

BRIANBOATRIGHT
ARCHITECT

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**PROJECT MANUAL
AND SPECIFICATIONS FOR**

**DOCTORS INLET ELEMENTARY
CAFETERIA EXPANSION**

**School District of Clay County
Project No. C-7-18/19**

Phase III Final Submittal

182000 DIS Cafeteria Expansion

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DOCTORS INLET ELEMENTARY CAFETORIUM REMODEL
Clay County School Board

BRIAN BOATRIGHT ARCHITECT, INC.

914 Plainfield Avenue
Orange Park, Florida 32073
(904) 413-8028

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DESCRIPTION OF THE WORK

PART 1- GENERAL

1.1 **Scope:** This information is for summary and general information only. The Drawings and Specifications supercede information contained in this section.

A. **Location:** The project involves extensive remodeling and expansion of the existing cafeteria at Doctors Inlet Elementary, Middleburg, Florida.

B. **General Description:**

1. The campus is currently occupied. ***The cafeteria must remain in operation during the construction.***

2. ***Therefore, the interior remodel of the existing building must take place during the summer of 2020.*** The addition and site work may take place during the school year. ***All work must be complete before the start of school in the Fall of 2020.***

3. Existing gross square footage of the existing cafeteria is 6,716 GSF.

4. The addition gross square footage is 2,830 GSF.

C. **Detailed Description:**

1. **Phasing:** The project involves two phases: Addition, during which the addition and sitework is to be completed; and Remodel, where the interior of the existing building is modified. The school and cafeteria will be occupied during the first phase. The second phase must occur during the summer and the entire project is to be completed by the end of the summer break.

2. **Demolition:** The project involves demolition of existing interior walls and the creation of several new openings in the exterior walls. The CMU and brick veneer walls are not load-bearing.

3. **Sitework:** Sitework will include grading, new sanitary, storm and water lines and new grease trap structure. Work will need to be performed carefully to maintain existing utilities to the buildings to remain occupied. Work is phased to allow utilities to remain temporarily and to be replaced in a future phase.

4. **Building Envelope:** The existing building exterior brick veneer is to remain in the addition. The existing roof (consisting of multi-ply membrane roofing over light-weight concrete deck) is to be re-roofed.

4. **Systems:** The electrical system will utilize the existing service and will include new cabling, receptacles, light fixtures and switches. Data and telephone cabling will be required. The existing package HVAC units will be replaced with new units. All ductwork will be new.

1.2 ***Note that there is a mandatory pre-bid conference. Bidders not attending will not be permitted to submit bids. Refer to Section 00100, Instructions to Bidders.***

END OF SECTION 00009

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SECTION 00010

**NOTICE TO BIDDERS
(Invitation to Bid)**

Sealed bids will be received by the District School Board of Clay County until

2:00pm on Thursday, 3 October 2019,
in the Business Affairs Conference Room,
814 Walnut Street, Green Cove Springs, FL 32043

at which time and place all bids received will be publicly opened and read aloud for furnishing all labor and materials for the construction of:

DOCTORS INLET ELEMENTARY CAFETERIA EXPANSION

All work shall be done according to the plans and specifications prepared by:

BRIAN BOATRIGHT ARCHITECT, INC.
914 Plainfield Ave, Orange Park, FL 32073
email all questions to brianboatrightaia@gmail.com
include project number in subject line

Plans are on file and open to inspection at the office of the architect and are available for purchase and on file with the following plan room:

LDI Reprinting Center
550 Wells Road, Suite 100, Orange Park, FL 32073
(904) 579-4027 (904) 579-4154 FAX
orangepark@ldireprinting.com

Prime bidders, who will be submitting a bid to the owner, are required to register with the architect their intention to bid and as a plan holder. Any addenda will be sent automatically (electronically) to the known plan holders. Other delivery methods may be arranged with the architect. Partial sets of drawings and/or specifications are not advised and neither the architect nor owner will be responsible for partial information given to subcontractors by the general contractors. ***Electronic drawings and specifications will not be distributed.***

There will be Mandatory Pre-bid Meeting at the site on 19 September 2019 at 9:00am per Section 00100, Part 9.2. Bidders not attending the pre-bid meeting will not be permitted to submit a bid.

Only contractors having been pre-qualified by the Clay County School District are eligible to submit bids for this project. **Only pre-qualified Contractors should submit bids** for this project (Florida Statutes).

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DISCRIMINATION: An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide goods or services to a public entity, may **not** submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may **not** submit bids on leases of real property to public entity, may **not** award or perform work as a contractor, supplier, subcontractor, or consultant under contract with any public entity, and may **not** transact business with any public entity.

The owner reserves the right to waive any irregularities and minor technicalities or to reject any and all bids. Each bidder must deposit, with his bid, a bid bond or cashier's check in the amount of five percent (5%) of the base bid price, payable to the owner.

The successful bidder will be required to provide a performance, labor and material bond in the amount of 100% of the accepted bid amount.

No bidder may withdraw his bid within (60) days after the actual date of the opening thereof. Any actual or prospective bidder who disputes the reasonableness or competitiveness of the terms and conditions of the invitation to bid, contract award, or recommendation for contract award, shall file a notice of protest with the superintendent of schools within 72 hours of receipt of the bid solicitation, posting of the bid tabulations, or posting of the bid award and must file a formal written protest within ten (10) days following the filing of the notice to protest. Failure to observe such timelines will constitute a waiver of proceedings and of right to protest as stipulated in Chapter 120 of the Florida Statutes. The school board requires a protestor to post bond in accordance with Florida Statutes, Section 255.0516 F.S.

Bond Requirement:

Should a contractor wish to protest the bid recommendation, the protestor shall be required to post a bond as follows:

- (1) Five percent (5%) of the recommended award for all projects valued less than \$500,000.00;
and
- (2) Twenty-five thousand (\$25,000.00) for all projects in excess of \$500,000.00.

Conditioned upon payment of all cost and fees, which may be adjusted against the protestor, in the administrative hearing. If at the hearing, the school board prevails, it may recover all costs and attorney's fees from the protester; if the protestor prevails, the protestor shall recover from the school board, all costs and attorney's fees.

Bid tabulations shall be posted at the main office, 900 Walnut Street Green Cove Springs, outside the board's meeting room after the intended recommendation is announced on or about four (4) days of the bid opening and after the board's decision is made. The bid tabulation will remain posted for a minimum period of 96 hours.

Addison Davis, Superintendent
Clay County District Schools

END OF SECTION 00010

SECTION 00100

INSTRUCTIONS TO BIDDERS

PART 1 - SPECIFICATION TERMINOLOGY

- 1.1 The Bidders are required to obtain a copy of AIA Document A701, 1997 Edition, for their reference.
- 1.2 **Definition of Terms:** Whenever in the Specifications the following terms or pronouns in place of them are used, their intent and meaning shall be interpreted as follows:
 - A. **Owner:** District School Board of Clay County, Florida.
 - B. **Architect:** Acting directly or through a duly-authorized representative.
 - C. **Inspector:** An authorized representative of the Architect or Owner assigned to inspect any of the materials, workmanship or completed work entering into the work.
 - D. **Bidder:** Any individual, firm, partnership or corporation submitting a proposal for the work contemplated.
 - E. **Surety:** The corporate body which is bound with and for the Contractor, which is primarily liable and which guarantees the faithful performance of the Agreement.
 - F. **Proposals:** The approved forms on which the Bidder will submit his bid for the work contemplated.
 - G. **Drawings:** The authorized plans and other drawings or reproductions thereof pertaining to the work to be done.
 - H. **Project Manual:** The Conditions of the Contract, detailed technical specifications and such other descriptions of the work as are set forth in any of the Contract Documents.
 - I. **Agreement:** "Agreement" shall mean the document entitled "Form of Agreement Between Contractor and Owner for Construction of Buildings", including all Addenda issued prior to execution of Agreement and all modifications issued subsequent thereto.
 - J. **Contract:** "Contract" shall mean the Contract Documents as defined and listed in the Agreement.
 - K. **Pre-Qualified Bidder:** Contractors pre-qualified to submit bids for Clay County School District projects.

PART 2 - QUALIFICATIONS OF BIDDERS

- 2.1 The Agreement will only be entered into with responsible contractors having been pre-qualified at the time of bid opening.

PART 3 - FAMILIARITY WITH LAWS

- 3.1 The Bidder is required to be familiar with all Federal, State and Local laws, ordinances, rules and regulations that in any manner affect the work. Unfamiliarity or misinterpretation on the part of the Bidder will in no way relieve him from applicable responsibilities.
- 3.2 The Contractor will be provided from the Clay County School District's Project Manager, the appropriate building permit prior to commencement of such work.

PART 4 - PROGRESS PAYMENTS

- 4.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments to the Contractor as provided in the Agreement. **No payment will be allowed for any material or equipment stored off the project site.**

PART 5 - BIDDING DOCUMENTS

- 5.1 All of the descriptions of the work as well as of the instruments of procedure which are contained in and embraced by the Drawings and Specifications and including Addenda not contained therein comprise the Bidding Documents.

PART 6 - ALTERNATES

- 6.1 If there are any alternate prices required, they will be detailed in Section 00105, Alternates.

PART 7 - ADDENDA

- 7.1 In case the Architect finds it expedient to supplement, modify or interpret any portion of the Bidding Documents during the bidding period, such procedure will be accomplished by the issuance of written Addenda to the Bidding Documents which will be delivered or mailed to all prospective Bidders at the respective addresses furnished for such purposes.

PART 8 - INTERPRETATION OF BIDDING DOCUMENTS

- 8.1 No interpretation of the meaning of the Drawings, Specifications, or other Bidding Documents, no correction of any apparent ambiguity, inconsistency or error therein will be made to any Bidder orally. Every request for such interpretation or correction should be in writing, addressed to the Architect. All such interpretation and supplemental instructions will be in the form of written Addenda to the Bidding Documents.
- 8.2 Only the interpretation or correction so given by the Architect, in writing, shall be binding and prospective Bidders are advised that no other source is authorized to give information concerning or to explain or interpret the Bidding Documents.

PART 9 - EXAMINATION OF BIDDING DOCUMENTS AND SITE WORK

- 9.1 Bidders are required, before submitting their proposals, to visit the site of the proposed work and completely familiarize themselves with the nature and extent of the work and any local conditions that may in any manner affect the work to be performed and the equipment, materials, and labor required. They are also required to examine carefully the Drawings, Specifications and other Bidding Documents to inform themselves thoroughly regarding any and all conditions and requirements that may in any manner affect the work.
- 9.2 ***Mandatory Pre-bid Meeting: A mandatory meeting will be held at the site as advertised. The purpose of the meeting will be to familiarize the bidders with the existing conditions, scope of work and special conditions, if any. Questions will be accepted and answered at the meeting. A sign-in sheet will be maintained by the architect for the purpose of certifying that a representative of the bidder was***

present at the meeting. Bids will not be accepted from contractors who have not attended the mandatory meeting.

PART 10 - BID GUARANTEE

10.1 **Bid Bonds (Guarantee):** Each bid must be accompanied by certified check, cashier's check, or a bid bond attached thereto, duly executed by the bidder as principal, and by a surety company admitted to do business in Florida, as a surety, such bond/check in the amount of five percent (5%) of the Base Bid Price. Certified/cashier's check will be returned by mail to all except the three (3) lowest bidders within five (5) days after opening of the bids, and the remaining checks will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if an award has been made, thirty (30) days after the date of award, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid. If a bid bond is submitted it must be signed by a Florida Licensed resident agent who holds a current power of attorney for the surety company issuing the bond.

PART 11 - SURETY COMPANY ACCEPTABILITY

11.1 To be acceptable to the Owner as Surety for Bid Bonds, Performance Bonds and for Labor and Material Payment Bonds, a Surety Company shall comply with the following:

A. IF THE BID IS \$500,000 OR LESS THE SURETY COMPANY MUST COMPLY WITH THE FOLLOWING:

1. Must have twice the minimum surplus and capital required by the Florida Insurance Code at the time that invitation to bid is issued;
2. Must otherwise be in compliance with the provisions of the Florida Insurance Code; and
3. Must hold a currently valid certificate of authority issued by the United State Department of the Treasury under ss. 31 U.S.C. 9304-9308.

NOTE: IT MAY BE THE RESPONSIBILITY OF THE SURETY COMPANY OR ITS AGENT TO SUBMIT PROOF OF COMPLIANCE WITH 11.1.A: 1. 2. and 3. ABOVE, AT THE TIME THE SURETY BONDS ARE SUBMITTED TO OWNER FOR APPROVAL.

B. IF THE BID IS IN EXCESS OF \$500,000 THE SURETY COMPANY MUST COMPLY WITH THE FOLLOWING:

1. The Surety Company must be admitted to do business in the State of Florida.
2. The Surety Company must have been in business and have a record of successful continuous operations for at least five years.
3. The Surety Company shall have at least the following minimum ratings according to (Best's Key Rating Guide, latest Edition.)

(1)	POLICY HOLDER'S RATING*	REQUIRED: FINANCIAL RATING*	SURPLUS RATING
CONTRACT AMOUNT \$500,000 to 750,000	A-	CLASS VIII	10-25 MIL
\$750,000 to 1,500,000	A-	CLASS VIII	25-50 MIL

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\$1,500,000 to 2,500,000	A-	CLASS VIII	50-100 MIL
\$2,500,000 or more	A-	CLASS VIII	100-250 MIL

* From Best's Key Rating Guide, Current Edition.

(2) Best's Policy Holder's Rating of "A" (which signifies A = Excellent) based upon good underwriting, economic management, adequate reserves for undisclosed liabilities, net resources for unusual stock and sound investment).

- 11.2 The Surety Company shall not expose itself to any loss on any one risk in an amount exceeding ten (10) percent of its surplus to policy holders, provided:
- A. Any risk or portion of any risk shall have been reinsured (in which case these minimum requirements contained herein also supply to the reinsuring carrier) in assuming insurer authorized or approved by the Insurance Commissioner to do such business in this State shall be deducted in determining the limitation of risk prescribed in this Section.
 - B. In the case of a surety insurance company, there shall be deducted in addition to the deduction for reinsurance, the amount assumed by any co-surety.
 - C. The value of any surety deposited, pledged or held subject to the content of the Surety and for the projection of the Surety.

PART 12 - LISTING AND APPROVAL OF SUBCONTRACTORS

- 12.1 In order that the Owner may be assured that only qualified and competent subcontractors will be employed on the project, each Bidder shall submit with his Proposal a list of the subcontractors who will perform the work in these Specifications as indicated by the "List of Subcontractors" form contained in these Specifications in Section 00400. The Bidder shall have determined to his own complete satisfaction that a listed subcontractor has been successfully engaged in this particular type of business for a reasonable length of time, has successfully completed installations comparable to that which is required by this Agreement and is qualified by technically and financially to perform that pertinent phase of this work for which he is listed. Each Subcontractor shall be currently certified and licensed to perform that phase of the work for which he is listed. Only one subcontractor shall be listed for each phase of the work. Electrical, air conditioning, mechanical, plumbing, roofing and underground utility contractors (where required by the project scope) shall have a valid, in-force Florida state-certified or registered license for Clay county, and shall present a copy of the license to the Owner as proof of valid licensure within 24 hours of bid opening.
- 12.2 After public opening and reading of Proposals, the Listing of Subcontractors submitted by the apparent competitive low Bidders will be read publicly. The listings or the next two low bids will be held for 30 days.
- 12.3 No change shall be made in the list of subcontractors before or after the award of a contract, unless agreed to in writing by the Owner.

PART 13 - PREPARATION AND SUBMISSION OF BIDS

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- 13.1 Each Bidder shall copy the proposal form on his own letterhead indicating his prices thereon in proper spaces for the entire work and for alternates on which he bids. Any erasure or other correction in the proposal may be explained or noted over the signature of the Bidder. Proposals containing any conditions, omissions, unexplained erasures, alterations, items not called for or irregularities of any kind may be rejected by the Owner.
- 13.2 Each bid must give the full business address of the Bidder and state whether he is an individual, corporation or partnership.
- 13.3 Proposals by a corporation must be signed with the legal name and seal of the corporation followed by the name of the state of its incorporation and the manual signature and designation of an officer, agent or other person authorized to bind the corporation.
- 13.4 Proposals by partnerships shall show the names of the partners and must be signed in the partnership name by one of the partners. The partnership signature shall be followed by the manual signature of the partner signing.
- 13.5 In every case, the name of the person signing and his designation shall be typed or printed below his signature. A person who affixes to his signature the work "President", "Secretary", "Agent" or other designation without disclosing his principal may be held to be individually responsible for such bid. Satisfactory evidence of the authority of an officer, agent, attorney or other person signing for a corporation and agent, attorney or other person signing for a partnership or an individual shall be furnished.
- 13.6 Bidder's proposal with all required documents shall be enclosed in a sealed envelope which shall be marked and addressed as indicated by the advertisement. If mailed the sealed envelope shall be placed within a mailing envelope, sealed, marked and addressed as above and delivered to the proper address.

PART 14 - BID MODIFICATION

- 14.1 Delete any reference to Bid Modifications.

PART 15 - WITHDRAWAL OF BIDS

- 15.1 Bids may be withdrawn on written or telegraphic request received from Bidders prior to the time fixed for opening. Negligence on the part of the Bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened and the Bid Guarantee may be forfeited.

PART 16 - DISQUALIFICATION OF BIDDERS

- 16.1 More than one bid from an individual, firm, partnership, corporation or association under the same or different names will not be considered. Reasonable grounds for believing that a Bidder is interested in more than one proposal for the same work will cause the rejection of all proposals in which such bidders are believed to be interested.
- 16.2 Bidders not already qualified by the Clay County School Board may not bid on this project.
- 16.3 ***Bidders who did not attend the mandatory pre-bid meeting and who are not on the sign-in sheet from said meeting may not bid on this project.***

PART 17 - RECEIPT AND OPENING OF BIDS

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- 17.1 Bids will be opened publicly at the time and place stated in the Call for Bids. The Officer whose duty it is to open them will decide when the specified time has arrived and no bids received thereafter will be considered. No responsibility will be attached to any officer for the premature opening of a bid not properly addressed and identified. At the time fixed for the opening of bids, their contents will be made public for the Bidders and others interested who may be present.
- 17.2 ***Within 24 hours of the bid opening, the three apparent low bidders shall submit a detailed bid form breakdown with detailed costs to the Architect for review.*** The breakdown shall be itemized in CSI 16-Division format (Division 0 thru Division 16) corresponding to the table of contents in the Specification Manual. Each major item of work and each subcontracted item within each division shall be itemized. Lump sum amounts shall be broken down as requested by the Architect. Contractor's overhead, profit and other cost shall be distributed proportionately in each item. The total of the items shall equal the contract sum.

PART 18 - DISQUALIFICATION OF BIDS

- 18.1 Any or all proposals will be rejected if there is reason to believe that collusion exists among the Bidders and no participants in such collusion will be considered in future proposals for the same work. Proposals in which the prices obviously are unbalanced may be rejected.
- 18.2 Contractors not previously approved by the School Board are not eligible to bid this project.

PART 19 - REJECTION OF BIDS

- 19.1 The Owner reserves the right to reject any one or all bids, or any part of any bid, to waive any informality in any bid, and to award the purchase in the best interest of the Clay County District Schools.

PART 20 - AWARD OF CONTRACT

- 20.1 The contract will be awarded as soon as possible to the lowest responsible Bidder provided his bid is reasonable and it is in the best interest of the Owner to accept it.
- 20.2 The Owner reserves the right to waive any informality in bids received when such waiver is in the interest of the Owner.

PART 21 - TIME OF COMPLETION AND LIQUIDATED DAMAGES

- 21.1 The Work to be performed under this contract is to be performed in **two (2) phases under one (1) contract**. The Work involves the completion of the **Phase 1 addition** while the cafetorium is in use during the school year. The **Phase 2 remodeling** of the interior cannot be performed while school is in session and must therefore be completed during the summer. Although the Owner and the Architect are not charge of the means and methods of construction, they can require certain schedule milestones to be met.
- 21.2 Phase 1 shall be commenced within **five (5) calendar days** after receipt of Notice to Proceed. Note that non-interior work, which does not affect the continued functioning of the cafetorium and food preparation may be performed during Phase 1 (such as re-roofing of the existing building). Provided all safeguards for construction on an occupied campus are preserved.

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- 21.3 Phase 2 cannot commence until **Wednesday, June 3, 2020**. The Date of Substantial Completion for the entire project shall be not later than **Tuesday, 14 July 2020**. The Work shall be substantially completed not later than **Tuesday, 4 August 2020**, at which time the cafetorium and food preparation areas shall be fully functional. Final Completion shall not be later than **Friday, September 4, 2020**.
- 21.4 Should any change orders be granted, the above schedule shall be adjusted maintaining the duration in days and adjusting the dates.
- 21.5 In as much as failure to complete the project within the time fixed in the Agreement will result in substantial injury to the Owner, and as damages arising from such failure cannot be calculated with any degree of certainty, it is hereby agreed that if the project is not substantially completed, according to the definition of "substantial completion" in Section 00800, Article 8B, of the Specifications, or within such further time, if any, as in accordance with the provisions of the contract documents shall be allowed for substantial completion, the Contractor shall pay to the Owner as liquidated damages for such delay, and not as a penalty, **one thousand dollars (\$ 1,000)** for each and every calendar day elapsing between the date fixed for substantial completion and the date such substantial completion shall have been fully accomplished, and **five hundred dollars (\$ 500)** for each and every calendar day elapsing between date fixed for Final Completion and the date such Final Completion shall have been fully accomplished. Said liquidated damages shall be payable in addition to any excess expenses or costs payable by the Contractor to the Owner under the provisions of the contract documents, except for Contractor's delays.
- 21.6 This provision for liquidated damages for delay shall in no manner affect the Owner's right to terminate the contract as provided in Article 14 of the General Conditions or elsewhere in the contract documents. The Owner's exercise of the right to terminate shall not release the Contractor from his obligation to pay said liquidated damages in the amounts set out in the Agreement.
- 21.7 It is further agreed that the Owner may deduct from the balance retained by the Owner under the provisions of Article 4 of the Agreement as the case may be, or such portion thereof as the said retained balance will cover.

PART 22 - BASIS FOR BIDDING, TRADE NAMES, PERFORMANCE SPECIFICATIONS

- 22.1 Refer to Section 01150, Substitution Requests. For clarity of description and as a standard of comparison, certain equipment, materials, etc., have been specified by trade names or manufacturers to insure a uniform basis for bidding. The Bidder shall base his Proposal on the particular system, equipment or material specified.
- 22.2 The use of a particular trade name or manufacturer is not intended to imply a sole source relationship with that product or manufacturer. Manufacturers are invited to submit their products, in accordance with the requirements of the particular specification section, for consideration as equal to the product specified.
- 22.3 **No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.**
- a. For the purposes of this bid, this date shall be fixed as ten (10) calendar days prior to the initial bid opening date.

- b. **If the bid date is postponed in an addendum, this date shall NOT be moved, unless this is specifically stated in the addendum postponing the bid opening.**
- 22.4 **Unsolicited and Unapproved Materials and/or Manufacturers:** Submitting prices for unsolicited and/or unapproved products to the Bidders will not be tolerated. Any product or manufacturer that has not been pre-approved in the specification or by addendum will not be approved during construction and will be rejected. The cost to provide the approved product will be solely borne by the Bidder. If there is a question about the approval of a manufacturer or product, call the Architect for verification.

PART 23 - FLORIDA PRODUCTS AND LABOR

- 23.1 The Contractor's attention is called to Section 255.04, Florida Statutes, which require that on public building contracts Florida products and labor shall be used wherever price and quality are equal.

PART 24 - TAXES

- 24.1 Although the Owner is not subject to the Florida Sales and Use Tax, any Contractor who purchases materials which will be used in the construction of state-owned building will not be exempted from the Sales Tax on these materials as evidenced by the following excerpt from the Florida statutes:
- "The State, any county, municipality or political subdivision of this State is exempt from the sales tax, except this exception shall not include sales of tangible personal property made to contractors employed either directly or as agents of any such government or political subdivision thereof when such tangible personal property goes into or becomes a part of public works owned by such government or political subdivision thereof."*
- 24.2 The Owner is **not** subject to:
- A. Federal Excise Taxes on materials or appliances that are incorporated into and become a part of the completed improvement.
 - B. Federal Tax on Transportation of Property.
- 24.3 In every case of a purchase of materials to be incorporated in the work which are subject to Federal Excise Tax, the Owner will furnish to the Contractor the necessary Federal Excise Tax Exemption Certificate upon receipt of a copy of the supplier's invoice showing the item or items, the net price, and Federal Excise Tax separately.
- 24.4 The Bidder shall take these factors into consideration in preparing his proposal, including therein the cost of the State Sale and Use Tax on materials, but excluding the cost of those taxes not applicable.

PART 25 - PERMITS

- 25.1 The Owner, hence the Contractor, is exempt from all county, municipal, or local building codes, interpretations, building permits and assessments of fees for building permits, and ordinances.
- 25.2 The Contractor, upon award by the School Board, will be provided the Building Permit from the Clay County School District's Project Manager. No work shall commence until the building permit has been received. The building permit shall be posted in the field office or where designated by the building official.

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PART 26 - GOVERNING CODES FOR SCHOOL FACILITIES

- 26.1 The Florida Building Code shall govern codes to be followed for this project.
- 26.2 All work contained under this Contract is based on the requirements contained **in the latest edition** to the following codes:
- A. Florida Building Code, Latest Edition
 - B. Florida Plumbing Code, Latest Edition
 - C. Florida Mechanical Code, Latest Edition
 - D. National Electrical Code, Latest Edition
 - E. Florida Gas Code, Latest Edition
 - F. Florida Fire Prevention Code, Latest Edition
 - G. ANSI A117.1 (Physically Handicapped)
 - H. NFPA Life Safety code, NFPA101 and others NFPA codes as applicable. NFPA codes shall be used in accordance with the Florida Fire Prevention Code, as noted above.
 - I. DCA - Department of Community Affairs
 - J. SREF Standards for Educational Facilities
 - K. Other Standards as referenced or specified in other Sections.

PART 27 - BID PROTEST

- 27.1 Any actual or prospective bidder who disputes the reasonableness or competitiveness of terms and conditions of the Invitation to Bid or contract award recommendation shall file a Notice to Protest with Superintendent of Schools within 72 hours of receipt of bid solicitation or posting of the bid tabulation with recommendation and must file a formal written protest within ten (10) days following the filing of Notice to Protest. Failure to observe such timelines will constitute a waiver of proceedings and of right to protest - Chapter 120, Florida Statutes. The School Board requires a protestor to post bond in accordance with Florida Statutes, Section 255.0516 F.S.
- 27.2 **Bond Requirement:** The School Board requires a protestor to post bond in accordance with Florida Statutes, Section 255.0516. Should a Bidder wish to protest the bid recommendation, the protestor shall be required to post a bond as follows:
- A. Five percent (5%) of the recommended award for all projects valued less than \$500,000.00; and
 - B. Twenty-five thousand dollars (\$25,000.00) for all projects in excess of \$500,000.00; Conditioned upon payment of all costs and fees, which may be adjusted against the protestor, in the Administrative Hearing. If, at the Hearing, the School Board prevails, it may recover all costs and attorney's fees from the protestor. If the protestor prevails, the protestor shall recover, from the School Board, all costs and attorney's fees.
- 27.3 Bid Tabulations shall be posted outside the Board's Meeting Room after the intended recommendation is announced, on or about four (4) days of the bid opening and after the Board's decision is made. The Bid Tabulation will remain posted for a minimum period of 96 hours.

PART 28 - CHECKLIST FOR BID SUBMITTAL

- 28.1 The following items shall be included within the sealed bid envelope:
- A. Bid Proposal on Proposal Form
 - B. Bid Security
 - C. List of Subcontractors (Section 00400)

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- D. Résumé of Previous Work by the Roofing Installer
- 28.2 Within 24 hours, copies of subcontractor's licenses shall be submitted by the apparent low bidder to the Owner, if requested.

PART 29 - EXECUTION OF AGREEMENT AND BOND

- 29.1 **Agreement Between Owner and Contractor:** If the Contractor is to be an individual, the Agreement shall be signed with his manual signature.
- 29.2 If the Contractor is a firm or company owned by an individual, the Agreement shall be executed in the name of the firm or company by the manual signature of the Owner.
- 29.3 If the Contractor is a Partnership, the Agreement shall be executed in the name of the partnership by the manual signature of a partner or partners.
- 29.4 If the Contractor is a Corporation, the Agreement shall be executed in the name of the Corporation and shall bear the corporate seal. It may be signed for the Corporation by any other officer than the President, the signature of such officer signing shall be attested by the Secretary, the executed contract shall be accompanied by a duly authenticated document, bearing the seal of the Corporation, quoting the section of the by-laws of the Corporation authorizing the Board of Directors to designate such Officer a copy of the resolution designating and authorizing him to execute on behalf of the Corporation. That document must contain a statement that the authority is in effect on the date of the execution of the contract and may not be dated earlier than the date of the execution of the Agreement. The same officer may not execute the Agreement and authenticate the document of authority.
- 29.5 **Performance and Payment Bond:** This bond shall be executed on behalf of the Contractor in the same manner and by the same person who executed the contract.

END OF SECTION 00100

SECTION 00105

ALTERNATES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 If the Owner wishes to learn the relative or additional construction cost of an alternative method of construction, an alternative use of type of material, or an increase or decrease in scope of the project, these items will be defined as Alternates and will be specifically described by the Drawings and/or Specifications. Alternates will be listed in the Proposal Form in such a manner that the Bidder shall be able to clearly indicate what sums he will add to or deduct from his Base Bid.
- 1.4 Such alternates may or may not be accepted. The alternate will be accepted or rejected solely by the decision of the Clay County School Board.
- 1.5 Within each alternate include labor, materials, equipment, mobilization, overhead, profit, and including, but not limited to, handling, storing, protecting, connecting, adjusting, testing, finishing, cleaning, and completing. Demolition, removal and disposal of existing materials for each alternate shall be included as part of the price. It is the intent to include for any accessories that may be required or necessary for a complete, secure installation. Later requests for additional money to complete an installation with required accessories, materials or labor will not be accepted.
- 1.6 The Bidder shall modify his Base Bid dollar amounts for each of the items listed in the Bid Proposal Form.

- A. **DEDUCTIVE ALTERNATES:** The Bidder shall **DEDUCT** from his base bid dollar amounts for each of the following items in the order listed below:

ALTERNATE No. 1 - Deduct the Cost of Re-roofing the Existing Building.

Deduct the cost of roofing removal, new roofing, new flashing and new roof drains.

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ALTERNATE No. 2 - Deduct the Cost of Replacing the Existing Rooftop Units. Deduct the cost of replacing all existing rooftop units on the existing building.

ALTERNATE No. 3 - Deduct the Cost of Replacing the Fascia on the Existing Building. Deduct the cost of fascia removal and new fascia installation on the existing building.

ALTERNATE No. 4 - Deduct the Cost of the Stage Skirt Replacement. Deduct the entire cost of removal and installation of a new stage skirt.

PART 2 - PRODUCTS: Not used.

PART 3 - EXECUTION: Not used.

END OF SECTION 00105

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SECTION 00200

PUBLIC ENTITY CRIMES

Please note the following public entity crime statement:

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a proposal on a contract to provide any goods or services to a public entity, may not submit a proposal on a contract with a public entity for the construction or repair of a public building or public work, may not submit proposals on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with a public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, F.S., for Category Two for a period of 36 months from the date of being placed on the convicted vendor list.

END OF SECTION 00200

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SECTION 00300

BID PROPOSAL FORM

SUBMIT IN DUPLICATE ON CONTRACTOR'S LETTERHEAD

TO: **BRIAN BOATRIGHT ARCHITECT, INC.**
914 Plainfield Avenue
Orange Park, Florida 32073

FOR: **182000 Doctors Inlet Elementary Cafeteria Expansion**

The undersigned, hereinafter called "Bidder", having visited the site of the proposed project and familiarized himself with the local conditions, nature and extent of the Work, and having examined carefully the drawings, specifications, the Form of Agreement, and other Contract Documents with the Bond Requirements therein, proposed to furnish all labor, materials, equipment and other items, facilities and services for the proper execution and completion of the referenced construction, in full accordance with the Drawings and Specifications prepared by the firm of Brian Boatright Architect, Inc., in full accordance with the advertisement for bids, Instructions to Bidders, Agreement, and all other documents relating thereto on file in the office of the Architect and if awarded the Contract, to complete the said work ***within the time limits specified and including the required phasing schedule*** for the following bid price:

BASE BID _____ **Dollars \$** _____

The following alternates, described in detail in Section 00105, Alternates, shall be **DEDUCTIVE**:

ALTERNATE No. 1 - Deduct the Cost of Re-roofing the Existing Building

Alt No. 1: _____ **Dollars \$** _____

ALTERNATE No. 2 - Deduct the Cost of Replacing the Existing Rooftop Units

Alt No. 2: _____ **Dollars \$** _____

ALTERNATE No. 3 - Deduct the Cost of Replacing the Fascia on the Existing Building

Alt No. 3: _____ **Dollars \$** _____

ALTERNATE No. 4 - Deduct the Cost of the Stage Skirt Replacement

Alt No. 4: _____ **Dollars \$** _____

The following unit prices, detailed in Section 01026 of these specifications, will remain in effect for the duration of the Work, until the Final Acceptance and release of retainage:

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UNIT PRICE No. 1: \$ _____/SF (Remove/Replace Concrete Slab)

UNIT PRICE No. 2: \$ _____/SF (Install Empty Box and Conduit)

UNIT PRICE No. 3: \$ _____/SY (Remove Sidewalk)

UNIT PRICE No. 4: \$ _____/SY (Install 4" thick Concrete Sidewalk)

UNIT PRICE No. 5: \$ _____/SY (Install Sod)

There is enclosed a certified check, cashier's check, treasurer's check, bank draft or Bid Bond in the total amount of not less than five (5%) percent of the Base Bid payable to the District School Board of Clay County as a guarantee for the purpose set out in your Instructions to Bidders.

The Bidder hereby agrees that;

- A. The base bid proposal and alternates shall remain in full force and effect for a period of sixty (60) calendar days after the time of the opening of this proposal and that the Bidder will not revoke or cancel this proposal or withdraw from the competition within the said sixty (60) calendar days.
- B. In the event the Contract is awarded to this Bidder, he will enter into a formal written Agreement with the Owner in accordance with the accepted bid within ten (10) calendar days after said Contract is submitted to him and will furnish to the Owner a Contract Performance Bond and Labor and Material Bond with good and sufficient sureties, satisfactory to the Owner, in the amount of 100% of the accepted bid, the form and terms of which shall fully comply with Section 255.05, Florida Statutes. The Bidder further agrees that in the event of the Bidder's default or breach of any of the agreements of this proposal, the said bid deposit shall be forfeited as liquidated damages.

Acknowledgment is hereby made of receipt of the following Addenda issued during the bidding period (*Expand list to accommodate all addenda as required*):

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

_____ A List of Subcontractors (if applicable) is included in the Bid.

_____ The Bidder certifies that they, or an authorized representative of the company, was present at the mandatory pre-bid meeting listed in Section 00100, Part 9.2.

_____ Installer Résumé of Comparable Roofing Work

In witness thereof, the Bidder has hereunto set his signature and affixed his seal this ___ day of _____, A.D. 20__.

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By: _____
(Print Name)

(Signature)

(Seal)

Title: _____

Company Name: _____

Address: _____

Phone Number: _____

Florida Construction Industries Licensing Board of Certification

(Name of Holder)

(Certificate No.)

END OF SECTION 00300

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SECTION 00400

LIST OF SUBCONTRACTORS FORM

(To be submitted on the Bidder's letterhead, placed in a sealed envelope and attached to proposal).

DATE: _____

This list is an integral part of the bid submitted by: _____
(Bidder to insert his full name and address)

For the Construction of: **Doctors Inlet Elementary Cafeteria Expansion**

The undersigned, hereinafter called the "Bidder", lists below the names of the Subcontractors who will perform the phases of the work indicated:

TYPE OF WORK	NAME/ADDRESS OF SUBCONTRACTORS
1. Demolition	_____
2. Underground Utilities	_____
3. Brick Manufacturer	_____
4. Mason	_____
5. Roofing Manufacturer	_____
6. Roofing Installer	_____
7. Insulation Installer	_____
8. Window Manufacturer	_____
9. Window Installer	_____
10. Kitchen Equipment Supplier	_____
11. Plumbing	_____
12. Mechanical	_____
13. Electrical	_____

Proof of each Licensed Subcontractor's State License shall be provided within 24 hours of Bid Opening.

END OF SECTION 00400

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SECTION 00500

AGREEMENT AND COMPLETION FORMS

The Bidders are required to obtain and familiarize themselves with the following forms:

AIA A101-1997	Standard Form of Agreement Between Owner and Contractor (Stipulated Sum)
AIA G706	Contractor's Affidavit of Payment of Debts And Claims
AIA G706A	Contractor's Affidavit of Release of Liens

Included in this section are the following forms which will be used for the completion of this Project:

**Substantial Completion Inspection Form (for reference)
Certificate of Substantial Completion**

**Final Completion Inspection Form (for reference)
Certificate of Contract Completion**

The Owner may substitute updated or revised forms in lieu of the listed forms herein.

School District of Clay County Substantial Inspection Report

Project Name: _____
SDCC Project Number: _____ **OEF Project Number:** _____
School/Campus: _____
Contractor: _____
Architect: _____
Inspection Date: _____
Inspected By: _____
Accompanied by: _____

- A. Threshold Building included in project? Yes No
 (If yes, has the District received the letter of certification from the Threshold Inspector?) Yes No

- B. Systems and areas Inspected:
- | | |
|--|---|
| <p>_____ Fire Alarm and Detectors</p> <p>_____ HVAC Shut-down</p> <p>_____ Inter-Com System</p> <p>_____ Signage</p> <p>_____ Emergency Power Shut-down</p> <p>_____ Emergency Generator Operation</p> <p>_____ Emergency Lighting</p> <p>_____ Exiting & Exit Lights</p> <p>_____ Glazing</p> <p>_____ Fire Extinguishers</p> <p>_____ Toilet Facilities</p> <p>_____ Food Preparation</p> <p>_____ Site Lighting</p> <p>_____ Site Parking</p> | <p>_____ Fire Hydrant Test</p> <p>_____ Elevator Certification</p> <p>_____ Well Certification/Test</p> <p>_____ Water Certification/Test</p> <p>_____ Kitchen Hood Certification</p> <p>_____ Fire Sprinkler Certification</p> <p>_____ Lift Station Test</p> <p>_____ HVAC Test & Balance</p> <p>_____ Carpet Certification/Test</p> <p>_____ DEP Certification/Clearance</p> <p>_____ SJRWMD Inspection/Clearance</p> <p>_____ Safety Conditions Interior</p> <p>_____ Safety Conditions Exterior</p> <p>_____ Roofing</p> |
|--|---|

*See attached punch list

Project Manager's Signature

(Date)

Architect's Signature

(Date)

Contractor's Representative Signature

(Date)

School District of Clay County Certificate of Substantial Inspection

Having completed all requirements as outlined within the project specifications and drawings, I certify that the project listed below is substantially completed and has been constructed in accordance with said documents.

Project Title: _____

School: _____

SDCC Project Number: _____

OEFIS Project Number: _____

Project Architect: _____

Project Contractor: _____

Date of Substantial Completion: _____

Signature: Contractor Date _____

Signature: Architect Date _____

Signature: Project Manager Date _____

School District of Clay County Final Completion Inspection and Report

Date: _____
SDCC Project Number: _____
Project Name: _____
Contractor: _____
Architect: _____
SDCC Project Manager: _____

A. All deficiencies identified as the final punch list have been identified, and a list is attached? Yes No

B. The following items (as identified within the Project Manual) must be received in accordance with project specifications before a Certificate of Final Completion will be issued:

- _____ Application for Payment
- _____ Consent of Surety to Final Payment
- _____ Extra Materials (when specified)
- _____ Warranties and Bonds
- _____ Completion of the Architect/Engineer Punch List
- _____ Certificate of Contract Completion
- _____ Test and Balance Reports (if applicable)
- _____ Other Certifications, as required:
 - 1. Asbestos 5. Clearance letter from Dept. of Environmental Protection (DEP)
 - 2. Carpet 6. Storm Water
 - 3. Lead 7. Toxic Substances
 - 4. Bacteriological
- _____ As-Built Drawings
- _____ Maintenance and Operations Manuals
- _____ Keys accepted
- _____ Other (Explain)

Signature: _____ Date: _____
Contractor

Signature: _____ Date: _____
Architect

Signature: _____ Date: _____
Project Manager

School District of Clay County Certificate of Final Inspection

Having completed all requirements as outlined within the project specifications and drawings, I certify that the project listed below has reached final completion and has been constructed in accordance with said documents.

Project Title:

School:

SDCC Project Number:

OEFIS Project Number:

Project Architect:

Project Contractor:

Date of Final Completion:

_____ Date _____

Signature: Contractor

_____ Date _____

Signature: Architect

_____ Date _____

Signature: Project Manager

END OF SECTION 00500

SECTION 00600

BONDS AND CERTIFICATES

1.1 Form for Performance and Payment Bond:

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN, THAT _____, hereinafter called the Principal, and _____, hereinafter called the Surety of Sureties, are held and firmly bound unto the Owner and their successors, in the sum of _____ (\$ _____) for the payment whereof the Principal and the Surety of Sureties bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly, by these presents.

WHEREAS, The Principal has, by means of a written Agreement, dated _____, entered into a Contract with the Owner for _____ a copy of which Agreement is by reference made a part hereof.

NOW, THEREFORE, the Condition of this Obligation is such that the Principal:

1. Performs the Contract at the times and in the manner prescribed in the Contract, and
2. Promptly makes payments to all persons supplying Principal with labor, material and supplies used directly or indirectly by the Principal or subcontractors, in the prosecution of the work provided for in the Contract, as prescribed by Section 255.05, or Section 713.23, Florida Statutes, whichever is applicable to the Contract, and
- c. Pays the Obligee all loss, damages, costs and attorney's fees that the Obligee sustains because of default by the Principal under the Contract, and
4. Performs the guarantee of all work and materials furnished or this obligation shall be void; otherwise, it shall remain in under the Contract applicable to the work and materials, then in full force and effect.

The provisions and limitations of Section 255.05 or Section 713.23, Florida Statutes, whichever is applicable to the Contract, are incorporated in this Bond by reference.

Signed and Sealed this ___ day of _____, 20__, In presence of:

_____	_____
_____	By: _____
_____	By: _____

END OF SECTION 00600

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SECTION 00700

AIA GENERAL CONDITIONS

The ***General Conditions of the Contract for Construction, AIA Document A201, Latest Edition***, issued by the American Institute of Architects, and its Supplements if any, relates directly to the Work of this Project and is hereby made a part of the Contract as though fully contained in these Specifications.

The Contractor is hereby specifically directed, as a condition of the Contract, to obtain the necessary number of copies of AIA Document A201, to acquaint himself with the Articles contained therein and to notify and apprise all Subcontractors, Sub-subcontractors, suppliers and any other parties to the Contract or individuals or agencies engaged on the Work as to its contents.

No contractual adjustments shall be made as a result of failure on the part of the Contractor to fully acquaint himself and all other parties to the Contract with the conditions of AIA Document A201.

END OF SECTION 00700

SECTION 00800

SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

- A. These Supplementary Conditions modify, extend and add to provisions of the **General Conditions of the Contract for Construction, AIA Document A201, Latest Edition**, for specific project requirements. Modifications specified herein supplement, change, delete from and add to above-referenced AIA Document A201. Where a portion of the General Conditions is modified herein, the unaltered portions of the General Conditions shall remain in effect. Paragraphs not listed herein are not modified. The General Conditions and Supplementary Conditions apply to all Sections in each Division of the Specifications and the Drawings. The Contractor shall be responsible for informing all applicable parties. This becomes especially critical when partial sets of Plans and Specifications are issued to Subcontractors not familiar with these requirements. General Contractors are responsible for verifying Bids prior to submitting the Bid.

ARTICLE 1 - DEFINITIONS

1.2 Execution, Correlation and Intent:

- A. Paragraph 1.2.3: ADD the following Subparagraphs:
- .1 In the event of conflicts or discrepancies among the Contract Documents, the Architect's interpretations will be based on the following priorities:
 1. The Agreement.
 2. Addenda, with those of later date having precedence over those of earlier date.
 3. The Supplementary Conditions.
 4. The General Conditions of the Contract for Construction.
 5. Drawings and Specifications.
 - .2 In case of an inconsistency between the Drawings and Specifications or within either Document as to a material, product system, dimension, size, quantity or method, the Contractor shall include in the Contract Sum the cost of providing the more expensive, better quality or greater quantity material, product, system, dimension, size quantity or method. The Architect will interpret the inconsistency and the Contract Sum will be adjusted when the intent of the Contract Documents is interpreted by the Architect and his interpretation is that the intent was to be the less expensive, lesser quality or lesser quantity material, product, system, dimension, size, quantity or method.
- B. Paragraph 1.2: ADD the following Subparagraph:
- 1.2.6 References in these Contract Documents to standards including trade associations, Federal and Military Specifications, technical societies, organizations, and associations, codes and government authorities whether specific or by implication, shall refer to the latest issue or edition in effect 30 days prior to date of receipt of Bids or date of the Agreement,

if there were no Bids, unless a date is specified. The provisions of referenced standards shall not change the duties and responsibilities of the Owner, the Contractor, or the Architect, or any of their consultants, agents or employees.

1.2.7 The word "provide" shall mean furnish and install the indicated term, product, material or system unless otherwise indicated.

1.2.8 The terms "as shown" or "as indicated" or phrases of similar import, shall mean as shown or indicated on the Drawings.

ARTICLE 3 - CONTRACTOR

3.4 Labor and Materials:

A. Add Paragraphs 3.4.3, 3.4.4 and 3.4.5 as follows:

3.4.3 The Contractor shall not use or allow to be used and shall not furnish or install any material, product, equipment or tool that contains or uses asbestos or any other toxic material or substance, as determined by the U.S. Environmental Protection Agency, for use in or on the Project, whether temporary or permanent. Should the Contractor determine that a material, product or equipment that is specified or indicated in the Contract Documents contains asbestos or any other toxic material or substance, the Contractor shall not install the material, product or equipment and shall notify the Architect immediately.

3.4.4 Substitutions: After the Contract has been executed, the Owner and the Architect will consider a written request for substitution of products in place of those specified only under conditions set forth herein.

.1 Materials, products, and systems are specified in the Contract Documents by manufacturer, trade name or distributor to establish a standard of the required criteria, including function, performance, dimension, appearance and quality to be met by a proposed substitution. Each application shall include name, Specification Section, Paragraph and manufacturer of the material, product, equipment or system for which it is to be substituted and a complete description of the proposed substitute including Drawings, product data, performance and test data and all other information necessary for an evaluation. A statement setting forth all changes in other materials, equipment or other portions of the Work including changes in Work of other Contracts, that incorporation of the substitute would cause or require, shall be included with the application for a substitution. The application shall include an itemized cost estimate indicating all cost and saving caused by the acceptance of the substitute. The burden of proof of merit of proposed substitute is upon the proposer.

.2 Substitutes shall not be incorporated in the Work without prior written approval of the substitute by the Architect.

.3 Where material, products, or systems are specified by one or more manufacturers with model number(s) or specific item, identification and "or approved equal" is included, only the item(s) that is specified by

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manufacturers with model number(s) or specific identification is approved and any other item shall be submitted for approval same as a substitution.

- .4 Where materials, products, equipment or systems are specified by a referenced standard or performance specification, the item must be submitted for approval same as a substitute.
- .5 Applications submitted for approval as substitutions shall be by the Contractor and not by Subcontractor or Supplier. Each item submitted for substitution shall be a separate submittal.
- .6 Whether or not the Architect and Owner accept a proposed substitute, when notified by the Owner, the Contractor shall reimburse the Owner for the Architect's cost for the Architect and the Architect's consultants for evaluating any proposed substitute including changes required in the Contract Documents for the substitute.
- .7 The Architect's decision of approval or disapproval of a proposed substitution shall be final.

3.4.5 By making requests for substitutions based on Subparagraph 3.4.4 above, the Contractor:

- .1 Represents that the Contractor has personally investigated the proposed substitute item and determined that it is equal or superior in all respects to that specified;
- .2 Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 Certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently becomes apparent; and
- .4 Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

3.11 Documents and Samples at the Site:

A. Add Paragraph 3.11.2 as follows:

- 3.11.2 Additional requirements for Record Documents are specified in Division 1 General Requirements.

3.12 Shop Drawings, Product Data and Samples:

A. Add Paragraphs 3.12.12 thru 3.12.17 as follows:

- 3.12.12 Contractor shall stamp each item in each Submittal with his firm approval stamp, date and sign each copy. Contractor shall not reproduce Architect's Drawings for Shop Drawings without written approval of the Architect.
- 3.12.13 Submittal: Submit a minimum of six (6) copies of product data and Shop Drawings to the Architect. The Architect will mark-up his review comments on the copies and return three (3) of the marked-up copies of Drawings and three (3) marked-up copies of product data to the Contractor.

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- 3.12.14 Mark-up: Shop Drawings and data will be reviewed by the Architect and marked APPROVED, APPROVED AS NOTED, RETURNED FOR CORRECTIONS, NOT APPROVED or RETURNED WITHOUT ACTION (or words to that effect). Submittal returned APPROVED AS NOTED need not be returned if Architect's comments are acceptable to the Contractor. Submittal returned NOT APPROVED, and RETURNED FOR CORRECTION must be resubmitted. Architect's comments will be marked in red pencil.
 - 3.12.15 When submittals are rejected and returned more than two times through no fault of the Architect, then the Contractor shall reimburse the Owner for the Architect's time to review submittals that are resubmitted three or more times. The Architect's cost is defined in Paragraph 4.1.5.
 - 3.12.16 Transmittal: Contractor shall use transmittal letter provided by the Architect. Submit separate transmittal letter and one (1) copy for each group of Shop Drawings common to a portion of the Work and separate transmittal letter and one (1) copy for each Section of the Specifications. Partial Submittal are not acceptable. Each item in the Submittal must be listed in the transmittal letter. The Architect will return transmittal letter to Contractor with each returned Submittal with disposition noted for each item.
 - 3.12.17 The Architect shall review the submittals within sufficient time to avoid impacting the Project schedule. The Contractor must transmit submittals in the order of construction, in sufficient quantity and complete as directed in the Specifications.
 - 3.12.18 Samples: Submit samples, in the quantity required by the Specifications Section, where it is specified, accompanied by same transmittal letter as used for Drawings and product data.
- 3.18 **Indemnification:**
- A. Add Paragraph 3.18.4 as follows:
 - 3.18.4 For ten dollars (\$10.00), acknowledged to be included and paid for by the Owner, in the Contract Sum, and other good and valuable consideration, the Contractor agrees to indemnify and hold harmless the Owner and his agents and employees in accordance with the provisions of this Paragraph 3.18 and of Paragraph 3.17. For ten dollars (\$10.00), and other good and valuable consideration, to be paid to the Contractor by the Architect after execution of the Agreement by the Contractor and the Owner, the Contractor also agrees to indemnify and hold harmless the Architect and his agents, employees and his consultants in accordance with the provisions of this Paragraph 3.18 and of Paragraph 3.17.
- 4.2 **Administration of the Contract:**
- A. From Paragraph 4.2.10, DELETE the second sentence in its entirety.
 - B. Add as follows:
 - 4.2.12.1 Should the Contractor fail to request interpretations or questionable items in the Contract Documents, neither the Owner nor the Architect will

thereafter entertain an excuse for failure to execute the Work in a satisfactory manner.

- 4.2.12.2 Should conflict occur between the Contract Documents, the Contractor is deemed to have estimated upon the more expensive method of performing the Work unless he has requested and received a written decision from the Architect before submission of his Proposal.
- C. To Paragraph 4.2.13, ADD the following to the end of the paragraph:
The term "aesthetic effect" as used herein refers to color, texture, profile and juxtaposition of masses. The Architect shall be the sole interpreter of the design intent with respect to such matters, but the Architect's authority with respect thereto shall not contravene any other rights of either the Owner or the Contractor ascribed to them by other provisions of the Contract.

4.3 Claims and Disputes:

- A. Paragraph 4.3.6: Add Subparagraph 4.3.6.1 as follows:
.1 When data on subsurface investigations including soil borings, ground water table and other data on existing conditions above and below the ground surface is included in the Contract Documents or made available by the Architect, the data is made available for information indicating only the conditions found by said investigations and is limited to the exact locations and dates listed in the data available. The Architect and the Owner shall not be responsible for variations found to exist between data made available and actual field conditions. The Contractor shall make his own investigations of ground water table conditions and other existing conditions and shall not assume that ground water table conditions remain the same after the date and time the available data was made.

ARTICLE 5 - SUBCONTRACTORS

5.2 Award of Subcontracts and Other Contracts for Portions of the Work:

- A. Paragraph 5.2.1: Add Subparagraph 5.2.1.1. as follows:
.1 Not later than thirty (30) days after date of commencement, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as manufacturers for each of the products identified in the General Requirements (Division 1 of the Specifications) and, where applicable, the name of the installing Subcontractor.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 Owner's Right to Perform Construction and to Award Separate Contracts:

- A. ADD the following Section 6.1.1.1:

The term "Owner's own forces" may include a potential Subcontractor to the Contractor, provided no formal subcontract between the two exists. The Contractor is obligated to execute subcontract agreements per Article 5.1.1.

ARTICLE 7 - CHANGES IN THE WORK

7.3 Construction Change Directives:

- A. Paragraph 7.3.6: In the first sentence, DELETE the words “a reasonable allowance for overhead and profit” and substitute “an allowance for overhead and profit in accordance with Subparagraphs 7.3.10.1 thru 7.3.10.6 below”.
- B. Paragraph 7.3 - add the following Paragraph:
 - 7.3.10 In Paragraph 7.3.6, the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:
 - .1 For the Contractor, for Work performed by the Contractor’s own forces, 10% of the cost.
 - .2 For the Contractor, for Work performed by the Contractor’s Subcontractor, 10% of the amount due the Subcontractor.
 - .3 For each Subcontractor, or Sub-subcontractor involved, for Work performed by that Subcontractor’s or Sub-subcontractor’s own forces, 10% of the cost.
 - .4 For each Subcontractor, for Work performed by that Subcontractor’s Sub-subcontractors, 5% of the amount due the Sub-Subcontractor.
 - .5 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
 - .6 In order to facilitate checking of quotations for extras or credits, all proposals, unless otherwise agreed upon, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Subcontracts shall be itemized also. In no case will a change be approved without such itemization.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.11.1 Liquidated Damages:

- A. The Owner will suffer financial loss if the Project is not Substantially Complete on the date set forth in the Contract Documents. The Contractor shall be liable for and shall pay to the Owner the sums stipulated in the Contract Documents as fixed, agreed and Liquidated Damages for each calendar date of delay until the Work is Substantially Complete. If Final Completion is not achieved within the time limits stipulated in the Contract Documents, the sums stipulated in the Contract Documents are to be levied as fixed, agreed and Liquidated Damages for each calendar date of delay.

9.2 Schedule of Values:

- A. Add Paragraph as follows:
 - 9.2.2 The Schedule of Values shall be prepared on AIA Documents G702 and G703, Certificate for Payment. Schedule shall be itemized in CSI 16-Division format (Division 0 thru Division 16). Each major item of Work

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and each subcontracted item within each Division shall be itemized. Contractor's overhead, profit and other cost shall be distributed proportionately in each item. The total of the items shall equal the Contract Sum.

9.3 **Application for Payment:**

A. ADD as follows:

- 9.3.4 Make Applications for Payment monthly. Use AIA Form G702 and continuation Sheet G703 for all applications. Place sub-total or total at the bottom of each sheet and continuation sheet. Each Application for Payment shall be due on or before the first day of each month and shall be based on 90% of the Contract price of labor and materials suitably stored at the site thereof up to the 25th day of that month, less the aggregates of previous payments. Progress payments shall be made by the Owner on or before the 10th day of the month following Owner's receipt of Architect's Certificate for Payment.

9.6 **Progress Payments:**

A. ADD as follows:

- 9.6.7 Progress Payments and Final Payment to the Contractor will be made as required by the Florida Mechanics' Lien Law.
- 9.6.8 Applications for Payment shall be accompanied by properly executed partial Releases of Lien by all Subcontractors, Laborers, and Material Suppliers who have served Notice to Owner supporting all payments made up to and including the Contractor's current Application for Payment. All partial Release of Lien for this Project shall be consistent in form and wording and shall be approved by the Owner and Architect.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.2 **Safety of Persons and Property:**

A. ADD as follows:

- 10.2.8 Contractor shall provide adequate fire extinguishers on the premises during the course of the construction period of the type and size as recommended by the National Fire Protection Association, to control fires resulting from the particular Work being performed, and the Contractor shall instruct his employees in their use. All extinguishers shall be placed in the immediate vicinity of the Work being performed ready for instant use. In the use of especially hazardous types of equipment, such as acetylene torches, welding equipment, tar pots, kettles, salamanders, etc., no Work shall be commenced or equipment used unless fire extinguishers of an approved type and capacity are placed in the working area and available for immediate use by the workmen using the above-mentioned equipment.

ARTICLE 11 - INSURANCE

11.1 Contractor shall take out, pay for and maintain at all times during the prosecution of the Work under the Contract, the following forms of insurance by carriers acceptable to and approved by the Owner.

.1 **Statutory Workman’s Compensation and Employer’s Liability Insurance:** The Contractor shall procure and shall maintain during the life of this Contract, Statutory Workmen’s Compensation Insurance and Employer’s Liability Insurance with a limit of **One Hundred Thousand Dollars (\$100,000)** for all of his employees to be engaged on the Project under this Contract. In case of any such Work sublet, the Contractor shall similarly require Subcontractors to provide the same insurance for all of the Subcontractor’s employed to be engaged in such Work unless such employees are covered by the protection afforded by the Contractor’s Workmans Compensation Insurance. In case any class of employees engaged in hazardous work on the Project under this Contract is not protected under the Workmen’s Compensation Statute, the Contractor shall provide, and shall cause each Subcontractor to provide, adequate Employer’s Liability Insurance for the protection of such of the employees as are not otherwise protected.

.2 **General Liability and Property Damage Insurance:** The Contractor shall take out and maintain during the life of this Contract such Public Liability and Property Damage Insurance as shall protect him and any Subcontractor performing the Work covered by this Contract from claims for damages of personal injury, including accidental death, as well as from claims of property damages which may arise from operations under this Contract, including blasting when blasting is done on or in connection with this Work of this Project, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them. **The Policy shall include as insureds the Owner, Architect and Engineers** .The amounts of such insurance shall be as follows:

- A. Comprehensive General Liability Limits:

Bodily Injury	(Occurrence Basis)
Per Person	\$ 500,000
Per Occurrence	\$ 1,000,000
Property Damage	
Per Occurrence	\$ 500,000
- B. Contractual Liability as regards this Contract, as per General Conditions Article 4.18 entitled “Indemnification”.
- C. Protective Liability
 - Contractor (Independent)
 - Owner
- D. Completed Operations.
- E. Automobile Comprehensive Liability - \$300,000.00. Policy shall include Automobile Bodily Injury Liability Insurance covering all Contractor owned vehicles. The Contractor shall similarly require Subcontractors to provide Automobile Property Damage Liability Insurance. (NOTE: The coverage shall be amended to an “Occurrence Basis”.

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- .3 **Builder's Risk Insurance:** The Contractor shall effect and maintain during the life of this Project - until the Project is accepted by the Owner - an **ALL RISK** Builder's Risk Insurance Policy to include as insureds the Owner, the Architect and/or Engineer, the General Contractor, the Subcontractors and/or Sub-Subcontractors as their respective interest may appear. This policy shall include but not be limited to the perils of Fire, Lightning, Windstorm, Hurricane, Hail, Explosion, Riot, Civil Commotion, Smoke, Aircraft, Land Vehicles, Vandalism, Malicious Mischief, etc., in an amount equal to 100% of the Contract Sum (but not including excavation, filling, grading, demolition, foundations, paving, side-walks, curbs and gutters, and other similar non-insurable items). In the event it is necessary to operate permanently-installed equipment on other than a testing basis or in the event it is necessary for the Owner to occupy a part of or the entire structure, the Contractor agrees to have the Builder's Risk Insurance Policy endorsed to permit same.
- .4 **Proof of Carriage of Insurance:** The Contractor shall furnish the Owner with a satisfactory proof of carriage of the Insurance required. Certificates of Insurance will be required in duplicate for file with the Owner and Architect. Such certificates to provide that the Owner is entitled to the same notice as that given to the purchaser of the insurance in case of cancellation or any major change therein.

11.5 Performance Bond and Payment Bond:

- A. Change Article 11.5.1 to read:

The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. These bonds must be written by an insurance company having an A.M Best Rating of "A-VIII" or better. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract sum. The amount of each bond shall be equal to 100% of the Contract Sum.

The Contractor shall deliver the required bonds to the Owner not later than three (3) days following the date of the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

The Contractor shall require the attorney-in-fact who execute the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

Not modified.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

- A. Add Paragraph 13.8 as follows:

13.8 **Preconstruction Conference:**

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- 13.8.1 Before commencing Work, a conference will be held in the Architect's office, or other agreed upon place, for the purpose of verifying general procedures, expediting Shop Drawings and Schedules and to establish a working understanding between the parties. The Contractor, the Contractor's job Superintendent and representatives to the Architect shall attend the conference. The Contractor shall have representatives of Mechanical and Electrical and other major Subcontractors present. The date and time of the conference shall be agreed upon by the Contractor and Architect.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

- A. ADD Paragraph 14.4 as follows:

14.4 Termination by the Owner for Convenience:

- 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.
- 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:
- .1 Cease operations as directed by the Owner in the notice;
 - .2 Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
 - .3 Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing Subcontracts and Purchase Orders and enter into no further Subcontracts and Purchase Orders.
- 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment from the Owner on the same basis provided in Subparagraph 14.1.2.

END OF SECTION 00800

SECTION 00810

PROGRESS PAYMENTS

PART 1 - GENERAL

- 1.1 The Contractor shall, **within ten (10) days from the date of the Notice to Proceed**, submit a preliminary payment application with full schedule of values for approval to the Architect. The work shall be subdivided, as a minimum, into line items matching the index in these specifications. Each item shall be further subdivided into Contractor-purchased material costs, Direct-purchased material costs, and Labor costs. All subcontractor bids shall be broken into their component parts to comply with this section – lump sum values will not be accepted. The value of each item shall include a true proportionate amount of the Contract's overhead and profit. The sum of all such scheduled values shall equal the Contract Sum as evidenced by the Agreement. **No payments shall be issued until the Schedule of Values is approved in writing.**
- 1.2 Approved change orders shall be likewise broken down into their constituent parts in subsequent pay requests, matching the subdivision used in the initial approved Schedule of Values, and placed at the end of the Schedule of Values, Revised (updated) contraction schedules shall also accompany each progress payment.
- 1.3 The approved form of the Schedule of Values will accompany and support the Contract's periodic Applications for Payment and shall indicate the value of suitable stored material as well as labor performed and materials incorporated into the work for each subdivision of the schedule during the period for which the requisition is prepared.
- 1.4 The Owner may withhold payment should the Contractor fail to provide the above referenced documents.
- 1.5 Owner will retain **ten percent (10%)** of the amount earned by the Contractor until Final Payment is made. Upon substantial completion of the project, as determined by the Project Manager and Architect, the Owner may choose to reduce retainage.
- 1.6 Owner will at intervals, make progress payments to the Contractor as provided in the Agreement. Payment will be as follows:
 - A. Monthly payments for work completed, less 10% retainage.
 - B. Final Payment of balance due, at final completion of the project, subject to other conditions of the project documents.
- 1.7 Job will be considered 100% complete after the final inspection and acceptance by the Architect and District Schools and any other inspection required by the Architect or State Agencies.

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- 1.8 The Clay County District Schools will issue payment no later than 25 business days after the date on which the invoice is received by the Architect.
- 1.9 The Contractor shall request such compensation except for final payment by submitting:
 - A. A properly completed and notarized Application for Progress Payment using AIA Document G703, 1992 Edition or a mutually agreed schedule.
 - B. A schedule of Contract Values using AIA Document G703, 1992 Edition. A computer generated form may be used provided it contains all the information required by AIA Document G703, 1992 Edition.
 - C. See Section 01700 Contract Closeout for submittals required for Final Payment.

PART 2 - EXCLUSION OF OWNER FROM LIABILITY

- 2.1 Notwithstanding any other provision of the Contract Documents, should the Contractor sustain loss or be damaged by act or omission of a separate Contractor, the Owner shall not be liable for any such loss or damage and the Contractor shall not be entitled to obtain any monetary relief from the Owner to compensate for any such loss or damage, but shall be limited to such recovery as it otherwise available at law from persons and/or entities other than the Owner.

PART 3 - SUBSTITUTION OF MATERIALS AND EQUIPMENT

- 3.1 Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance and function. Any substitution shall be clearly identified to the Architect and it shall not be purchased or installed by the Contractor without the Architect's written approval.

PART 4 - NOTICE TO PROCEED

- 4.1 The Contractor shall not commence work on the Project until all preconstruction requirements and obligations specified in these Contract Documents are satisfied including the Building Permit and he has received from the Owner bonafide "Notice to Proceed".

END OF SECTION 00810

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SECTION 00860

PROJECT DOCUMENTS

The Architect has submitted signed and sealed Plans, Specifications, and Energy Calculations for permitting to the school district as a part of the Phase III (Final Design) submittal.

Upon request after bidding and contract award, the Architect can re-send the Contractor electronic (PDF) copies of the Drawings and Specifications for use in construction.

END OF SECTION 00860

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SECTION 00860

PROJECT DOCUMENTS

The Architect has submitted signed and sealed Plans, Specifications, and Energy Calculations for permitting to the school district as a part of the Phase III (Final Design) submittal. Upon request after bidding and contract award, the Architect can re-send the Contractor electronic (PDF) copies of the Drawings and Specifications for use in construction.

END OF SECTION 00860

SECTION 00900

SPECIAL CONDITIONS

PART 1 - COMMON REFERENCE STANDARDS

- A. Reference in the Contract Documents to known standards such as codes, standard specifications, etc., promulgated by professional or technical associations, institutes, societies mean the latest edition of each such standard adopted and published as of the date of the Contract for the work of this Project, except where otherwise specifically indicated. The following is a representative list of such standards together with the abbreviation by which each is identified:
- | | |
|--------|--|
| AAMA | Architectural Aluminum Manufacturers Association |
| AA | Aluminum Association |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI | American Concrete Institute |
| AIEE | American Institute of Electrical Engineers |
| AISC | American Institute of Steel Construction |
| ANSI | American National Standards Institute |
| API | American Petroleum Institute |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| AWSC | American Welding Society Code |
| AWWA | American Water Works Association |
| CRSI | Concrete Reinforcing Steel Institute |
| CS | Commercial Standard of National Bureau of Standards |
| FBC | Florida Building Code |
| FGMA | Flat Glass Marketing Association |
| NAAMM | National Association of Architectural Metal Manufacturers |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Assoc. |
| NFPA | National Fire Protection Association |
| SDI | Steel Deck Institute |
| SREF | State Requirements for Educational Facilities |
| SSPC | Steel Structures Painting Council |
| TCA | Tile Council of America, Inc. |
| UL | Underwriters' Laboratories, Inc. |

PART 2 - PROJECT MEETING

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

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- B. **Minutes:** The Architect will compile minutes of each project meeting and will furnish copies to the Contractor and the District Project Manager. The Contractor may make and distribute such other copies as he wishes.
- C. Except as noted below for Preconstruction meeting, project meetings will be held as necessary, but at least monthly. Coordinate as necessary to establish mutually acceptable schedule for meetings.
- D. To the maximum extent practicable, meetings will be held at the job site.
- E. Preconstruction Meeting will be scheduled after the Owner has received the signed contract from the contractor. Provide attendance by authorized representatives of the Contractor and all subcontractors identified by the Owner.

PART 3 - CONSTRUCTION MEETING

- A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, in analyzing by use of Critical Path Method or PERT, and in preparation and issue of periodic reports as required below.
- B. Within ten (10) days after receipt of Notice to Proceed, submit one (1) reproducible and four (4) prints of construction schedule. Failure to comply may result in withholding progress payments until such time as construction schedule is received.
- C. Submit updated construction schedule (3 sets) along with each monthly progress payment. Failure to provide this schedule may result in payment being withheld or delayed.

PART 4 - PRODUCT DATA AT JOB SITE

- A. Satisfactory evidence as to the kind and quality of all materials and equipment, in the form of shop drawings, manufacturer's literature, samples, or certification shall be readily available at the job site at all times for the Architect's inspection regardless of whether such evidence has been required in the project manual for submittal to the Architect.

PART 5 - TESTING LABORATORY

- A. The Contractor shall obtain testing services to be provided by Independent Testing Laboratories. The Testing Companies will be approved in writing by the Owner.
- B. Select a testing laboratory, qualified in accordance with ASTM E329, "Recommended Practice for Inspection and Testing".
- C. Testing, when required, shall be in accordance with all pertinent codes and regulations and with the specified standards.
- D. Provide all testing laboratory facilities required to satisfactorily perform the testing required under pertinent other Sections of these Specifications and within the increments of time essential to timely completion of the work.

PART 6 - TESTS

- A. The Contractor will schedule the tests giving sufficient time for the execution of the work mutually agreed upon between the Testing Laboratory and the Contractor. The Contractor is responsible for review of each section of the

specifications to determine specifics of the testing requirements. ***If a required test is omitted or in conflict with the Technical Specifications, then the most strict requirements will prevail, at the Architect's discretion.***

PART 8 - RECORD DRAWINGS (AS-BUILTS)

- A. In accordance with the requirements of the General Conditions, the Architect will provide the Contractor with a set of reproducible drawings of the original bidding documents, as required and at Contractor's expense as follows:
1. If the Contractor elects to vary from the Contract Documents, and secures prior approval of the Architect, for any phase of the work other than those listed below, he shall record in a neat readable manner all such variances on the reproducible drawings furnished.
 2. For plumbing, heating, ventilating and air conditioning, electrical, and fire protection work, record drawings shall be maintained by the Contractor as the work progresses and as follows:
 - a. All deviations from sizes, locations and from all other features of all installations shown in the Contract Documents shall be recorded.
 - b. In addition it shall be possible, using these drawings, to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as all other features of work which will be concealed underground and/or in the finished building.
 - (1) Locations of underground work shall be established by dimensions to column lines of walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
 - (2) For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed.
Architect's/Engineer's decisions shall be final.
 - c. The following requirements apply to all As-Built Drawings:
 - (1) They shall be maintained at the Contractor's expense.
 - (2) All such drawings shall be done carefully and neatly by a competent draftsman and in form approved by the Architect.
 - (3) Additional drawings shall be provided as necessary for clarifications.
 - (4) They shall be kept up-to-date during the entire course of the work and shall be available on request for examination by the Architect and, when necessary, to establish clearances for other parts of the work.

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- (5) The record drawings shall be returned to the Architect on completion of the work and are subject to the approval of the Architect.
- (6) Provide four sets of black line prints showing the locations of items not installed as shown on the original Contract Documents. These As-Built drawings are required before final acceptance and payment can be made.
- (7) Provide laminated As-Built drawings pertaining to each system in its associated DDC equipment panel, and a diagram of the panel itself, attached to, or frame mounted on a wall adjacent to the panel. Provide one (1) complete set of laminated As-Built drawings, attached or located as directed by the Owner.
- (8) Provide a computer disc compatible with AutoCAD LT 2000.

PART 9 - OPERATION AND MAINTENANCE MANUALS

- A. Refer to Section 01730, Operations and Maintenance Manuals.

PART 10 - SIGNS

- A. No signs will be permitted on this Project except the project sign, identifying captions over offices, certain directional and warning signs required for safety and protection. Contractor shall take all necessary steps to prevent installation of any unauthorized signs and, should any appear, cause them to be removed immediately, and repair and repaint any damage caused thereby without additional cost to the Owner.
- B. **Project Sign:** The project sign shall consist of a 4'x 8' x 3/4" sheet of pressure treated plywood on a 4'x 4' supporting structure, painted and installed in location designated. Exact design, text and colors shall be provided by Architect, which will include the name of the building and of the Owner, any emblem selected by the Owner, the Architect's name, names of the Architect's principal consultants, the Contractor's name, and the names of the firms executing the principal parts of the Work. The sign shall be placed as directed by the Architect.

PART 11 - SCAFFOLDS AND RUNWAYS

- A. Contractor shall furnish, erect and maintain for duration of the Work as required, all scaffolds, runways, guard rails, platforms and similar temporary construction as may be necessary for the performance of the Contract. Such facilities shall be of type and arrangement as required for their specific use; shall be substantially constructed throughout, strongly supported, well secured, and shall comply with all applicable rules and regulations of applicable State and local codes.
- B. The several levels of the structure shall be connected by means of suitable ladders, ramps and temporary stairs; provided, however, that permanent stairways may be used for such purposes if adequately protected against damage. Open well and shafts shall be enclosed as required by OSHA.

PART 12 - CLEANING UP

- A. In addition to the provisions of Article 4.15 of the General Conditions, the following shall be required:
 - 1. Besides the "removal of waste materials", the following special cleaning shall be required just prior to acceptance:
 - a. **Remove Stains:** This work shall be done by person skilled and equipped for such work.
 - b. Remove foreign matter, marks, stains, foreign paint, fingerprints, soil and dirt from new surface
 - c. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Architect.
 - 2. In addition to clean-up provisions of the Specifications, Contractor shall take appropriate steps to prevent airborne dust due to the work of this Contract. Water shall be applied wherever practical to settle and hold dust to a minimum, particularly during excavation and moving of materials.

PART 13 - EQUAL OPPORTUNITY

- A. The contractor shall maintain policies of employment as follows:
 - 1. The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. The Contractor shall take affirmative action to insure that applicant are employed, and the employees are treated during employment, without regard to their race, religion, color, sex, national origin or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.
 - 2. The contractor and all subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will received consideration for employment without regard to race, religion, color, sex, national origin or age.

PART 14 - TOXIC SUBSTANCES

- A. The State of Florida has prepared a list of toxic substances. The Contractor shall review the list to determine if any materials which he will be installing are listed.
- B. The Contractor will notify the Owner in writing three (3) days prior to use of any toxic substances in the construction of the facility.
- C. The Contractor shall comply with all state, federal and local regulations for the use of any toxic substances.

PART 15 - LEAD

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- A. No lead product shall be used on this project. The use of solder which contains lead or paint which contains lead are not acceptable on this project. Lead boots on roofs are not acceptable on this project.
- B. The Contractor is responsible for notifying all Suppliers that no lead is acceptable on this project.
- C. If by Independent Test Laboratory studies the Owner discovers any lead-containing products have been used on this project, the Contractor will be liable for necessary consulting fees, removal of lead-containing products and installation of new products of similar value.
- D. The Contractor shall provide written certification, prior to substantial completion, that no lead has been used on this project and acknowledging the agreement to replace any lead-containing products, if discovered, at no expense to the School Board. The certification shall be addressed to the Superintendent of the Clay County District Schools.

PART 17 - ASBESTOS

- A. No asbestos, or products containing asbestos, will be used on this project.
- B. The Contractor shall be responsible for notifying all Suppliers of this requirement.
- C. If by Independent Test Laboratory studies the Owner discovers any asbestos products have been used on this project, the Contractor will be liable for necessary consulting fees, removal of asbestos products and installation of new product of similar value.
- D. The Contractor shall provide written certification, prior to substantial completion, that no asbestos products have been used on this project and acknowledging the agreement to replace any asbestos products, if discovered, at no expense to the School Board. The certification shall be addressed to the Superintendent of the Clay County District Schools.

PART 18 - JESSICA LUNSFORD ACT COMPLIANCE

- A. For the purposes of this Part, the term "workers" shall include all employees of the general contractors, subcontractors and vendors supplying materials to the project site.
- B. Workers are subject to the Jessica Lunsford Act, Florida Statute (F.S.) 1012.465. This act deals with noninstructional and contractual personnel who are on school district property when students are present, have direct contact with students, or receive school district funds, and requires they pass a Level 2 background screening, as described in F.S. 1012.467.
- C. **Workers who remain at a site where students are not permitted are exempt from the background screening requirements under F.S. 1012.468 if the site is separated from the remainder of the school grounds by a single chain-link fence of 6 feet in height.**
- D. Therefore, all workers are prohibited under this contract from having direct contact with students.
- E. The project construction site must be fully fenced with a minimum 6-foot high chain-link fence and the access from the fenced compound to the remainder of the school grounds must be secured at all times. The fenced compound shall

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have a direct fenced access to a public road that prohibits students from entry to the access road or construction site. Signage shall be mounted on the fence near access points and on all sides stating that the construction site is off limits to unauthorized persons.

- F. Once the fenced compound has been removed (e.g. at the end of the project at, or after, substantial completion) the requirement for a Level 2 background screening are in effect, as follows:
1. All workers must have passed a Level 2 background screening before being allowed on the job site. The contractor's site supervisor shall provide the School Board with a list of those persons who will be allowed on the job site.
 2. This supervisor shall bear the responsibility for ensuring that all persons on the site, other than School Board employees, have passed a Level 2 screening.
 - a. Screening may be obtained from the school district screening location by appointment. Results can take up to five (5) days to be received and processed. **Screening through the Sheriff's office or other locations (other than described in Item 2b below) are NOT acceptable.** Contact the School Board at (904) 284-6500 to arrange for an appointment.
 - b. Employees who have been screened by another school district in Florida, that has a Memorandum of Understanding with the School Board, will be accepted.
 - c. Photo identification with date of birth will be required at each school site for verification.
 3. School board employees shall spot check to determine compliance with these requirements.
 4. Any violation subjects the employer to a civil fine of up to \$500.00 for each time such an employee goes onto School Board property when students are present.
 5. It is the responsibility of each vendor/contractor to keep their list of fingerprinted, screened and cleared employees updated.
 6. If an employee terminates or is fired, the contractor is responsible for notifying the School Board by phone as soon as possible and following up with a notification in writing. The written notification may be faxed to the Clay County School District Human Resources Department at (904) 284-6535.
 7. **Employees who have not been fingerprinted, screened, and cleared will NOT be granted access to schools when students are present.**
- G. Per F.S. 1012.468 known, registered sexual offenders or predators are **prohibited** from school grounds, including the construction site fenced or not fenced, **at all times**.
- H. At any time, workers area subject to a search of his or her name or other identifying information against the registration information regarding sexual predators and sexual offenders maintained by the Department of Law Enforcement under s. 943.043 and the National Sex Offender Public Registry

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maintained by the United States Department of Justice. The school district shall conduct the search required under this subsection without charge or fee to the contractor.

END OF SECTION 00900

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Conditions, Supplementary Conditions, and Special Conditions, (if any), together with Specifications Division 1 respective portions of the Drawings, shall be included as part of each Section of each Division of the Specifications.
- 1.2 This Division modifies and/or adds to the requirements of the General Conditions and Supplementary Conditions. Those portions of the General Conditions and Supplementary Conditions not modified shall remain in full force and effect as published and those additional requirements of this Division shall become a part of the "Conditions of the Contract", for this project.
- 1.3 Each and every Contractor, Subcontractor and Sub-Subcontractor and Supplier shall familiarize themselves with this Division and comply with the provisions contained herein.

PART 2 - CONTRACTOR'S DUTIES

- 2.1 **Contractor's Duties:**
 - A. Except as specifically noted, provide and pay for the following to include, but not be limited to, purchase or rental:
 1. Labor, materials and equipment.
 2. Tools, construction equipment and machinery.
 3. Temporary utilities required for construction.
 4. Other facilities and services necessary for proper execution and completion of Work.
 5. Provide an on-site full-time employee to supervise, direct, and instruct and be responsible for all construction activities, to include, but not be limited to, construction procedures and sequences, work safety, techniques of construction, conducting tests and all other activities as defined or designated in the Contract Documents.
 - B. Pay legally required sales, consumer and use taxes as specifically noted in the Contract Documents.
 - C. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of starting Work, to include, but not be limited to:
 1. Permits.
 2. Government Fees.
 3. Licenses.
 - D. Give required notices to Owner, Architect and regulatory agencies as required by Law or Contract Documents, to include, but not limited to:

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1. Start of Work.
2. Disconnection or interruption of utilities.
3. All Testing required by Contract Documents or as directed by Owner or Architect.
4. Delivery of materials.
5. Disruption of Owner's activities.

Ensure that no construction activities interfere with school functions without prior approval from project manager.

- E. Comply with all codes, ordinances, rules, regulations, orders and other legal requirements of public authorities.
- F. Enforce strict discipline and good order among employees. Do not employ to work:
1. Unfit persons, to include, but not be limited to, as follows:
 - a. Under the influences of alcohol or illegal drug substances.
 - b. Disorderly, abusive, rowdy.
 - c. Disruptive to work progress.
 - d. Any behavior deemed by Owner to be unsuitable and offensive.
 2. Persons not skilled in assigned tasks, to include, but not be limited to:
 - a. Unskilled.
 - b. Inexperienced.
 - c. Unlicenced.
 - d. Unsupervised.
- G. Prohibit consumption of alcohol, drugs or other substances prohibited by, and in violation of state laws and dismiss any person found to be under the influence or consuming such substances while on site whether during, before or after work hours.

2.2 **Contracts:** Construct Work under a single lump-sum contract.

2.3 **Work Sequence:**

- A. As Owner may occupy and use substantially completed buildings and site, coordinate Work so as not to inconvenience or disrupt the Owner's continued occupancy and use.
- B. Do not disconnect or interrupt utilities without prior approval to the Owner and Architect.
- C. Do not encumber school parking areas, access to buildings, walkways and other such school facilities with equipment, materials, trash or vehicles without prior notice to, and consent of, Owner.

2.4 **Use of Premises:**

- A. Confine operations at site to areas permitted by:
1. Owner.
 2. Law.
 3. Ordinances.
 4. Permits.
 5. Contract Documents.

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- B. Do not unreasonably encumber site with materials, equipment or trash.
- C. Assume full responsibility for protection and safekeeping of any equipment at any buildings and grounds open or accessible to workmen, whether employees of the General Contractor, Subcontractors or Sub-Subcontractors, to include, but not be limited to, damaged, abused or marred equipment, buildings, or other such facilities.
- D. Coordinate location of stored products, materials, or equipment with Owner.
- E. Confine use of site to areas as designated by Owner.
- F. Move any stored products, materials, or equipment which may interfere with operations of Owner.
- G. **Use of Site:**
 - 1. Confine use of site to buildings designated under the Contract Documents.
 - 2. Areas designated by Owner for storage.
 - 3. Maintain a clean site at all times.

2.5 **Reference Standards:** Where references or standard specifications, (i.e., Federal Specifications, ASTM, ANSI, ACI, etc.) are made a part of these Specifications, they shall be the Latest Edition or revision effective on date and acceptable to local building authorities.

END OF SECTION 01010

SECTION 01026

UNIT PRICES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** It is the intent of this section to provide for unit prices for listed items in quantities shown and for additional quantities that may be required by Owner or Architect as being necessary for a complete, secure installation.
- 1.4 **Inclusions:**
- A. Within each Unit Price, include labor, materials, equipment, mobilization, overhead, profit, and including, but not limited to, handling, storing, protecting, connecting, adjusting, testing, finishing, cleaning, and completing. Demolition, removal and disposal of existing materials for each Unit Price shall be included as part of the Unit Price.
 - B. Execute work covered by a Unit Price in same manner as if included in a stipulated sum.
 - C. Include, as a part of the Base Bid, the sum of each allotted measurements for each Unit Price item.

PART 2 - PRODUCTS

- 2.1 **Unit Prices:**
- A. The Unit Prices are defined as follows, by number:

UNIT PRICE No. 1: Cost per SF to Remove/Replace Concrete Slab. Cost per square foot to remove existing concrete slab and haul off debris. Include the cost to compact, add 15 mil vapor barrier, welded wire mesh (6 x 6 / W1.2 x W1.2 minimum) and 2,500 psi concrete in accordance with Section 03300.

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- UNIT PRICE No. 2: Cost each to Install Empty Box and Conduit.** Cost, each, to install empty electrical duplex receptacle box with 1" conduit (in wall) to above the ceiling. Include multi-port data cover as specified on electrical drawings and specifications. Receptacle to be installed at the same elevation and to the same specifications as indicated on the electrical drawings and specifications.
- UNIT PRICE No. 3: Cost per SY to Remove Existing Concrete Sidewalk.** Cost per square yard to remove existing concrete sidewalk, haul off debris and prep the soil for either new sidewalk or sod. The prep work may include, but not be limited to, grubbing roots, raking, adding clean fill, smoothing, and compacting. This cost is to be included in the unit cost.
- UNIT PRICE No. 4: Cost per SY to Install 4" thick Concrete Sidewalk.** Cost per square yard to install 4" thick 2,500 psi concrete sidewalk on compacted soil with formed edge, 10mil vapor retarder and 6x6/W1.4xW1.4 welded wire mesh reinforcement. Broom finish, slight crown and no bird baths. Control joints no further apart than 10 feet on center, each direction.
- UNIT PRICE No. 5: Cost per SY to Install Sod.** Cost per square yard to install healthy centipede sod. Include in the cost any soil amendments required to ensure a healthy growth and establishment of the sod. Any sod that dies within three (3) months of installation shall be replaced at no cost to the owner. Include the cost any staking or netting required for installation on sloping ground.

PART 3 - EXECUTION Not used.

END OF SECTION 01026

SECTION 01040

COORDINATION, INSPECTION AND PROTECTION

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions, (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 The Contractor shall compare and coordinated all Drawings and Specifications. When in the opinion of the Contractor, a discrepancy exists, and he shall promptly report it to the Architect for proper adjustment before proceeding with the work.
- 1.3 In the event that certain features of the construction are not fully shown on the Drawings, then their construction shall be of the same character as for similar conditions that are shown or noted.
- 1.4 Prior to commencing any work, the Contractor shall satisfy himself as to the accuracy of all survey data as indicated in these Plans and Specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, error or omissions in the data survey, he shall immediately notify the Architect in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the survey data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said survey data.
- 1.5 **General Coordination:**
 - A. Coordinate the work of all trades so that any related work or items shown or specified elsewhere throughout the documents are included and the work completed as intended.
 - B. Coordinate the work of all trades so that each will have sufficient space and time within which to work properly and efficiently.
 - C. Changes in the intended design of the project as a result of improperly-coordinated construction work will not be allowed. Delays in the work caused by rejections of installed materials due to improper coordination, and as otherwise specified, will not be considered valid justification for extensions of Contract time if such are requested by the Contractor.
- 1.6 **Altering of Structural Members:**
 - A. No structural member shall be omitted, notched, cut blocked out or altered for any reason without express written prior approval by the Architect.
 - B. If any structural member is found to have been altered it shall be corrected as directed by the Architect at no additional cost.

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- 1.7 No deviation in the location of plumbing, mechanical, or electrical as shown will be allowed without approval of the Architect.

PART 2 - PRODUCTS

- 2.1 Each trade shall review the work required of other trades and be award of what products will be installed adjacent to their work. Complete, approved submittals and show drawings of the other trades shall be available for review at the job site at all times.

PART 3 - EXECUTION

- 3.1 All areas, substrates and conditions under which any and/or all materials are to be installed shall be inspected and any conditions detrimental to proper and timely completion of the installation shall be documented to the Architect. Work shall only proceed when such conditions have been properly corrected.
- 3.2 Protection: Coordinate the work of each trade so that upon completion of any installation protective conditions are maintained to ensure the work will be without damage or deterioration at the time of acceptance.

PART 4 - INSPECTION PROCEDURES

- 4.1 The Contractor shall request from the Clay County School District Building Department all inspections identified on the appropriate building permit. This request shall be made a minimum of 24 hours in advance of the desired inspection time. The request shall be made in writing by fax. A copy shall also be sent to the project Architect that he will coordinate the particular engineer to be present as required.
- 4.2 The Building Code inspector will sign off once the inspections have been successfully accomplished.
- 4.3 Should a particular section fail an inspection, the Contractor shall make appropriate correction and re-submit for reinspection. Provide 24 hours notice again.
- 4.4 The Contractor is required by the specifications to perform other test and inspections. The Contractor shall maintain in the field office copies of all test reports for review by the Building Code Inspector.

END OF SECTION 01040

SECTION 01042

DIRECT PURCHASING

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the Work specified in this Section.
- 1.2 **Description:** The Owner is exempt from sales tax on the purchase of construction materials. The Owner has elected to exercise this right to purchase directly various construction materials, supplies, and equipment that may be a part of this Contract. Such direct purchase shall be without any additional cost to the Owner. The Owner shall, via Purchase Orders (PO), purchase the materials and the Contractor shall assist the Owner in the preparation of the purchase orders. The materials shall be purchased from the Vendors selected by the Contractor for the price originally negotiated by the Contractor.
- 1.3 The Contract Amount shall be reduced by the net, undiscounted amount of the purchase orders plus all sales taxes. This reduction in the Contract Amount will occur through a **Change Order**, which will reference the Purchase Order effecting the change.
- 1.4 Issuance of Purchase Orders by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased. **The Contractor shall remain fully responsible for coordination, correct quantities ordered, submittals, protection, storage, scheduling, shipping, security, expediting, receiving, installation, cleaning and all applicable warranties.** The Contractor must maintain his Builder's Risk policy to include materials stored on-site and materials installed on site.
- 1.5 It is recognized that the Contractor may encounter additional overhead costs in assisting the Owner with this task. The Contractor is charged with including all additional costs as a part of the Base Bid.
- 1.6 No payment will be made for material stored off-site. Payment is contingent on the receipt of properly verified and approved delivery tickets.
- 1.7 All invoices must contain the Purchase Order Number in order to be paid.
- 1.8 **Terms:** For the purpose of this Section the following terms will be defined:
 - A. **Material:** Any material, supply, or item of equipment intended for permanent installation in the Project.
 - B. **Vendor:** A company supplying materials to the Project, whether such provision includes installation or not.

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- C. **Vendor Purchase Order (VPO):** A material list and price quote by a Vendor required for issuance of a Purchase Order by the Owner.
- D. **Purchase Order (PO):** An authorization issued by the Owner for the supply of stated materials and agreement to pay quoted price for material upon verification of delivery.
- E. **Delivery Ticket:** A receipt issued by the Vendor on a business -like form indicating the date, quantity, and type of materials delivered to the site and referencing a Vendor's invoice or the Purchase Order.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

- 3.1 Each Subcontractor, or Vendor if no Subcontractor is involved in the installation of the material, shall issue a Vendor's Purchase Order (VPO) addressed to the Owner and submitted to the Contractor for review and approval prior to submission to the Owner's representative. The VPO shall contain the following minimum information:
 - 1. Date of Issuance
 - 2. Project name and location
 - 3. Vendor's full business name
 - 4. Vendor's full business address
 - 5. Vendor's business telephone number and fax number
 - 6. Description of materials
 - 7. Quantity of each material
 - 8. Unit cost of each material
 - 9. Extended price of each material (quantity times unit cost)
 - 10. Sale tax on materials
 - 11. No shipping and handling will be paid by the Owner
 - 12. Total price (extended prices plus sales tax)
 - 13. Signature and printed name of the authorizing agent for the Subcontractor or Vendor, including address
 - 14. Signature and printed name of the authorizing agent for the Contractor
- 3.2 The Owner will issue a Purchase Order in the amount of the Vendor's Purchase Order less the sales tax. The Purchase Order will contain the following minimum information
 - 1. Date of issuance.
 - 2. Project name and location.
 - 3. Vendor's full business name.
 - 4. Vendor's full business address.
 - 5. Reiteration of the authorized quantity, material description, unit cost, and extended price for each material.
 - 7. Total price
 - 8. Signature and printed name of approving agent for the Owner.
 - 9. Signature and printed name of authorizing agent for the Owner.

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The PO will be sent directly to the Vendor with a copy retained by the Owner and copies sent to the Subcontractor, Contractor and Architect.

- 3.3 Upon receipt of the PO by the Vendor, the Vendor shall issue an invoice to the Owner for payment on materials. The invoice shall clearly reference the PO number.
- 3.4 All materials are to be received on the site with the Vendor's delivery ticket. Delivery tickets are to be collected, verified as to accuracy, quantity and product, and signed by the Contractor, or the Contractor's on-site representative.
- 3.5 The Owner will issue payment to the Vendor for the amount of the approved invoice from the Contractor. In order to maintain timely payments, it will be the responsibility of the Subcontractor/Vendor and the Contractor to process invoices in accordance with the payment schedule. Any late fees incurred as a result of the Contractor's failure to process invoices in a timely manner (when an invoice is faxed to the Contractor for approval the Contractor shall respond back to the District within one week [approval or disapproval] will be paid by the Contractor.
- 3.6 The Contractor shall be responsible for maintaining a summary of materials purchased and tax savings for inclusion on the AIA Form G702, Application and Certificate for Payment. The total cost of goods directly purchased by the Owner shall appear on Line 8 and the total sales tax savings of goods directly purchased by the Owner shall appear on Line 9. Both lines will then be deducted from the Contract Amount via Change Order when determining payment due to the Contractor.
- 3.7 Examples of the following forms are included in this section.
 1. Vendor Purchase Order

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VENDOR PURCHASE ORDER

PROJECT: _____

DATE: _____
BID PACKAGE NO. _____

ADDRESS: _____

DELIVER TO: _____

CITY/ST: _____

DELIVERY DATE: _____

VENDOR: _____

(Print Vendor's Name, Address, City State, Zip Code.)

CONTACT PERSON: _____

PHONE: _____ FAX: _____

QUANTITY	DESCRIPTION OF MATERIALS	UNIT COST	PRICE
THIS IS TO REQUEST A PURCHASE ORDER ONLY. VENDOR MUST SEND INVOICE AND DELIVER MATERIALS TO SITE TO RECEIVE PAYMENT.		SUBTOTAL	
		SALES TAX	
		TOTAL	

(Signature) Phone Number

(Signature) Phone Number

(Signature) Phone Number
Authorized Agent for Subcontractor

(Signature) Phone Number
Authorized Agent for Subcontractor

END OF SECTION 01042

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions, (if any), along with General Requirements, apply to the work specified in this Section.
- 1.2 The Contractor shall provide a qualified Surveyor, subject to approval of the Architect, to locate and maintain the building lines and assure correct location and elevations, verify boundary lines and curb and sidewalk lines and grades required for complete layout of all work provided under the Contract.
- 1.3 The Surveyor shall keep a complete accurate log of control work as it progresses and the log shall be available to the Architect when required.
- 1.4 The Contractor shall be responsible for obtaining a foundation survey at no additional cost to the Owner. ***Prior to pouring the concrete slab, the Contractor shall provide an electronic and print copy of the foundation survey. Work shall not proceed without the written approval of the Architect of the foundation survey.***

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

- 3.1 The Contractor will establish and safeguard bench marks in at least two (2) widely separated places and set permanent and properly marked bench marks.
- 3.2 Care shall be exercised to insure that work is within lot, property, and setback lines.
- 3.3 It shall be the sole responsibility of the Contractor to take down, repair, or rebuild in an approved manner any work that may have been constructed over lot, property, or setback lines.

END OF SECTION 01050

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SECTION 01060

CODES, PERMITS AND FEES

PART 1 - GENERAL

1.1 Standards:

- A. The codes and regulations adopted by the Local and State Authorities govern the construction of this project. The following codes apply specifically to this project and all aspects of construction shall conform to the strictest requirements of these codes:
1. Florida Building Code, Latest Edition.
 2. Florida Plumbing Code, Latest Edition.
 3. Florida Mechanical Code, Latest Edition.
 4. Florida Fire Prevention Code, Latest Edition.
 5. NFPA 101, Life Safety Code.
 6. NFPA 90A, Latest Edition.
 7. NFPA 70, Latest Edition.
 8. NFPA 13, Latest Edition.

1.2 Laws, Codes and Ordinances:

- A. Contractor and all Subcontractors shall comply with all laws, codes, and ordinances applicable to the work. This shall include federal, state, county and/or municipal entities having jurisdiction. If governing laws, codes or ordinances conflict with this specification, then the laws, codes or ordinances shall take precedence, except where these specifications exceed them in quality of materials or labor, then the specifications shall be followed. When a conflict occurs, the Architect shall be notified before proceeding with the work.

1.3 Workmanship:

- A. Except as otherwise required by this Section, all products and workmanship shall conform to the best quality and practices recognized by the agencies, associations, councils, etc., as specified in individual Sections.
- B. In the absence of specified standards, the Contractor shall conform to the requirements of the most widely recognized standards for each particular portion of the work.

1.4 Fees and Permits:

- A. The Contractor shall obtain and pay for any and all fees, including impact fees or downstream pollution charges, and all permits which may be required in connection with the execution of this Work. He shall pay for other temporary or permanent permits, licenses or highway fees required, including legal notices and legal fees required unless otherwise specified in these Specifications.

PART 2 - PRODUCTS Not Applicable.

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PART 3 - EXECUTION

3.1 Copies:

- A. Provide the Architect and Owner with copies of all permits as they are issued. Secure approvals and certificates of inspection and occupancy that may be required by authorities having jurisdiction over the work. All permit originals shall be included in the Close-Out Documents submitted at the close of the Project.

END OF SECTION 01060

SECTION 01070

CUTTING AND PATCHING

PART 1 - GENERAL:

1.1 Description:

- A. Execute cutting, fitting or patching of Work required to:
 - 1. Make existing and new work fit properly.
 - 2. Uncover existing work to provide for installation of new work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace Work not conforming to Contract Documents.
 - 5. Install specified work in existing construction.
 - 6. Remove samples of installed Work as specified or designated and directed by Owner and/or Architect for testing.

1.2 Samples:

- A. Should conditions of work indicate a need for a change of materials or methods, submit a written recommendation to the Architect, including, but not limited to:
 - 1. Conditions necessitating change.
 - 2. Recommendations for alternative materials and methods.
 - 3. Submittals for substitute materials.
- B. Submit written notice to the Owner and Architect designating what period of time the work will be uncovered to allow for observation.

1.3 Payment for Costs:

- A. Costs incurred and caused by ill-timed sequences of installation, defective materials, unacceptable methods of installation or Work not conforming to Contract Documents, including, but not limited to, additional architectural or engineering fees, testing, removal and replacement costs shall be borne by the Contractor.
- B. Costs incurred and caused by Work done through written instructions and directions of the Owner or Architect, other than the removal and replacement of defective or non-conforming work, will be borne by the Owner.

1.4 Inspection:

- A. Inspect existing conditions of Work, including elements subject to movement or damage during:
 - 1. Cutting and patching.
 - 2. Demolition.
- B. After uncovering Work, inspect conditions affecting installation of new products.

1.5 Preparation:

- A. Prior to cutting:

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1. Provide shoring, bracing and support as required to maintain structural integrity of Work.
2. Provide protection for other portions of Project.
3. Provide protection from the elements.

1.6 **Performance:**

- A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances and finishes.
- B. Execute cutting and demolition by methods which will prevent damage to other Work and or owner's property, and provide proper surfaces to receive installation of repairs and new Work.
- C. Restore Work which has been cut or removed, and install new products to provide completed Work in accord with Contract Documents.
- D. Refinish adjacent or entire surfaces as necessary to provide a uniform finish and appearance.

END OF SECTION 01070

SECTION 01150

**SUBSTITUTION REQUESTS
(only permitted during bidding)**

PART 1 - GENERAL

1.1 Description:

- A. Substitution requests are **only** accepted during the bidding phase and require the approval of the Architect in writing to be considered acceptable.
- B. **"OR EQUAL":**
 - 1. Where the phrase "or equal", or "or equal as approved by the Architect", occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically approved in writing by the Architect.
 - 2. This bid time substitution request process supercedes any and all "or equal" statements in the specification manual.
 - 3. The decision of the Architect shall be final.
- C. Bidders are responsible for reviewing the entire set of Contract Documents. Neither the Architect, nor the Owner, shall be responsible for errors by Bidders as a result of the receipt of partial information. Note that some products or systems are integrated and substitution requests shall take this into consideration.

1.2 Submittal of Substitution Requests:

- A. During bidding, the Architect will consider written requests for substitutions, ***received no later than ten (10) days prior to the originally advertised Bid Date.*** Requests received after that time will not be considered and will be rejected without review. Note that this means that any request should be made as quickly as possible, in order to allow time for questions from the Architect, and possible follow-up information. If the requested follow-up information is not received at least 13 days prior to the Bid Date, allowing time for review, then the submitted substitution will be rejected.
- B. **Collateral Changes:** In connection with the use of any substitute item approved by the Architect it shall be the Bidder's, and ultimately the awarded Contractor's, responsibility to see that such items meet all space requirements and that any alterations to connecting items necessitated by use of the alternate items are properly made. Starters, connections and other accessories are to be included and their requirements coordinated with other Subcontractors, with no increase in cost to the Owner.
- C. **Basis of Design:** Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc. by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Specific reference in the specifications does not exempt the Bidder or product manufacturer from meeting all of the specific technical requirements of the Specifications. Substitutions for Basis of Design

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products or systems shall comply with all physical, performance and aesthetic characteristics of the Basis of Design. Compliance only with ASTM or other testing standards does not constitute an acceptable waiver for acceptance.

- D. **Bidder Representation:** In making request for substitutions, or by including an approved substitution product in his bid, the Bidder represents:
1. He has personally investigated the proposed product or method and determined that it is equal or superior in all respects to that specified.
 2. He will provide the same guarantee for the substitution as for the product or the method specified.
 3. He will coordinate the installation of the accepted substitution into work, making such changes as may be required for work to be complete in all respects.
 4. He waives all claims for additional costs related to the substitution which consequently becomes apparent.
 5. The manufacturer will warrant that his material used for this application is acceptable.
- E. **Request for Prior Approval Format:** In order to allow the fullest competition, consistent with the Owner's interests, the Architect will give consideration, prior to submission of proposals, to requests for approval of products and materials competitive with and similar to those specified by proprietary name. To be considered and in order to facilitate the Architect's review of requests for approval of substitutions for specified products or materials, all such requests shall be made in writing using the "Substitution Request for Prior Approval" form at the end of this section. ***Failure to include this form, or complete in its entirety, with the submittal will result in the submittal being rejected without review.***

1.3 Supporting Data:

- A. Include the following minimum data:
1. Manufacturer cut sheet of the specific product proposed. Do **not** include the manufacturer's entire catalog of products.
 2. Performance and test data that indicates the proposed product's performance characteristics. The relevant specification section will indicate the performance requirements that must be met. Ensure that each performance item in the specification section is addressed in the proposed product's data. Clearly identify applicable portions of the data.
 3. Warranty information that confirms that the proposed product meets or exceeds the warranty requirements listed in the relevant specification section.
 4. Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.
 5. Provide any additional information which would aid the Architect in making an informed decision. Include side-by-side product comparisons, technical data, laboratory test results, product drawings, photographs, etc.
- B. Include any form or information specifically requested in the relevant specification section that is required for substitution consideration, such as a list of installer experience.

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- C. Ensure that the **specific** system or product is identified. Submittal of a manufacturer's name or entire product line for consideration as "equal" is not acceptable. The burden of proof rests with the party proposing the substitution. **The Architect will not conduct research into the product line to see which model was intended as the substitution.** Any such submittal will be rejected without further review.
- D. The Individual or Firm requesting a substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.

1.4 Samples and Mockups:

- A. Certain products will require the inclusion of a sample or mock-up for consideration. For example, brick typically requires a strap sample showing the full range; and casework typically requires submittal of a mock-up that demonstrates that the specific construction requirements can be met.
- B. Refer to the relevant specification section for specific requirements for approval. If unsure, submit the question to the Architect in writing for clarification.
- C. All architectural finishes will require the submittal of samples using the same components and assemblies (such as the same primer and coats of finish paint) that are specified for use in the Project.

1.5 Notification:

- A. Products and materials that have been approved by the Architect will be listed in Addenda to the Bidding Documents furnished to all Bidders. **Following the receipt of Bids, no further requests for substitution of products or materials will be considered.**

1.6 Requests for Substitutions during Construction:

- A. Substitutions are not permitted during construction. Required submittals, such as shop drawings, shall be for products listed in the specifications as pre-approved, or in an addendum as an approved substitution. In no case shall the Contractor submit a product for review during construction that does not meet the above two requirements. Any such submittal will be returned unreviewed and neither the Owner, nor the Architect, shall be charged with delaying the Project.
- B. In cases of extreme need, such as the sudden discontinuation of a specified product, the Architect will consider Contractor's request for substitution when the following conditions are satisfied. **If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.**
 - 1. Statement why the specified product cannot be provided. If it is no longer available, the Contractor shall document efforts at finding the product through every available means.
 - 2. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may

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include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

3. Requested substitution does not require extensive revisions to the Contract Documents.
4. Requested substitution is consistent with the Contract Documents and will produce indicated results.
5. Requested substitution will not adversely affect Contractor's construction schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one subcontractor, and the requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all subcontractors involved.

SUBSTITUTION REQUEST FOR PRIOR APPROVAL
(to be submitted during bidding)

Date of Request: _____

Bid Date: _____

Project Name: _____

Name of Party Making Request: _____

Specified Item: _____

Specification Section and Paragraph: _____

Proposed Substitute: *(Model No.)* _____

Manufacturer: _____

(the following section may be expanded as necessary)

Deviations from the Specified Item: <i>(List all deviations, no matter how seemingly inconsequential)</i>	
Manufacturer's Recommendations for Use and Installation: <i>(List all recommendations)</i>	
Change in Other Work to Permit Use of Proposed Substitute: <i>(List changes, submit drawings, if required, for clarity)</i>	
Technical Data to Support Request for Approval: <i>(List designations met, submit testing reports, etc.)</i>	
Other Supporting Data: <i>(Submit brochures, samples, Drawings, etc.)</i>	

Certification: *(If request is made by Prime Bidder)*

"I have personally examined the Contract Documents and certify that any changes whatsoever to the proposed work required by the use of this substitute product have been identified and will be included in my Base Bid".

Signed: _____

Certification: *(If request is made by Manufacturer)*

"I have personally examined the Contract Documents and certify that I will attach to and make a part of my pricing to all Bidders the changes to any or all details, space or weight requirements, utility requirements etc., necessary to accommodate the equipment or product for which I request approval".

Signed: _____

SECTION 01200

JOB SITE ADMINISTRATION

PART 1 - GENERAL

1.1 Supervision:

- A. The Contractor shall provide a qualified, full-time Superintendent at the project site throughout the construction. The Superintendent shall maintain at the job site a complete and accessible file containing all submittals, shop drawings and samples approved by the Architect as well as supplemental erection or installation instructions for these items.
- B. The Superintendent (project foreman) or his designee will be present on the job site at all times the project site is manned by the Contractor or any Subcontractor. This will ensure the Architect or Owner representative will have access to a representative of the Contractor at all times.
- C. The Superintendent shall henceforth make every effort to expeditiously coordinate all phases of the work, including the required reporting procedures, to obtain the end result within the full purpose and intent of the Drawings and Specifications for the Project.
- D. The Superintendent will ensure that any Owner-supplied equipment or materials left in the construction area shall not become a victim of theft, damage, or destruction.
- E. The Contractor shall not remove the existing Superintendent without first notifying the Architect in writing. And then only after providing the new Superintendent enough time to familiarize himself with the project.

1.2 Field Office: The Contractor at his discretion shall furnish, equip and maintain at the job site a temporary field office for the use of the Superintendent and occasional use by the Architect or his representatives. The office shall be weather-tight, with a telephone, fax machine, and adequate heating, ventilation and cooling. Lighting and furnishings shall be adequate for reading blueprints. These facilities shall be property of the Contractor and shall be removed by him upon completion of the Work. Coordinate the location of the field office and all storage structures with the Owner.

1.3 Access to the Site: Access to the site and construction operations shall at no time interfere with the normal business operations of neighboring buildings or their parking, nor cause damage to any of the existing buildings, paving, utilities or landscaping. In the event that any should occur, the Contractor shall repair, replace or otherwise correct the damage at his own expense.

1.4 Site Maintenance: The Contractor shall maintain the building and site in a safe manner, free from accumulation of construction debris. Clean and remove debris from the site at least once a week.

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1.5 **Public Access:** Comply with the requirements of the governing authorities concerning the use of the public streets and right-of-ways for deliveries, access and construction. Maintain in good condition and repair or replace pavement, curbs, utilities and other improvements damaged during construction to the satisfaction of the governing authority having jurisdiction.

1.6 **Pre-construction Conference:**

- A. Before beginning work at the site the Contractor shall attend a pre-construction conference scheduled by the Architect and bring with him the Superintendent employed for this project. At this time all parties concerned will discuss the project under contract and prepare a program of procedure in keeping with requirements of the Drawings and Specifications.
- B. The purpose of this conference will be to discuss and clarify contract administration procedures which will be employed during construction.
- C. The pre-construction meeting shall be held at time and date to be determined by the Architect.
- D. Attendance:
 - 1. Owner
 - 2. Architect
 - 3. Engineers
 - 4. Contractor
 - 5. Superintendent
 - 6. Subcontractors
- E. Agenda:
 - 1. Construction schedule
 - 2. Critical work sequencing
 - 3. Coordination of Subcontractors
 - 4. Designation of responsible personnel and duties
 - 5. Processing of field decisions and Change Orders
 - 6. Submittals
 - 7. Use of premises and site
 - 8. Delivery of materials
 - 9. Security procedures
 - 10. Permits and Approvals, including Pay Requests
 - 11. Direct Purchasing Procedures
 - 12. Other pertinent issues

END OF SECTION 01200

SECTION 01300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions, (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Summary:**
- A. Section includes requirements for the administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
 - B. Related Sections:
 - 1. Section 00810, Progress Payments, for submitting Applications for Payment and the schedule of values.
 - 2. Section 01320, Progress Reporting, for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 01730, Operation & Maintenance Manuals, for submitting operation and maintenance manuals.
 - 4. Section 01721, Project Record Documents, for submitting record Drawings, record Specifications, and record Product Data.
 - 5. Section 01740, Demonstration and Training, for submitting video recordings of demonstration of equipment and training of Owner's personnel.
- 1.3 **Definitions:**
- A. **Action Submittals:** Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
 - B. **Informational Submittals:** Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.
 - C. **File Transfer Protocol (FTP):** Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
 - D. **Portable Document Format (PDF):** An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- 1.4 **Submittal Administrative Requirements:**
- A. **Coordination:** Coordinate preparation and processing of submittals with performance of construction activities.

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1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. **Processing Time:** Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. **Initial Review:** Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. **Intermediate Review:** If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. **Resubmittal Review:** Allow 5 days for review of each resubmittal.
 4. **Concurrent Consultant Review:** Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to other parties, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- C. **Identification and Information:** In addition to transmittal form identification, place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings .
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use sequential numbering, with G-, M-, or E-prefix to differentiate between various disciplines, General,

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Mechanical, or Electrical (e.g. G-1, M-1, etc.) Resubmittals shall include an alphabetic suffix (e.g. G-1A).

- j. Drawing number and detail references, as appropriate.
- k. Location(s) where product is to be installed, as appropriate.
- l. Other necessary identification of product, assembly, etc., included in submittal.

- D. **Identification and Information:** Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall use the next sequential decimal number (e.g., LNHS-061000.02).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Include the following information on an inserted cover sheet:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Name of subcontractor.
 - h. Name of supplier.
 - i. Name of manufacturer.
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Other necessary identification of product, assembly, etc., included in submittal.
 5. Include the following information as keywords in the electronic file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. **Options:** Identify options requiring selection by the Architect.
- F. **Deviations:** Identify deviations from the Contract Documents on submittals.
- G. **Additional Paper Copies:** Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

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- H. **Transmittal:** Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using two transmittal forms. Architect will discard submittals received from sources other than Contractor.
 - 1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect, and/or Construction Manager, on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- I. **Resubmittals:** Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- J. **Distribution:** Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.
- K. **Use for Construction:** Use only final submittals that are marked with approval notation from Architect's action stamp.

1.5 Construction Schedule:

- A. The Contractor, within ten (10) days of award of the Contract, shall prepare and submit, with approval of the Architect, a complete graphic construction schedule showing dates upon which each item or Subdivision of the work shall begin and end. Schedule shall also show required delivery dates for material or equipment to be supplied by the Owner.
- B. The graphic schedule shall be divided into at least weekly periods so that at any period the actual state of the work may be clearly determined.
- C. Schedule shall be updated monthly and distributed to appropriate agencies.

1.6 Manufacturer's Specifications:

Where the name of a concern or manufacturer is mentioned on the Drawings or in Specifications in reference to his required service or product, and no qualifications or specification of such is included, then the material gauges, details of manufacturer, finish, etc., shall be in accordance with his standard practice, directions or specifications. The Contractor shall be responsible for any infringement of patents, royalties, or copyrights which may be incurred thereby.

1.7 Substitutions:

All substitutions will be strictly bound by Section 01150, Substitution Requests. ***All requests for substitutions shall only be accepted during the bidding period.*** After the bid opening, the only products that shall be submitted are those expressly named in specification sections or approved in an addendum. Submittal of non-approved products will result in summary rejection of the submittal.

1.8 Warranties and Guarantees:

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- A. **Warranties and guarantees shall begin on the official date of substantial completion and shall be in effect for specified duration. Include all specific items covered, company name(s) and addresses and names of person authorized to warrant or guarantee items, if not blanket coverage.**
- B. If, within any guarantee period, repairs or changes are required in connection with the guarantee work which, in the opinion of the Architect or Engineer, is rendered necessary as the result of the use of materials, equipment or workmanship which are defective or inferior or not in accordance with the terms of the Contract, the Contractor shall promptly, upon receipt of notice from the Owner, and without expense to the Owner, proceed to:
 - 1. Place in satisfactory condition in every particular, all of such guaranteed work, correct all defects therein, and:
 - 2. Make good all damages to the structure or site or equipment or contents thereof which, in the opinion of the Architect or Engineer, are the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the Contract; and
 - 3. Make good any work or materials or the equipment and contents of structures or site disturbed in fulfilling any such guarantee.
- C. If the Contractor, after notice, fails to proceed promptly to comply with the terms of guarantee, the Owner may have the defects corrected and the Contractor and his Surety shall be liable for all expenses incurred.

PART 2 - PRODUCTS

2.1 Submittal Procedures:

- A. Shop Drawings and submittals as required by other Sections of these Specifications **shall be submitted prior to the commencement of work.**
- B. **General Submittal Procedure Requirements:** Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 3. **Closeout Submittals and Maintenance Material Submittals:** Comply with requirements specified in Sections 01700, Project Close-out, and 01730, Operation & Maintenance Manuals.
 - 4. **Certificates and Certifications Submittals:** Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

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5. **Test and Inspection Reports Submittals:** Comply with requirements specified in Sections 01400, Quality Requirements, and 01410, Testing Laboratory Services.
- B. **Product Data:** Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable or available for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Standard color charts.
 - c. Statement of compliance with specified referenced standards.
 - d. Testing by recognized testing agency.
 - e. Application of testing agency labels and seals.
 - f. Notation of coordination requirements.
 - g. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
 - b. Four paper copies of Product Data, unless otherwise indicated. Architect will return two copies. Retain one marked up copy as a Project Record Document.
- C. **Shop Drawings:** Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. **Preparation:** Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Two opaque (bond) copies of each submittal. Architect will return one copy.

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- D. **Samples:** Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. **Identification:** Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number of applicable Specification Section and paragraph (e.g. 01300, 2.1.A.1.).
 3. **Disposition:** Maintain sets of approved Samples at Project site, available for quality control comparisons throughout the course of construction activity. Sample sets will be used to determine final acceptance of construction associated with samples.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 4. **Samples for Verification:** Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. **Number of Samples:** Submit two sets of Samples. Architect will retain one Sample set; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.
- E. **Subcontract List:** Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

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4. Submit subcontract list in the following format:
 - a. PDF electronic file.
 - b. Number of Copies: 3 paper copies of subcontractor list, unless otherwise indicated. Architect, through Construction Manager, will return 2 copies.
- F. **Qualification Data:** Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- G. **Welding Certificates:** Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
- H. **Installer Certificates:** Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- I. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- J. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- K. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- L. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- M. **Product Test Reports:** Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. **Research Reports:** Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- O. **Schedule of Tests and Inspections:** Comply with requirements specified in Sections 01400, Quality Requirements, and 01410, Testing Laboratory Services.
- P. **Preconstruction Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

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- Q. **Compatibility Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- R. **Field Test Reports:** Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- S. **Maintenance Data:** Comply with requirements specified in Section 01730, Operation & Maintenance Manuals.
- T. **Design Data:** Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 Contractor's Review:

- A. **Action and Informational Submittals:** Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. **Project Closeout and Maintenance/Material Submittals:** Refer to requirements in Section 01700, Project Close-out.
- C. **Approval Stamp:** Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents. Approval stamp actions and statements shall conform with Transmittal Form actions and statements.

3.2 Architect's Action:

- A. **General:** Architect will not review submittals that do not bear Contractor's approval stamp and signature, and will return them without action.
- B. **Action Submittals:** Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will indicate on the accompanying Transmittal Form the appropriate action.
- C. **Informational Submittals:** Architect will review each submittal and will return it to indicate it does or does not comply with requirements. Architect will forward each submittal to Contractor only, to be distributed by Contractor as is appropriate.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

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END OF SECTION 01300

SECTION 01320

PROGRESS REPORTING

PART 1 - GENERAL

- 1.1 **Submission of Construction Schedule:** Within **ten (10)** days after the date of the Owner's issuance of a Notice to Proceed, the Contractor shall prepare and submit to the Architect **four (4)** copies of the proposed Construction Schedule graphically depicting the activities required to complete the project, and showing the sequence in which the Contractor proposes each such activity to occur and the duration (dates of commencement and completion, respectively) of each such activity. The schedule shall, as a minimum, separate the work as outlined in the various specification sections. The Architect shall have the right to request further subdivision of the schedule to clarify the construction sequencing.
- 1.2 **Monthly Review of Schedule:** At least once each month, the Architect shall determine whether the Construction Schedule developed and submitted by the Contractor meets the requirements stated above and whether the progress of the Work complies with the Contractor's schedule. Failure of the Contractor to develop and submit a Construction Schedule as aforesaid shall be sufficient grounds for the Architect to find the Contractor in substantial default and certify to the Owner that sufficient cause exists to terminate the Contract or to withhold any payment.
- 1.3 **Progress Charting:** Following the development and submittal of the Construction Schedule, the Contractor shall, at the end of each calendar month, update and/or revise the Construction Schedule to show the actual progress of the Work performed and the occurrence of all events which have affected or will affect the progress of the work yet to be performed. Each such update and/or revision to the Construction Schedule shall be submitted to the Architect in duplicate. Failure of the Contractor to update, revise and submit the Construction Schedule as aforesaid shall be sufficient grounds for the Architect to find the Contractor in substantial default and certify to the Owner that sufficient cause exists to terminate the Contract or to withhold payment to the Contractor until a schedule or schedule update acceptable to the Architect is submitted.
- 1.4 **Early Substantial Completion:**
 - A. The Contractor shall have the option of scheduling a Substantial Completion earlier than the date established by the Contract Documents for Substantial Completion; provided the earlier Substantial Completion date is acceptable to the Owner. The consideration of an early completion will be entertained only as a matter of convenience to the Contractor and shall not change the date for Substantial Completion established by the Contract Documents or be otherwise binding on the Owner or anyone under the Owner's control. Should events occur during the performance of the Work which would justify the granting of an extension of the Contract Time pursuant to the provision of Article 8 of the

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General Conditions which form a part of the Contract Documents, the Contractor shall be entitled to receive only such an extension of the Contract Time as is determined by the Architect to be due the Contractor as follows:

1. In the event the current Contractor's schedule indicates completion **ahead of** the contractually established date for Substantial Completion, the time extension to the Contract shall be determined as the total time directly affecting the critical path of the schedule and will be added to the end date of the schedule thereby making a new end date beyond the contractual completion date.
2. In the event the current Contractor's schedule indicates completion **at or after** the contractually established date for Substantial Completion, the time extension shall only be added to the contractually established date for Substantial Completion and shall be determined by the Architect as the portion of delay time directly affecting the critical path of the current approved contract schedule.

PART 2 - PRODUCTS

2.1 Submission:

- A. As accompaniment to the monthly updated Progress Schedule, the Contractor shall submit a Monthly Progress Report in a concise format approved by the Architect. The Monthly Progress Report shall address separately each of the following topics:
 1. General progress of the work during the preceding month.
 2. Progress outlook for the upcoming month.
 3. Change Orders, including status of any pending changes in the work.
 4. Delays in the work during the preceding month; current or anticipated delays; any decisions required.
 5. Information needed from the Architect or Engineer.
 6. Information needed from the Owner.

END OF SECTION 01320

SECTION 01400

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.

1.2 **Summary:**

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities, requirements that also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. **Related Sections:**
 - 1. Section 01320, Progress Reporting, for developing a schedule of required tests and inspections.
 - 2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 **Conflicting Requirements:**

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

1.4 **Informational Submittals:**

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- A. **Contractor's Quality-Control Plan:** For quality-assurance and quality-control activities and responsibilities.
- B. **Testing Agency Qualifications:** For testing agencies specified in 01410, Testing Laboratory Services, to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. **Schedule of Tests and Inspections:** Prepare in tabular form and include the following:
 - 1. Specification Section number and title and paragraph.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.5 Contractor's Quality-control Plan:

- A. **Quality-Control Plan, General:** Submit quality-control plan within 10 days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. **Quality-Control Personnel Qualifications:** Project superintendent shall be trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
- C. **Submittal Procedure:** Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. **Testing and Inspection:** Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction.
- E. **Continuous Inspection of Workmanship:** Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. **Monitoring and Documentation:** Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming

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work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.6 Reports and Documents:

- A. **Test and Inspection Reports:** Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section name and paragraph.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. **Manufacturer's Technical Representative's Field Reports:** Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. **Factory-Authorized Service Representative's Reports:** Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

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

1.7 Quality Assurance:

- A. **General:** Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. **NRTL:** A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. **NVLAP:** A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to

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inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- J. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing, analyzing, and reporting results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove and discard test specimens, assemblies, mockups; do not reuse products on Project.
 - 2. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to be retained by Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. **Integrated Exterior Mockups:** Construct integrated exterior mockup in accordance with approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.
- L. **Room Mockup:** Construct room mockup incorporating required materials and assemblies, finished in accordance with requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Provide room mockup as directed by the Architect.

1.8 Quality Control:

- A. **Contractor Responsibilities:** Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall employ a separate entity from those engaged by Owner, unless agreed to in writing by Owner.

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3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01300, Submittals, for informational submittals.
- C. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- D. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.

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6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
 - G. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
 - H. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents as a component of the Contractor's quality control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses. .
 1. **Distribution:** Distribute schedule to Owner, Architect testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- 1.9 **Special Tests and Inspections:**
- A. **Special Tests and Inspections:** Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
 - B. **Special Tests and Inspections:** Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 Test and Inspection Log:

- A. Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.

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3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 **Repair and Protection:**

- A. **General:** On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01070, Cutting & Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 Description:

- A. Specific requirements of tests specified in other Specification Sections shall be provided in addition to requirements specified in this Section.
- B. Record reports are specified in Section 01721, Project Record Documents.

1.2 Cost of Testing: The Contractor shall employ and pay an independent testing laboratory to perform tests and to submit test reports.

1.3 Test Reports:

- A. Test reports shall be submitted in accordance with the construction schedule, and in no case longer than twenty-four (24) hours after the time the tests are completed.
- B. Identify test reports by project title, Architect's project number, project location, location of test on project, type of test, section where test is specified in Contract Documents, name of the testing laboratory, and person(s) conducting test.
- C. Reports Contents: Provide test results and interpretations of results. Describe the conditions at the test site at time of testing. Render professional opinion regarding compliance of work tested with requirements specified and indicated on Drawings. Recommend additional work required by test results.
- D. Provide a minimum of **three (3)** copies of each report to the Architect for distribution to the Owner and Engineers, as necessary.

END OF SECTION 01410

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 Description:

- A. **Work included:** Temporary facilities and controls required for this project include, but are not necessarily limited to:
 - 1. Temporary utilities such as water and electricity.
 - 2. Field offices and sheds.
 - 3. Sanitary facilities.
 - 4. Enclosures and coverings such as fencing, tarpaulins, barricades and canopies.
 - 5. Construction site security.
 - 6. Fire protection.
 - 7. Traffic maintenance and control.
- B. **Related Work Described Elsewhere:**
 - 1. **Compliance with safety regulations:** Compliance with all requirements of pertinent regulations is described in General Conditions.
 - 2. **Subcontractor Equipment:** Except for equipment furnished by Subcontractors, all other equipment shall comply with all requirements of pertinent safety regulations. The ladders, hoists, planks and similar items normally furnished by individual trades in execution of their own portions of the work are not part of this Section of these Specifications.
 - 3. **Utility Hook-Up:** Installation and hook-up of the various utility lines are the responsibility of the contractor.

1.2 Product Handling:

- A. **Protection:** Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.
- B. **Replacements:** In the event of loss or damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 Utilities:

- A. **Temporary Utilities:**
 - 1. **General:** Provide and pay all costs for all gas, water and electricity required for the performance of the work.
 - 2. **Temporary Piping:**
 - a. Furnish and install all necessary temporary piping and, upon completion of the work, remove all such temporary piping.

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- b. Where the installation of water meters are required to obtain temporary water, install meters of a size to accommodate requirements of the finished project.
 - c. Where the existing water system at the project site does not have sufficient pressure to provide water at outlets, provide temporary pumps, tanks and compressors as necessary to produce required pressures.
3. **Temporary Electricity:**
- a. Furnish and install all necessary temporary wiring and associated equipment.
 - b. Furnish and install area distribution boxes so located that the individual trades may use their own construction-type extension cords to obtain proper power and artificial lighting at all points where required by inspectors and for safety.
 - c. Should a building or portion of the project be occupied by Owner after Substantial Completion but before Final Acceptance, the metered cost of electricity for the occupied portion will be borne by Owner from the time of partial occupancy until Final Completion.
4. **Telephone:** Mobile phone service is acceptable for this project. Wired phone service can be provided at the discretion of the contractor and bear all costs.
- 2.2 **Sanitary Facilities:**
- A. Furnish and install all required temporary toilet facilities for use by all personnel. Comply with all minimum requirements of public agencies having jurisdiction. Maintain in a sanitary condition at all times.
 - B. Permanent plumbing fixtures within the building shall not be used during construction.
- 2.3 **Enclosures:** Furnish, install and maintain for the duration of construction all required scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms and other temporary construction necessary for proper completion of the work in compliance with all required safety and other pertinent regulations.
- 2.4 **Construction Site Safety:** The Contractor shall take all measures necessary to ensure the security of the construction site.
- 2.5 **Temporary Fire Protection:** Provide fire protection equipment during the entire construction period as required by the authority having jurisdiction.
- 2.6 **Traffic Maintenance and Control:** Whenever the Contractor's operations affect public vehicular or pedestrian traffic, the Contractor shall be responsible for the installation and maintenance of any and all traffic control devices as deemed necessary by the authority having jurisdiction.

PART 3 - EXECUTION

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3.1 **Removal:**

- A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the work. Remove all such temporary facilities and controls as rapidly as progress of the work will permit or as directed by the Architect.
- B. Contractor shall furnish three (3) contact names and phone numbers for emergency calls.

END OF SECTION 01500

SECTION 01530

PROTECTIVE BARRIERS

PART 1 - GENERAL

- 1.1 **Scope:** It is the intent of this section to provide for the furnishing, and installation of all protective barriers to prevent harm to workmen, visitors, trees and other protected items by adequately marking and designating work areas that may be cause of such harm and to adequately mark those areas containing stored materials to prevent damage.
- 1.2 **Description:**
- A. Erect barriers around areas of construction to warn all persons of the possible hazards of personal injury when entering such areas.
 - 1. Erect barricades around open holes and work edges or other such items which may, because of location of work areas or type of work, be cause of injury or harm to any person within construction areas.
 - B. Erect barriers around existing planting areas to protect landscaping plants from damage due to construction operations, storage of materials and abuse by workmen.
 - C. The Contractor shall erect barriers or fences to protect materials stored on-site and to prevent children from playing on stored materials and equipment.

PART 2 - PRODUCTS

- 2.1 **Barriers:**
- A. Barricade may be portable, prefabricated types or erected and fabricated on-site of wood or rope and chains.
 - 1. **Signs:** post at not more than 12 feet apart and attached to barricade.
 - a. Attach signs stating "Danger" or "Do Not Enter".
 - 2. **Flags:** post red colored flags at not more than 6 feet apart.
 - 3. Each barricade type shall meet OSHA standards.
 - a. OSHA standards exceed all other type barricades listed herein.
 - B. **Landscaped Areas:** Erect barriers to prevent workmen from entering or storing materials in planting areas.
 - C. **Existing Trees:**
 - 1. Erect barriers to prevent damage to existing trees and to prevent the compaction of top soil within the tree drip-line.
 - 2. **Barriers shall be placed at the edge of the canopy drip, and in no case less than ten (10) feet from the trunk of any existing tree.**
 - 3. Tree protection barriers are to remain in place until the acceptance of Final Completion.
 - 4. Should barriers be damaged or removed at any time during construction, the Contractor shall re-erect the barrier to maintain a continuous protection of the tree.

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5. Should an existing tree be damaged and/or die during the warranty period through the failure of the Contractor to erect and maintain a protective barrier, the Contractor shall replace the inches with new trees of similar type (hardwood or softwood).
6. Should an existing tree die during the warranty period where the Contractor installed and maintained a protective barrier in accordance with these specifications, the Contractor shall remove the tree, if so directed by the Owner, and at the Owner's expense.

PART 3 - EXECUTION

- 3.1 Barriers shall remain in place during entire construction operations, from demolition until substantial completion.
- 3.2 Barrier locations will be determined on the plan sheet as approved by Architect and will be discussed at the Pre-construction Meeting.
- 3.3 Barriers shall be removed at completion of all construction operations.

END OF SECTION 01530

SECTION 01531

TEMPORARY FENCING

PART 1 - GENERAL

- 1.1 **Scope:** It is the intent of this Section to provide for the furnishing and installing of the temporary fencing and all associated work and accessories.
- 1.2 **Description:**
- A. Contractor will bear all fencing expenses.
 - B. Work included is a convenient listing of the significant items described within this Section and shall not be construed as the only work applicable or related to this Section.
 - C. Work includes, but is not limited to:
 - 1. Chain link fabric.
 - 2. Posts.
 - 3. Gates.
 - 4. Accessories.
- 1.3 **Quality Assurance:** Erector Qualifications: Minimum three (3) years experience installing similar fencing.
- 1.4 **Submittals:** Submit manufacturer's products data describing installation methods procedure with standard drawings of fence and gate installation.

PART 2 - PRODUCTS

- 2.1 **General:** Fence components shall be galvanically compatible.
- 2.2 **Chain Link Fabric:**
- A. Fed Spec RR-F-00191/1, Type II.
 - 1. Once piece fabric, full height 6 ft.
 - 2. Mesh size 2".
 - 3. Wire diameter finish gauge 11.
 - 4. Knuckle to knuckle
- 2.3 **Gates:**
- A. Fed Spec RR-F-00191/2, Type I, double swing.
 - 1. **Fabric:** Same as fence fabric.
 - 2. **Hinges:** Standard type.
 - 3. **Latches:** Plunger bar type, operable either side of gate with padlock hasp.
- 2.4 **Framework:**
- A. **Posts:** Fed Spec RR-F-00191/3, Type I, Class 3.

PART 3 - EXECUTION

3.1 Preparation:

- A. Measure and lay out complete fence line according to the site drawings. Measure parallel to the surface of the ground. Run fence to the existing fence for a temporary tie in.
- B. Locate and mark position of post. Locate line posts at equal distance spacing not exceeding 10' centers. Locate corner posts at positions where fence changes direction more than 10 degrees.

3.2 Installation:

A. Posts:

- 1. Maximum of 8' spacing.
- 2. Minimum of 2' depth.

B. Fabric:

- 1. Stretch fabric tight between terminal posts. Position bottom of fabric approximately 1" to 2" above ground level at each post.
- 2. Attach fabric to terminal post using tension bars and tension band.
- 3. Attach fabric to line posts using wire ties or clips.

C. Gates:

- 1. Install gates plumb and level 1/4" to 10 ft.
- 2. Adjust hardware to provide smooth operation.

3.3 Removal:

- A. Remove fencing at completion of construction. Remove all evidence of fencing. Fill holes and tamp. Remove all cuttings, clippings and concrete.

END OF SECTION 01531

SECTION 01620

MATERIALS, STORAGE AND PROTECTION

PART 1 - GENERAL

- 1.1 **Delivery:** All materials shall be new and delivered to the site in original manufacturer's or fabricator's bundles, packages, containers, etc. and tagged or otherwise marked or labeled for proper identification.
- 1.2 **Storage:** Store all materials in appropriate manner from elements and weather off ground, under cover or in enclosures as required by manufacturer's recommendations, code or trade association recommendations.
- 1.3 **Ventilation:** Ventilate enclosed or covered areas to prevent moisture damage to materials.
- 1.4 **Contamination:** Do not allow materials to become unusable by contamination from foreign matter, rain, frost, ice, rust, corrosion, etc.
- 1.5 **Singular Source:** Obtain all similar types of materials or products from a single manufacturer, produced by similar or duplicate methods. Do not change sources or brands during the course of the Work unless approved in writing by the Architect.

PART 2 - PRODUCTS As required by Specifications.

PART 3 - EXECUTION

- 3.1 **Inspection:** Inspect all materials and products prior to installation or incorporation into the work.
- 3.2 **Damaged Materials:** Do not install materials or items which are damaged or otherwise not acceptable. Acceptance of project is contingent upon all items or materials being in proper operating condition and free from defects, blemishes or damage.
- 3.3 **Installation:** Install all items specified or referenced by specification in locations and manner shown or required. Proprietary items shall be installed in manner and under conditions recommended by the manufacturer.

END OF SECTION 01620

SECTION 01700

PROJECT CLOSE-OUT

PART 1 - GENERAL

1.1 Definition:

- A. Close-out is the series of actions by Contractor near the end of the Contract period, preparatory to termination of the Contract, acceptance by Architect, occupancy by the Owner and similar actions evidencing completion of work and resulting in the Final Payment.
- B. It is the Owner's intent for the General Contractor to "construction clean" the entire facility prior to Substantial Completion and the Architectural Punch List. The Owner will then mobilize the delivery of equipment and furniture. Prior to occupancy, the General Contractor shall clean the entire facility with a "white glove" cleaning of all surfaces.

1.2 Final Cleaning:

- A. Upon completion of construction, clean finish surfaces as follows:
 - 1. **Pavements:** Sweep with broom to remove loose rock, dirt and construction debris and wash with water running from a hose to remove cement stain and other discoloration.
 - 2. **Aluminum:** Wash with mild solution of non-alkali soap or detergent and remove smudges, pencil marks, gypsum board compound and other foreign matter, followed by clean water rinse.
 - 3. **Painted Surfaces:** Remove stains and leave clean.
 - 4. **Mechanical Equipment:** Remove all stains from the roofing process.
 - 5. **Roof Surface:** remove all excess materials stains and debris and leave clean.
 - 6. Clean all other surfaces damage by the roofing process and leave as per original state. If surface can not be cleaned contractor shall repair surface to the acceptability of the Owner and Architect and bear all costs.

1.3 Prerequisites to Substantial Completion:

- A. **Certificate of Occupancy:** Contractor shall obtain written approval from all permitting agencies for building occupancy. Refer to Section 00500, *Agreement and Completion Forms*.
- C. **Releases of Lien:** Provide partial waivers of lien for all work minus retainer and work indicated on the Architect's Punch List.

1.4 Final Payment: Final payment shall be made to the Contractor as provided by the Agreement and upon receipt of the following:

- A. Completion of Architect's and Engineers' Punch Lists.
- B. Record Drawings.
- C. Operation and Maintenance Manuals.

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- D. Extra Materials (when specified).
- E. Warranties.
- F. Final Releases of Lien from Subcontractors, Suppliers, and General Contractor.
- G. Final Application for Payment.

END OF SECTION 01700

SECTION 01710

CLEANING

PART 1 - GENERAL

1.1 Description:

- A. **Work Included:** Throughout the construction period, maintain the building and site in a standard of cleanliness as described in this Section.
- B. **Related Work Described Elsewhere:** In addition to standards described in this Section, comply with all requirements for cleaning as described in various other Sections of these Specifications.

- 1.2 **Quality Assurance:** For codes and standards, in addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

- 2.1 **Compatibility:** Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Architect.

PART 3 - EXECUTION

3.1 Progress Cleaning:

- A. **General:**
 - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic and providing the required protection of materials.
 - 2. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this work.
 - 3. At least twice each month, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
 - 4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.
- B. **Site:**
 - 1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
 - 2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Re-stack, tidy or otherwise service all arrangements to meet the requirements of Paragraph 3.1.A.1 above.

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

3.2 Final Cleaning:

- A. **Definition:** Except as otherwise specifically provided, "clean" (for the purpose of this Paragraph) shall be interpreted as meaning the level of cleanliness generally provided by commercial building maintenance Subcontractors using commercial quality building maintenance equipment and materials.
- B. **General:** Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in Paragraph 3.1 above.
- C. **Site:** Unless otherwise specifically directed by the Architect, hose down all paved areas on the site and all public sidewalks directly adjacent to the site. Completely remove all resultant debris.
- D. **Structures:**
1. **Exterior:** Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Architect and Owner may require other cleaning at no additional cost to the Owner.
 2. **Interior:** Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains and dirt from finished surfaces. Wash all

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plumbing and electrical fixtures if necessary. Remove all temporary labels. Use only the specified cleaning materials and equipment.

3. **Glass:** Clean all glass inside and outside.
4. **Polished Surfaces:** To all surfaces requiring the routine application of buffed polish, apply the specified polish as recommended by the manufacturer of the material being polished.

E. **Timing:** Schedule final cleaning as approved by the Owner to accept a completely clean project.

3.3 **Cleaning During Owner's Occupancy:** Should the Owner occupy the work or any portion thereof to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Architect in accordance with the General Conditions.

END OF SECTION 01710

SECTION 01721

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 Description:

- A. Specific requirements for Record Documents specified in other specification sections are in addition to requirements specified in this Section and shall be included in Record Documents prepared for Owner as specified in this Section.
- B. Refer to Article 1, Paragraph 1.6 of the General Conditions. ***Note that the Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are copyrighted materials and no additional copies are to be retained by the Contractor, Subcontractors, etc. except as required to complete this project. At project completion, all extra copies of the Contract Documents are to be destroyed except for one copy which may be retained by the Contractor for his records.***
- C. The Contractor is charged with the full and complete responsibility for preparing and maintaining Record Documents for the Owner's records. The Record Documents shall include all additional information not indicated by original Contract Documents. Record Documents include Contract Drawings, Shop Drawings, Specifications, Addenda, Architect's Supplemental Instructions, Construction Change Directives and Change Orders, Product Data Submittals, Samples, Field Records for variable and concealed conditions such as excavations and foundations, and miscellaneous Project Record information on work not shown, or shown schematically.

1.2 Record Drawings: During the progress of work, maintain one (1) complete set of as-built drawings, marked-up to show work as actually installed. Show all changes and deviations from work as originally shown. Mark whichever drawings that will show more clearly and accurately work as actually installed. Where Shop Drawings are marked-up, provide a cross-reference on Contract Documents and the corresponding location. Note alternate numbers, Change Order numbers and similar identification. Require each person preparing the mark-ups to initial and date the marks and indicate name of firm. Label each sheet "**RECORD DOCUMENTS**" in 1/2" inch high letters.

1.3 Record Specifications: During progress of work, maintain and mark-up one (1) copy of Specifications, including Addenda, Change Orders and similar modifications issued in printed form during construction. Mark-up changes and variations in actual work in comparison with text of Specifications and modifications as issued. Identify substitutions, selection of options and information on work that is concealed. Label front cover "**RECORD DOCUMENTS**" in 3/4 inch high letters.

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- 1.4 **Record Product Data:** During progress of work, maintain one (1) copy of each product data submittal, and mark-up all deviations and changes in actual work in comparison with submitted information. Identify concealed products and portions of work that are not visible after work is complete. Label each data submittal "**RECORD DOCUMENT**" in 3/4 inch high letters.
- 1.5 **Record Samples:** At Substantial Completion, the Architect or Owner will notify Contractor if any of samples submitted during progress of work are to be transmitted to Owner for record purposes. Comply with the Architect's instructions for packaging, identification marking and delivery to Owner's sample storage space. Dispose of samples not transmitted to Owner.
- 1.6 **Miscellaneous Project Records:**
- A. Refer Section 01730, Operation and Maintenance Manuals, and other sections of these specifications for requirements of miscellaneous record-keeping and submittals. Immediately prior to Substantial Completion, complete miscellaneous Project Records and place in good order, properly identified and bound in 3-ring binders. Include the following:
 - 1. Test reports for compliance with Contract Documents.
 - 2. Certifications received from Contractor for compliance with Contract Documents.
 - 3. Field testing reports.
 - 4. Inspections and certifications by governing authorities.
- 1.7 **Submittal:** Submit all Record Documents at one time to Architect for review and transmittal to Owner. Final Payment will be withheld until Record Documents are submitted and accepted by the Owner. Refer to Section 01300, *Submittals*, for detailed information on the preparation of Record Drawings.

END OF SECTION 01721

SECTION 01730

OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 Description:

- A. Submit one (1) printed copy of the Operation and Maintenance manual and one (1) copy on CD-ROM in PDF format. Computer files shall be arranged and organized in specification format.
- B. Operational and Maintenance Manuals shall be specially prepared for the Owner and Owner's personnel. The Manuals shall contain information necessary for safe and efficient operation and maintenance of roof membrane.
- C. Operational and Maintenance Manuals shall include the information specified in Specification Sections, and include the following information as applicable:
 - 1. Table of Contents.
 - 2. Copies of applicable Shop Drawings and manufacturer's product data.
 - 3. System equipment identification, including name of manufacturer, model number and serial number of each component.
 - 4. Operating, maintenance and repair instructions.
 - 5. Emergency instructions.
 - 6. Copies of Warranties/Guarantees and Service Contracts.
 - 7. Names and addresses of sources of maintenance parts, materials and service for each item.

1.2 Quality Assurance: Preparation shall be by personnel who are thoroughly trained and experienced in the operation and maintenance of system involved.

1.3 Submittals: See Section 01300, Submittals.

1.4 Manuals:

- A. **Binders:** Commercial quality, three-ring vinyl-covered loose-leaf binders for 8-1/2" by 11" paper, 3" to 4" in thickness as necessary to accommodate contents. Provide clear plastic sleeve on spine, for holding labels. If necessary provide separate binders to accommodate all the information in a convenient size.
- B. Identify each binder on the front and spine with the printed title " ROOF OPERATIONAL AND MAINTENANCE MANUAL", title of project, and subject matter covered in manual. Indicate volume number for multiple volume sets of manuals.
- C. **Dividers:** Heavy paper dividers with celluloid covered labeled tabs for each separate section. Clearly mark each tab to indicate section contents.
- D. **Text Material:** Use either manufacturer's standard printed material, or specially-prepared data, neatly typewritten, on 8-1/2 x 11 inch, 20 pound white bond paper. Ensure that xerox copies are legible and clean, if not order new copies of information from the manufacturer.

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- E. **Drawings:** Provide reinforced punched binder tabs on Drawings and bind in with text. Fold oversize Drawings to same size as text pages.

1.5 **Manual Content:**

- A. Organize contents of each manual into sections for each piece of related equipment. Each manual shall contain a title page, table of contents, copies of product data, supplemented by drawings and written text, as appropriate, and copies of any warranty, guarantee and service contract provided by manufacturer.
- B. **Title Page:** Enclosed in a transparent plastic envelope as first sheet of each manual. Provide following information:
 - 1. Subject matter covered by manual.
 - 2. Name and address of project.
 - 3. Date of Substantial Completion.
 - 4. Name, address and telephone number of Contractor and equipment or product supplier.
 - 5. Cross reference to related system in other Operational and Maintenance Manuals.
- C. **Table of Contents:** Provide one section in manuals for architectural products, including applied materials and finishes, and a second section for products designed for moisture-protection and products exposed to weather.
- D. When manufacturer's standard printed product data is included in manuals, include only those sheets that are pertinent to specific part or product installed. Clearly mark each sheet to identify each part or product included in installation.
- E. When standard printed data is not available from manufacturer for operation and maintenance of equipment or systems, prepare typewritten text, to provide the necessary information.
- F. Prepare drawings when required to supplement manufacturer's printed data to illustrate the relationship of component systems.

1.6 **Materials and Finishes Maintenance:**

- A. Provide one section in manuals for architectural products, including applied materials and finishes, and a second section for products designed for moisture-protection and products exposed to weather.
- B. Provide complete manufacturer's data and instructions on care and maintenance of products, including applied materials and finishes.
- C. Provide complete manufacturer's data with instructions on the inspection, maintenance and repair of roofing, sealants and other products exposed to weather and for moisture-protection.

- 1.7 **Equipment and Systems Maintenance:** Provide Operational and Maintenance Manuals for each unit of equipment, each operating system, and each electric and electronic system, as appropriate. Refer to Specification Section where equipment is specified for additional requirements for providing operation and maintenance data for various equipment and operating systems.

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- 1.8 **Instructions to Owner's Personnel:** Prior to final inspection, instruct Owner's designated operating personnel in the operation, adjustment and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon time. Arrange to have the instruction session video recorded and included with the close-out documents.

END OF SECTION 01730

SECTION 01732

SELECTIVE DEMOLITION

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Scope:** The work required for this Section includes termite protection under all concrete slabs and inside hollow masonry foundation walls.
- 1.3 **Summary:**
- A. This section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
 - B. Related sections include the following:
 - 1. Section 01010, Summary of the Work.
 - 2. Section 01015, Contractor's Use of the Premises.
 - 3. Section 01045, Cutting and Patching.
 - 4. Section 01351, Construction Waste Management
 - 5. Section 01500, Temporary Facilities and Controls.
- 1.4 **Definitions:**
- A. **Remove:** Detach items from existing construction and legally dispose of them off-site, unless indicated to be "Removed and Salvaged" or "Removed and Reinstalled".
 - B. **Remove and Salvage:** Detach items from existing construction and deliver them to the Owner as described in the scope of the Work.
 - C. **Remove and Reinstall:** Detach items from existing construction, prepare them for reuse, and reinstall where indicated.
 - D. **Existing to Remain:** Existing items of construction that are not to be removed and that are not otherwise indicated to be "Removed", "Removed and Salvage", or "Removed and Reinstall".
 - E. **RFCI:** Resilient Floor Coverings Institute
 - F. **EH&S:** Environmental Health and Safety Department of the University of Florida.
 - G. **Deconstruction:** Disassembly of building and components for the purpose of recovering materials
- 1.5 **Materials Ownership:** Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner that may be encountered during selective demolition remain the Owner's property. Carefully remove and salvage each such item or object in a manner so as to prevent damage and deliver promptly to the Owner. Coordinate with the Owner's representative, who will establish special procedures for removal and salvage.
- 1.6 **Submittals:**

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- A. Comply with Section 01340, Submittals and Substitutions.
- B. **Qualification Data:** Provide data from the Demolition Subcontractor.
- C. **Schedule of Demolition Activities.** Indicate the following:
 - 1. Coordinate with Solid Waste Management Plan. Identify materials to be recycled. Identify materials to be salvaged for reuse on and off site.
 - 2. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure the Owner's on-site operations are uninterrupted.
 - 3. **Interruption of Utility Services:** Comply with Section 01016, Utility Outages.
 - 4. Coordination for shutoff, capping and continuation of utility services.
 - 5. Any required use of elevator and stairs.
 - 6. Locations of proposed dust- and noise-control temporary partitions, means of egress and protection requirements for non-construction personnel.
 - 7. Coordination of the Owner's continuing occupancy of portions of existing building and of the Owner's partial occupancy of completed work.
 - 8. Means of protection for items to remain and items in path of waste removal from the building.
- C. **Inventory:** After selective demolition is complete, submit a list of items that have been removed, recycled and salvaged.
- D. **Pre-demolition:** Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be construed as damage caused by selective demolition operations.
- E. **Landfill Records:** Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes. Indicate receipt of materials to be recycled and reclaimed.

1.7 Quality Assurance:

- A. **Demolition Firm Qualifications:** An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. **Refrigerant Recovery Technician Qualifications:** Certified by an EPA-approved certification program.
- C. **Regulatory Requirements:** Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of Authorities Having Jurisdiction.
- D. **Standards:** Comply with ANSI A10.6, NFPA 241 and USGBC.
- E. **Pre-demolition Conference:** Conduct the conference at the Project site to comply with requirements in Section 1201, Pre-construction Conference. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of the existing structure.
 - 3. Review and finalize the selective demolition schedule and verify availability of materials, demolition personnel, equipment and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.
- F. **Waste Management:** Handle materials as specified in Section 01351- Construction Waste Management.

1.8 Project Conditions:

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- A. The Owner will occupy portions of the building immediately adjacent to the selective demolition area. Conduct selective demolition so that the Owner's operations will not be disrupted. Comply with the requirements specified in Section 01010, Summary of the Work.
- B. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner as far as practical.
- C. Notify the Architect of any discrepancies between the existing conditions and the Drawings before proceeding with selective demolition.
- D. **Hazardous Materials:** It is unknown to what extent potentially hazardous materials will be encountered in the Work, if at all.
 - 1. If materials are suspected of containing hazardous materials are encountered, do not disturb the material and immediately notify the Architect and the Owner.
 - 2. Hazardous materials may be present in the existing construction. A report on the presence of hazardous materials is on file with the Owner for review and use. Examine the report to become aware of locations where hazardous materials may be present.
 - 3. Hazardous material remediation is specified elsewhere in the Owner-supplied contract documents. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- G. Storage or sale of removed items or materials on-site is not permitted.
- H. **Utility Service:** Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations. Maintain all fire protection devices and equipment in service during the selective demolition operation.

- 1.9 **Existing Warranties:** Remove, replace, patch and repair materials and surfaces cut or damaged during selective demolition by methods and with materials so that existing warranties are maintained.

PART 2 - PRODUCTS - Not used

PART 3 - EXECUTION

3.1 **Examination:**

- A. Verify that utilities have been disconnected and capped prior to their demolition.
- B. Survey existing conditions and correlate with requirements indicated to determine the extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, plumbing or structural elements conflict with intended function and design are encountered investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect and the Owner's representative.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 **Utility Services and Mechanical/Electrical Systems:**

- A. **Existing Services/Systems:** Maintain services and systems indicated to remain and protect them against damage during the selective demolition operation. Comply with Section 01016, Utility Outages.

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- B. **Service/System Requirements:** Locate, identify, disconnect and seal or cap off indicated utility services and mechanical or electrical systems serving the areas to be selectively demolished.
1. The Owner will arrange to shut off indicated services or systems based upon the approval of the Utility Outage Request.
 2. If services or systems are required to be removed, relocated or abandoned, before proceeding with selective demolition provide temporary services or systems that bypass the area of selective demolition and that can maintain continuity of services or systems to other parts of the building.
 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit after bypassing.
 4. Where an entire wall or partition is to be removed, existing services or systems may be removed with the removal of the wall.

3.3 Preparation:

- A. **Site Access and Temporary Controls:** Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways and other adjacent occupied facilities. Comply with Section 01500, Temporary Facilities and Controls.
- B. **Temporary Facilities:** Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent building and facilities to remain.
1. Provide protection to ensure safe passage of people around the selective demolition area and to and from the occupied portions of the building.
 2. Provide temporary weather protection, during the interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior area.
 3. Protect walls, ceilings, floors and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating and cooling as specified in Section 01500, Temporary Facilities and Controls.
- C. **Temporary Shoring:** Provide and maintain shoring, bracing and structural supports as required to preserve stability and prevent movement, settlement or collapse of construction and finishes to remain; and to prevent unexpected or uncontrolled movement or collapse of construction being demolished. Strengthen or add new supports when required during the progress of selective demolition.

3.4 Selective Demolition, General:

- A. In general, demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring

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existing finished surfaces.

4. Comply with the UF Hot Work Policy by EH&S (UFEHS-SAFE1) when applicable. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe chases, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors or framing.
 9. Dispose of demolished items and materials promptly.
- B. **Removed and Salvaged Items:**
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to the Owner.
 4. Transport items to the Owner's storage area on-site.
 5. Protect items from damage during transport and storage.
- C. **Removed and Reinstalled Items:**
1. Clean and repair items to functional condition adequate for intended use. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, support and miscellaneous materials necessary to make item functional for use indicated.
- D. **Existing Items to Remain:** Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Owner's representative, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 Selective Demolition Procedures for Specific Materials:

- A. **Concrete:** Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using a power-driven saw, and then remove concrete between saw cuts.
- B. **Masonry:** Demolish in small sections. Cut masonry at junctures with construction to remain, using a power-driven saw, then remove masonry between saw cuts. If brick masonry is needed to in-fill repair locations, cut masonry along mortar joints and remove brick whole. Clean mortar from brick to be re-used with a power saw.
- C. **Concrete Slab-on-grade:** Saw-cut the perimeter of the area to be demolished, then break up and remove in sections.
- D. **Roofing:** Remove no more existing roofing than can be covered in one day by new roofing and so that the building interior remains watertight and weathertight. Refer to Division 7 for new roofing requirements, if applicable.
 1. Remove existing roof membrane, flashings, copings and roof accessories.
 2. Remove existing roofing system down to the substrate.

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3.6 Environmental Procedures:

- A. Temporary Ventilation: Provide temporary ventilation as specified in Section 01352- Indoor Air Quality (IAQ) Management, and as follows:
 - 1. Vacuum old carpets prior to removal using a certified Carpet and Rug Institute (CRI) Green Label vacuum cleaner. Vacuum floor immediately after old carpet is removed.

3.7 Disposal of Demolished Materials:

- A. **General:** Except for items or materials indicated to be reused, salvaged, reinstalled or otherwise indicated to remain the Owner's property, remove demolished materials from the Project site and legally dispose of them in an EPA-approved landfill as indicated on the contractor's Waste Management Plan.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of the building by chute, hoist or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 01736, Construction Waste Management and Disposal.
- B. **Burning:** Do not burn demolished materials.
- C. **Disposal:** Transport demolished materials and dispose in EPA-approved landfill. Owner's property shall not be used to dispose of waste material of any kind.

- 3.8 **Cleaning:** Clean adjacent structures and improvements of dust, dirt and debris caused by selective demolition operations. Return adjacent areas to the condition existing before demolition began.

END OF SECTION 01732

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Work includes, but is not limited to the following: Structural elements including slabs, tie beams, masonry grout work, sills, foundations, embedded items, sidewalks and supervision of those items placed in or through the concrete by other trades.
- 1.4 **Quality Assurance:**
- A. **References:**
1. American Concrete Institute (ACI):
 - a. ACI 211: Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
 - b. ACI 214: Recommended Practice for Evaluation of Strength Test Results of Concrete.
 - c. ACI 301: Specifications for Structural Concrete for Buildings.
 - d. ACI 302: Guide for Concrete Floor and Slab Construction.
 - e. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - f. ACI 305: Hot Weather Concreting.
 - g. ACI 306: Cold Weather Concreting.
 - h. ACI 315: Details and Detailing of Concrete Reinforcement.
 - i. ACI 318: Building Code Requirements for Reinforced Concrete.
 - j. ACI 347: Recommended Practice for Concrete Formwork.
 2. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
 3. American Society for Testing Materials (ASTM). All ASTM Standards shall apply where appropriate.
 4. American Welding Society (AWS).
 - a. AWS D1.1 - Structural Welding Code.
 - b. AWS D1.4 - Structural Welding Code and Reinforcing Steel.
 5. American Institute of Steel Construction (AISC) Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

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- B. **Workmanship:** The Contractor shall furnish a full-time qualified foreman to oversee and direct the construction of all formwork, reinforcing steel placement, and concrete placement. The Contractor shall be responsible for correction of all work which does not conform to specified requirements, including strength, tolerances and finish. Deficiencies shall be corrected as directed by the Architect and as called for herein, at no cost to the Owner.
- C. **Concrete Testing Service:** The Contractor shall employ a qualified independent Testing Laboratory, approved by the Architect, to perform material evaluation tests, quality control during construction, and to design the concrete mixes, as specified in Section 01410. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during the progress of the work. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense.
- D. **Tests for Concrete Materials:**
 - 1. Regular Weight Aggregate - ASTM C33.
 - 2. Portland Cement - ASTM C150.
- E. Sources of materials must remain unchanged during the course of the work; any variation in materials will require retesting.
- F. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing, when acceptable to the Architect, provided the proposed materials have a satisfactory service record and have been tested within the past year and such previous tests have met the specified requirements. Certificates of compliance for each material must be signed by the Contractor and supplier.
- G. **Advance Mix Design:** ASTM C192; each class of concrete required for the job shall be designed by the Testing Laboratory to determine the proper proportions of ingredients to insure concrete of the desired strength, workability and durability. The maximum permissible water/cement ratio, based on a five-inch slump shall be such as to produce a laboratory strength at least 15% greater than the strengths specified. Advance mix designs shall be submitted prior to the placing of any concrete on the job. Regardless of the recommendations of the Testing Laboratory, it shall be the responsibility of the Contractor to furnish the strength and quality of concrete specified. Ultimate strength has been used on this project.
- H. **Quality Control Tests During Construction:** Concrete shall be sampled and tested for adequacy of the design for strength, as a basis for acceptance of the concrete and for shore removal. Test cylinders shall be made, stored and tested by the Contractor's Testing Laboratory. Special provisions shall be furnished to protect the test cylinders while on the job site. Handle and store carefully prior to testing. Concrete shall be sampled and tested as follows:
 - 1. **Acceptance Test Specimen (ASTM C31):** One set of **four (4)** standard test cylinders for each compressive strength test. Mold and store for laboratory cured test specimens.
 - 2. **Field-Stored Test Specimens (ASTM C31):** One set of **four (4)** standard test cylinders of shored concrete stored on job site, until tests are required, as

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nearly as possible under the same conditions as in-place concrete from which cylinders were taken.

3. **Compressive Strength Tests (ASTM C39):** One set for each 30 cubic yards or fraction thereof, for each class of concrete, placed in any one day or for each 2,400 square feet of surface area placed, whichever is less. One set for each 100 lineal feet of footing or one set per truck load. For acceptance tests, break 1 cylinder at 7 days and 2 at 28 days using average strength of the two and with one held in reserve. Field stored cylinders shall be taken in same manner as acceptance cylinders, except they shall be taken only from those portions of the structure which are shored or braced. To check time for removing shores, break one cylinder at a time until required strength is reached. When the strength of field stored cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
 4. **Tests of In-Place Concrete:** The Testing Laboratory shall make additional tests of in-place concrete when results indicate to the Architect that specified concrete strengths or other characteristics have not been met. Tests may consist of cored cylinders complying with ASTM C42, or, if these tests are not conclusive, by load test performed in accordance with Chapter 20 of ACI Standard 318-88. The cost of all such tests shall be at Contractor's expense.
 5. **Reports:** Report all test results to the Owner, Structural Engineer, Contractor and Architect immediately after tests are made. Report tests of materials and advance concrete mix designs before job concrete work is started. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of Contractor, name of supplier, truck number, name of testing service, concrete type and class, location of concrete batch in structure, design compressive strengths at 28 days, compressive breaking strength, type of break for both 7-day and 28-day tests, entrained air content, slump, air temperature, weather, and any water added after leaving the plant.
- 1.5 **Submittals:**
- A. **Manufacturer's Data:** For information only, submit two (2) copies of the manufacturer's data with application and installation instructions for all proprietary materials and items relative to the concrete work.
 - B. **Reinforcing Steel Shop Drawings: *Submit complete Shop Drawings of fabrication and placement of all reinforcing.*** Include bar schedules, stirrup spacing and arrangement and concrete cover. Provide full information for placement without reference to design drawings. Show all walls in elevation at a scale of not less than 1/4" = 1'-0". Show all openings which interrupt reinforcing, including special reinforcing. Coordinate openings with Plumbing, HVAC, and Electrical Contractors. Show all areas fully. Do not use "similar" or "opposite hand" notations. Approval of Shop Drawings does not constitute authorization to vary from Contract Drawings. All placement work must be checked against the Contract Drawings, and details shall be checked by the Contractor and show the Contractor's approval and the initials of the checker before they are submitted to the Architect for approval. If required dimensions or necessary details are not clearly shown on the

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Contract Drawings, the Contractor shall circle and question them on the Working Plans. These dimensions and details will be checked or furnished by the Architect.

PART 2 - PRODUCTS

2.1 Concrete Materials:

- A. **Cement:** Portland Cement - ASTM C150, Type I, unless otherwise acceptable to the Architect.
- B. **Coarse Stone Aggregate:** Crushed stone, rock or gravel meeting requirements of ASTM C33 and graded in accordance with Table II as follows:
 - 1. All Concrete - 57.
 - 2. All aggregate for exposed concrete shall be from the same source.
- C. **Fine Aggregate:** Clean, sharp silica or quartz sand meeting all requirements of ASTM C33 and having a fineness modulus between 2.3 and 3.0.
- D. **Water:** Clean, fresh, potable.
- E. **Air-Entraining Admixture:** ASTM C260.
- F. **Water-Reducing Admixture:** ASTM C494, Type A, containing no set-accelerating or set-retarding compounds, chlorides, fluorides or nitrates.
- G. **Set-Control Admixtures:** ASTM C494, Type D. Use retarding admixture in all horizontal pours when air temperature is above 80°F. Use sufficient amount to retard the initial set by not more than one hour.
- H. **Calcium Chloride:** Do *not* use calcium chloride in concrete.
- I. **General Requirements:** When any specified admixture is used in the concrete, the compressive strength, bond strength and flexural strength shall not be less than that of the specified concrete strengths without admixtures. Volume change of concrete shall not be more with admixtures than without admixtures.

2.2 Related Materials:

- A. **Preformed Expansion Joint Fillers:** Closed cell synthetic foam of 4" depth and 1/4" thickness or as shown on the Drawings. "Ceramar" as manufactured by W.R. Meadows, Inc. or an approved equal. Where joints are to be sealed or caulked, hold joint filler down, or score down to proper depths below concrete surface to allow for sealant, (refer to sealant manufacturer's recommendations). Bond one side to existing concrete surface before placing adjacent concrete to prevent floating. If, at the time sealants are to be applied to horizontal joints, the concrete has separated from the joint filler, furnish crack-sealing acrylic or latex caulking, as approved by the sealant supplier, to seal such cracks.
- B. **Joint Sealer:** See Section 07920, Sealants and Caulking, of these Specifications.
- C. **Membrane-Forming Curing Compound:** ASTM C309, Type I. Compound shall contain fugitive dye. Use in strict accordance with manufacturer's printed instructions. Do not use on any areas having materials or finishes bonded to them, unless specifically recommended in writing by the manufacturer. Apply at the rate of one gallon per 200 square feet.

2.3 Concrete Inserts: Concrete inserts shall be Liebig "Safety Bolts" or an approved equal.

- 2.4 **Non-shrink Grout:** Non-shrink, non-staining, non-metallic grout. Masterflow 713 or approved equal.

PART 3 - EXECUTION

3.1 Proportions:

- A. All concrete shall be accurately proportioned by weight so as to give an ultimate compressive strength at 28 days, or at time of use, as called for on the Structural Drawings.
- B. **Proportions:** The proportions of materials shall be such as to produce concrete that can be readily puddled into the corners and angles of the forms and around the reinforcement without segregation or undue accumulation of water or laitance on the surface. Water/cement ratio shall be held to the minimum consistent with proper placing and finishing. The amount of mixing water used shall take into account the moisture, or lack of the same, in the aggregate and liquid admixtures used. ***In no case shall concrete be placed which has a slump outside the following limits:***
1. Foundations -3" to 5"
 2. Slabs and Beams -3" to 5"
 3. Walls and Columns -3" to 5"
- D. **Admixtures:**
1. Use air-entraining admixture in all concrete, unless specifically shown otherwise. Add air-entraining admixtures at the manufacturer's prescribed rate to result in concrete at the point of placement having an entrained air content within the following limits for regular stone concrete: - 4% to 6%.
 2. Use water-reducing admixtures in strict compliance with the manufacturer's directions to increase cement dispersion and to provide increased workability of low-slump concrete at Contractor's option, subject to Architect's acceptance.
 3. Use retarding admixture only as previously specified.
 4. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at time of placing. Adjust quantities as required to maintain quality control.

3.2 Concrete Mixing:

- A. Concrete shall not be placed if it has been in the mixer for more than one hour after addition of the water, nor after concrete has begun to heat-up due to hydration.
- B. Ready-Mix Concrete: Ready-mixed concrete shall be used and shall be mixed and delivered in accordance with requirements set forth in the ***Standard Specification for Ready-Mixed Concrete (ASTM C94)***, and as noted above.

3.3 Concrete Placement:

- A. Comply with ACI-304, and as herein specified. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to

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- avoid segregation due to rehandling or flowing. Clean all dowels of hardened concrete before placing new concrete.
- B. **Pre-Placement Inspection:** Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be imbedded or cast-in. Notify other trades to permit the installation of their work; cooperate with other trades in setting such work, as required. Thoroughly wet wood forms immediately before placing concrete, as required and where form coatings are not used. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Notify Architect of placing schedule at least **48 hours** in advance.
- C. **Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic, to avoid cold joints. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use vibrators designed to operate with vibratory element submerged in concrete, maintaining a speed of not less than 10,000 impulses per minute. Have available for use at least two vibrators, in case of breakdown, for each concrete placing crew. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI-309, to suit the type of concrete and project conditions. Vibration of forms and reinforcing will not be permitted, unless expressly accepted by the Architect. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix. Do not place concrete on supporting elements until the concrete previously placed in columns and walls is no longer plastic, at least 2 hours.
- D. **Placing Concrete Slabs:** Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners. Consolidate concrete in slabs by vibrating bridge screeds, roller pipe screeds, or other acceptable methods. Limit the time of vibration consolidation to prevent bringing an excess of fine aggregate to the surface. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water or cement on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations. Maintain reinforcing in the proper position during concrete placement operations. If reinforcing position is not maintained by Contractor, approved supports for all reinforcing will be required (including slabs-on-grade).

3.4 Bonding:

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- A. Roughen surfaces of set concrete at all joints, except where bonding is obtained, by use of a concrete bonding agent, and clean surfaces of laitance, coating, loose particles and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly and to not leave laitance, loose particles of aggregate, or damaged concrete at the surface.
 - 1. **New to Fresh Concrete:** Dampen, but do not saturate, the roughened and cleaned surface of set concrete, and apply a coat of neat cement grout composed of equal parts of Portland Cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply with a stiff broom or brush to a minimum thickness of 1/16". Deposit fresh concrete before cement grout has attained its initial set. In lieu of neat cement grout, bonding grout may be an approved commercial bonding agent. Apply to cleaned concrete surface in accordance with manufacturer's printed instructions.
 - 2. **New to Hardened Concrete:** Bond fresh to fully-cured or existing concrete by using epoxy-resin adhesive binder in compliance with the manufacturer's printed instructions, including safety precautions. Mix the epoxy-resin adhesive binder in the proportions recommended by the manufacturer, carefully following directions for safety of personnel. Before depositing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with epoxy-resin grout not less than 1/16th thick. Place fresh concrete while the epoxy-resin material is still tacky, without removing the in-place grout coat, and as directed by the epoxy-resin manufacturer.

3.5 Embedded Items:

- A. Set and build into the work anchorage devices, steel angles and plates, stair nosings, dovetail anchor slots, reglets, ceiling inserts and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use Setting Drawings, diagrams, instructions, and directions provided by the supplier of the items attached thereto and to other Sections of Specifications. Protect all embedded items that must be set by others.
- B. Set all bolts, anchors, grounds and inserts as required. Where structural steel shapes and other members are shown and bolted to the concrete, bolts shall be set in proper position in the forms before the concrete is placed and spaced as indicated on the Drawings. Bolts and nuts exposed to moisture conditions shall be galvanized. Where masonry abuts concrete or where concrete is faced with masonry, furnish and install galvanized, felt-filled dovetail anchor slots. Slots shall be placed as required under the Masonry Section of the Specifications and as called for on the Drawings. Masonry ties are to be furnished and installed under Section 04150, Masonry Accessories.
- C. Conduit may be placed in slabs four-and-a-half (4-1/2) inches or more in thickness, provided conduit or layers of conduit fall completely within the middle third of the slab depth and are spaced not closer than 24" on center. No conduit in slabs shall be more than one inch in diameter. Conduit or piping may extend vertically through the middle third of the width of the beam or horizontally through the middle third of a column when not exceeding 4% of the gross area of the concrete member, unless

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such conduit or pipe is galvanized iron or steel not thinner than Schedule 40 steel pipe, in which case the maximum size with fittings may be two inches. No more than one pipe may be spaced not less than three diameters apart along the longitudinal direction of the beam. Pipe or conduit over two inches in diameter shall have Schedule 40 galvanized steel sleeves, and when located closer than three feet from face of support, shall have stirrups added as recommended by the Engineer. No pipe or conduit shall interfere with the placing or functioning of the reinforcing, and shall be rigidly held in the specified positions.

3.6 **Shore and Supports:**

- A. Comply with ACI-347 for shoring and reshoring construction, and as herein specified. Provide wedges, jacks or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.
- B. Tolerances: Construct formwork to provide completed concrete surfaces complying with the tolerances specified in ACI-347, Section 2.4, after removal of forms, except that tolerances for exposed concrete and troweled finish floors shall be half of those specified in ACI-347. Where closer tolerances are required for special conditions, such closer tolerances shall govern.

- 3.7 **Removal of Forms and Shores:** A competent foreman shall be in charge of all form or shore removal, and the work shall be done without damaging the concrete. Forms shall not be dropped to the floor below. All forms shall be completely removed and all form ties shall be broken back or pushed out and filled as specified. The Contractor shall be fully responsible for removal of forms, but in no case, shall forms be removed before concrete has hardened or until members have acquired sufficient strength to support their weight and the loads therein. Stripping of beam forms shall not be done in less than seven (7) days or less than two (2) days for columns, beam sides, and building walls. Beam and slab soffits shall not be stripped until job stored test cylinders indicate a compressive strength of at least three-fourths (3/4) the design strength. Stripping time shall be counted in calendar days from the time of the last pour. Beams and slabs shall remain shored or reshored until design strength is reached. No superimposed loads will be permitted on slabs or beams during removal of shores and until the reshoring is completed. Additional reshoring shall be provided when, due to job conditions, imposed loads may exceed the design live-loads.

3.8 **Construction Joints:**

- A. Except as otherwise shown on the Drawings, the work shall be planned to provide a minimum number of construction joints consistent with good placing practices, and at a maximum distance of 20 feet in either direction. Columns shall be placed continuously to an even level of bottoms of connecting beams. Beams and girders shall be considered a part of the floor system and shall be deposited integrally therewith. Allow two-hours lapse between placing concrete in columns and placing of superimposed concrete. Give particular attention to cleaning of laitance from the top of vertical forms and to cleaning of concrete from projecting reinforcing.

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Reinforcing shall run continuous through construction joints. Provide one-and-a-half (1-1/2) inch deep keyways between walls and beams and walls and footings.

- B. **Structural Frame:** Joints shall be made by forming wooden mortise and key dams fitted around the reinforcing at such points as to least impair the strength and appearance of the structure. Secure approval of the Structural Engineer for location. Joints shall be made at the center of the span. Where an intersecting member occurs at the center of the span, or where it is otherwise impossible to locate the joint at the center of the span, the Contractor shall obtain instructions from the Structural Engineer for special provisions which will be made for shear.

- 3.9 **Expansion Joints:** Construct expansion joints where shown on the Drawings. Form joints using a half-inch wide full-depth fiberboard strip.
- 3.10 **Slab Cold Key Joints:** Construct cold key joints in concrete slabs where shown on the Drawings. Joints are to be a tongue-and-groove shaped, 24 gauge galvanized steel cold joint left permanently in the slab. Joint shall be equal to "Burke-Keyed Kold Joint". Install joint, of appropriate size, in accordance with manufacturer's recommendations.
- 3.11 **Cold Weather Concreting:** Concrete shall not be placed during periods when the air temperature is at or below 40°F, or whenever it appears to the Architect, from weather reports or otherwise, that air temperature may fall below 40°F within the twenty-four hour period next following the completion of a concrete pour without taking approved precautions. The Contractor shall take approved precautions to maintain the temperature of the concrete at not less than 70°F for three (3) days or 50°F for seven (7) days after placement. For approved procedures, see ***Recommended Practice for Cold Weather Concreting (ACI-306)***.
- 3.12 **Hot Weather Concreting:** During hot weather, use all available means to keep concrete temperature as low as is practical, but in no case, shall temperature of concrete at time of placement be higher than 90°F. At air temperatures above 80°F, use the above specified retarding agent. For approved procedures, see ***Recommended Practices for Hot Weather Concreting (ACI-305)***.

END OF SECTION 03300

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SECTION 04090

CAVITY DRAINAGE MESH

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. **Section Includes:** Masonry mat designed for airspace maintenance, mortar dropping prevention, and drainage system for masonry cavities.
 - B. **Related Sections:**
 - 1. Section 04100 - Mortar and Grout
 - 2. Section 04150 - Masonry Accessories
 - 3. Section 04210 - Brick Masonry
 - 4. Section 04220 - Concrete Masonry Units
- 1.4 **Submittals:**
- A. Submit under provisions of Section 01300, Submittals:
 - 1. Product Data: Include descriptive data, product attributes, and performance characteristics.
 - 2. Samples: Submit two (2) samples of masonry mat, 6 x 6 inches in size.
- 1.5 **Delivery, Storage and Handling:** Store materials in clean, dry, sheltered area, off ground, until used.

PART 2 - PRODUCTS

- 2.1 **Approved Manufacturers:**
- A. CavClear
P.O. Box 241
Hudson, WI 54016
(888) 994-2620, Tim Bigler
 - B. **No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.**

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2.2 Materials:

A. Masonry Mat:

1. **Product:** CavClear Masonry Mat.
2. **Description:** Fluid conducting, nonabsorbent, mold and mildew resistant polymer mesh consisting of 100 percent recycled polyester with PVC binder.
3. **Thickness:** 1-1/4 inches.
4. **Size:** 16 inches x 8 feet.

PART 3 - EXECUTION

3.1 Examination:

- A. Verify that air space depth is at least 1/4 inch greater than masonry mat thickness.
- B. Verify that weeps, wall ties, and reinforcement are properly located.
- C. Verify that flashings are properly located and intact.

3.2 Preparation:

- A. Fill voids in substrate with suitable patching compound; finish flush.
- B. Remove projecting mortar and other protrusions from substrate.
- C. Remove mortar and debris from cavity spaces, wall ties, and reinforcing.

3.3 Installation:

- A. Install masonry mat throughout the full-height of all exterior masonry cavities during construction of exterior wythe; follow manufacturer's installation instructions.
- B. Install horizontally between wall ties and joint reinforcement. Stagger end joints in adjacent rows.
- C. Use folded mat at bottom of wall, above all flashing levels, and when air space depth exceeds folded masonry mat thickness by more than 3/8 inch. Do not extend extra mat past the top of base flashing if present.
- D. Butt adjacent pieces to moderate contact. Fit to perimeter construction and penetrations without voids.

END OF SECTION 04090

SECTION 04100

MORTAR AND GROUT

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Work Included in this Section:
 - 1. Mortar for concrete unit masonry work.
 - 2. Mortar for brick masonry work.
 - 3. Grout.

PART 2 - PRODUCTS

- 2.1 **Materials:**
- A. Cementitious Materials:
 - 1. Masonry Cement shall conform to ASTM C91.
 - 2. Portland Cement: ASTM C150, Type I.
 - B. Hydrated Lime shall conform to ASTM C207.
 - C. Sand shall be clean, **White** Builder's Sand.
 - D. Fine Aggregate: Aggregate for masonry grout shall conform to requirements of ASTM C144.
 - E. Coarse Aggregate: Aggregate for masonry grout shall conform to requirements of ASTM C404.
 - F. Water shall be clean and free from deleterious amounts of alkalies, acids, or organic materials.
 - G. **Color:** Mortar color is to be **standard grey**.
- 2.2 **Mixes:**
- A. Brick veneer mortar shall conform to ASTM C270, Type N.
 - B. Concrete Masonry Unit mortar shall conform to ASTM C270, Type S.
 - C. Grout shall conform to ASTM C476, or 2,500 PSI gravel concrete.
 - 1. Fine grout shall be used in spaces less than two inches (2") in width.
 - 2. Coarse grout shall be used in spaces two to four inches (2"-4") in width.

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3. Concrete shall be used in spaces over four inches (4") in width. Concrete shall be 3,000 PSI concrete in accordance with Section 03300, Cast-in-place Concrete.
- D. Submit mix design per Section 03300, Cast-in-place Concrete.

PART 3 - EXECUTION

- 3.1 Apply mortar according to Section 04210, Brick Masonry, and according to manufacturer's suggested procedure.
- 3.2 Water shall be clean, potable water free from debris.
- 3.3 Provide inspection clean-out holes at the bottom of all cells with vertical reinforcement when high-lift grouting (over 5 ft. high) is used.
- 3.4 **Grout Testing:**
 - A. For each type of grout, prepare one set of four prism specimens for each 30 cubic yards or fraction thereof being placed each day.
 - B. Report test results in writing and in form specified under each test method to Architect and Contractor, on same day tests are made.
 - C. Tests shall be performed by an independent testing laboratory under Contractor's responsibility. Cost of those services shall be paid by the Contractor.

END OF SECTION 04100

SECTION 04150

MASONRY ACCESSORIES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Work Included this Section:
 - 1. Reinforcing for lintel blocks, bond beams, and other reinforced masonry.
 - 2. Joint Reinforcement.
 - 3. Anchors and Ties.
 - B. Related Work Specified Elsewhere:
 - 1. Cavity Drainage System: Section 04090, Cavity Drainage Mesh.
 - 2. Weeps: Section 04210, Brick Masonry.
 - 3. Galvanized Steel Lintels: Section 05120, Structural Steel.

PART 2 - PRODUCTS

- 2.1 **Rods:** Reinforcing steel for lintel blocks, bond beams, and other reinforced masonry work as required, shall conform to ASTM A615-76A, Grade 60, size as indicated or specified.
- 2.2 **Joint Reinforcement:**
- A. Code Approval: Joint reinforcement for masonry walls shall be factory-fabricated units approved by the SBCC, BOCO, or IBCO Code Organizations.
 - B. Single Wythe Reinforcement shall be manufactured by cold-drawn steel wire conforming to ASTM A82-76 Wire-Bond Series 800 or approved equal with prefab corners and tees.
- 2.3 **Anchor Ties:**
- A. **Brick Ties to Concrete Masonry Units (CMU):** Shall be equal to Hohmann & Barnard (formerly Dur-o-Wall) 270 Ladder Eye-Wire, ladder-type reinforcing with hook and eye adjustable brick tabs, with 2.0 oz of zinc per SF. Ties to be of 9-gauge galvanized steel.

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- B. **Brick Ties to Steel Columns:** Shall be screwed or Ramset to steel. Triangular ties, Series 1100, with Type II retainer, galvanized as manufactured by Wire-Bond. Wire shall be 8-gauge minimum. Provide length as required to meet requirements.
- C. **Brick Ties to Sheathing:** Shall be equal to Wire-Bond 2500 Series, 12-gauge galvanized steel. Provide lengths as required to meet requirements.
- B. **Rigid Steel Anchors at Intersections in CMU Walls:** Wire-Bond Series 3000Z with the following dimensions: 1/8" thick x 1-1/2" wide x 8" long for CMU wall intersections.

2.4 **Acceptable Products:**

- A. **Approved Manufacturers:**
 - 1. Wire-Bond
 - 2. Hohmann & Barnard (Dur-O-Wall)
 - 3. Ty-Wal
- B. No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.

PART 3 - EXECUTION

- 3.1 Place masonry reinforcement as indicated on the Drawings and directed by the Architect. Install as per *Portland Cement Association Concrete Masonry Handbook*.

END OF SECTION 04150

SECTION 04210

BRICK MASONRY

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Related Work Specified Elsewhere:**
Section 03300 - Cast-in-place Concrete.
Section 04150 - Masonry Accessories.
Section 05120 - Structural Steel.
Section 05400 - Cold-formed Metal Framing.
Section 09900 - Painting (Masonry Sealer).
- 1.4 **Job Mock-Up:**
- A. Furnish Sample Panel approximately 4 feet long by 3 feet high, showing the proposed color range, texture, mortar and workmanship. Sample panel shall show complete range of brick colors.
 - B. Do not start work until Architect has accepted sample panel.
 - C. Use panel as standard of comparison for all masonry work built of same material.
 - D. Do not destroy or move panel until work is completed and accepted by Owner.
- 1.5 **Product Delivery, Storage and Handling:**
- A. Store brick off ground to prevent contamination by mud, dust, or materials likely to cause staining or other defects.
 - B. Cover materials when necessary to protect from elements.
 - C. Protect reinforcement from elements.
- 1.6 **Job Conditions:**
- A. **Protection of Work:**
 - 1. **Wall Covering:**
 - a. During erection, cover top of wall with strong waterproof membrane at end of each day or shutdown.
 - b. Cover partially completed walls when work is not in progress.
 - c. Extend cover minimum of 24 inches down both sides.

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- d. Hold cover securely in place.
 2. **Load Application:**
 - a. Do not apply uniform floor or roof loading for at least 12 hours after building masonry columns or walls.
 - b. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.
 - B. **Staining:**
 1. Prevent grout or mortar from staining the face of masonry to be left exposed or painted:
 - a. Immediately remove grout or mortar in contact with face of such masonry.
 - b. Protect all sills, ledges and projections from dropping of mortar, protect door jambs and corners from damage during construction.
- 1.7 **Submittals:**
- A. **Samples:** Furnish not less than five (5) individual brick as samples, showing extreme variations in color and texture.
 - B. **Test Reports:**
 1. Test reports for each type of building and facing brick are to be submitted to the Architect for approval.
 2. Testing and reports are to be completed by an independent laboratory.
 3. Test reports shall show results of ASTM C216 tests.
 - C. **Certificates:** Prior to delivery, submit to Architect certificates attesting compliance with the applicable specifications for grades, types or classes included in these specifications.

PART 2 - PRODUCTS

- 2.1 **Brick:**
- A. **Facing Brick:**
 1. Brick shall be a **wire-cut, extruded utility-size** brick.
 2. Brick shall be of Grade SW, Type FBS, in accordance with ASTM C216.
 3. Color shall be a blended earth tone range with color constant throughout the body of the bricks.
 4. Solid units used as corners in the wall shall have frogs or similar indentions acceptable to, and approved by, the Architect.
 5. **Approved Bricks: "Brown Wirecut" by Meridian.**
 6. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***
 7. Any manufacturer desiring to be approved must present strap samples indicating full standard range in brick colors, in size specified, and test data that indicates the proposed brick conforms to the details of these specifications.
 - B. **Mortar Color:** standard grey using **white** builder's sand.
 - C. **Weeps:** Cotton or nylon rope (3/8") diameter by nominal 6" length. Do **not** form weeps by raking or omitting mortar from head joints. Weep rope shall not protrude

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more than 1/4" from face of brick, and shall extend to the rear of the head joint and terminate in the cavity.

- D. **Brick Ties:** See Section 04150, Masonry Accessories.
- E. No more than 5% of brick in any one area shall be chipped or out of square.

PART 3 - EXECUTION

3.1 **Construction Tolerances:** Exceeding these construction tolerances shall be grounds for rejection of work. The Architect shall be the sole arbiter of whether work meets tolerances or is acceptable. Work deemed to exceed construction tolerance shall be removed and reconstructed at the Contractor's expense.

- A. Maximum variation from plumb in vertical lines and surfaces of columns, walls and edges (arrises):
 - 1. 1/4 in. in 10 ft.
 - 2. 3/8 in. in a story height not to exceed 20 ft.
 - 3. 1/2 in. in 40 ft. or more.
- B. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:
 - 1. 1/4 in. in any story or 20 ft. maximum.
 - 2. 1/2 in. in 40 ft. or more.
- C. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - 1. 1/4 in. in any bay or 20 ft.
 - 2. 1/2 in. in 40 ft. or more.
- D. Maximum variation from plan location of related portions of columns, walls and partitions:
 - 1. 1/2 in. in any bay or 20 ft.
 - 2. 3/4 in. in 40 ft. or more.
- E. Maximum variation in cross-sectional dimensions of columns and thicknesses of walls from dimensions shown on drawings:
 - 1. Minus 1/4 in.
 - 2. Plus 1/2 in.

3.2 Preparation:

- A. **Wetting Brick:** Fully spray down cubes of brick with clean potable water several hours before laying brick.
- B. **Cleaning Reinforcement:** Before being placed, remove loose rust and other coatings from reinforcement.

3.3 General Erection Requirements:

- A. **Pattern Bond:**
 - 1. Lay exposed masonry in a 1/3 running bond, or as indicated on the Drawings. Rowlock and other decorative courses shall be as shown on the Drawings.
 - 2. Bond unexposed masonry units in a wythe by lapping at least 2 inches.
- B. **Joining of Work:**

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1. Remove loose brick and mortar where fresh masonry joins partially-set masonry.
 2. Clean and lightly wet exposed surface of set masonry.
 3. Stop work on a wall by laying each successive course a half-unit shorter than the one below.
 4. Tooothing is not permitted.
 5. All head joints shall be completely full of mortar.
- C. **Tooling and Tuck Pointing:**
1. **Tooling:**
 - a. Tool exposed joints, when "thumb-print" hard, with a rod-type jointer slightly larger than the width of the joint.
 2. **Tuck Pointing:**
 - a. Fill solidly with pointing mortar.
- D. **Flashing:**
1. Clean surface of masonry, smooth and free from projections which puncture flashing material.
 - a. Place through-wall flashing on bed of mortar.
 - b. Cover flashing with mortar.
- E. **Weep Holes:**
1. Provide weep holes in head joints in first course immediately above grout cavity filler and above finished grade by:
 - a. Install weep rope at bottom so that approximately 1/4" of length is exposed beyond exterior face of wall.
 2. Maximum Spacing: 32" o.c.
 3. Keep weep holes and areas above grouting free of mortar dropping.
- F. **Sealant Recess:**
1. Leave joints around outside perimeters of exterior doors, window frames and where a dissimilar material joins the masonry.
 - a. Depth: 1".
 - b. Width: 3/8" maximum.
- G. **Vertical Expansion Joints:**
1. Keep clean from all mortar and debris.
 2. Locate vertical expansion joints as indicated on the plans. In areas where conflicts occur the Architect shall determine the location of expansion joints.
 3. Joints shall consist of a backer rod and sealant and shall be 3/8" wide maximum.
- H. **Cutting Brick:**
1. Cut brick with motor-driven saw. **Hand-chipping with trowel is not acceptable.**
- I. **Mortar Joint Thickness:**
1. Lay all brick with 3/8" bed and head joints.
- J. **Sealing Brick:**
1. Seal brick with specified clear sealer. See Section 09900, Painting.

3.4 Non-Reinforced Brick Masonry:

A. Procedures:

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1. Mix bricks from a minimum of three cubes, to ensure an acceptable variation of color range.
 2. Lay brick plumb and true to lines.
 3. Lay with completely filled mortar joints.
 4. Do not furrow bed joints.
 5. Butter ends of brick with sufficient mortar to fill head joints.
 6. Rock closures into place with head joints thrown against adjacent brick in place.
 7. Do not pound corners and jambs to fit stretcher units after they are set in position. Where an adjustment must be made after mortar has started to harden, remove mortar and replace with fresh mortar.
- B. **Cavity Walls:**
1. As work progresses, trowel protruding mortar fins in cavity flat onto inner face of wythe.
- C. Where combination horizontal joint reinforcing and brick tie assembly does not occur, attach brick veneer to backing with metal veneer ties.
1. Use one tie for each 2-1/2 square feet of wall area, minimum.
 2. Maximum space between adjacent ties:
 - a. Vertically: 16 inches.
 - b. Horizontally: 16 inches.
 3. Embed ties at least 2 inches in horizontal joint of facing.
 4. Provide additional ties at openings.
 - a. Maximum spacing around perimeter: 32 inches.
 - b. Install ties within 12 inches of opening continuous around perimeter of opening.

3.5 **Cleaning:**

- A. Cut out any defective joints or holes in exposed masonry and repoint with mortar.
- B. **Clean all exposed masonry:**
1. Apply cleaning agent to sample wall area of 20 square feet in location acceptable to the Architect.
 2. **Do not proceed with cleaning until sample area is approved by Architect.**
 3. Clean initially with stiff brushes and water.
 4. When cleaning agent is required:
 - a. Follow brick manufacturer's recommendations.
 - b. Thoroughly wet surface of masonry on which no green efflorescence appears.
 - c. Scrub with cleaning agent recommended by brick manufacturer.
 - d. Immediately rinse with clear water.
 - e. Do small sections at a time.
 - f. Work from top to bottom.
 - g. Protect all sash, metal lintels and other corrodible parts when masonry is cleaned with acid solution.
 - h. Remove efflorescence in accordance with brick manufacturer's recommendations.

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END OF SECTION 04210

SECTION 04220

STRUCTURAL CONCRETE MASONRY UNITS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Work Included in this Section:
 - 1. Concrete masonry unit walls and partitions.
 - 2. Concrete masonry unit lintels.
 - B. Related Work Specified Elsewhere:
 - 1. Mortar and Grout: Section 04100.
 - 2. Masonry Accessories: Section 04150.
 - 3. Brick Masonry: Section 04210.
 - 4. Concrete Work: Section 03300.
- 1.4 **Submittals:**
- A. Submit manufacturer's product data in compliance with Section 01300, Submittals. It should include nominal dimensions of block, special shapes, and appearance.
 - B. Submit manufacturer's testing data of CMU for material strength. Data should include as a minimum the net and gross area compressive strength for each size and style of block to be used for this project. Testing reports shall not be more than two (2) years old and with block fabricated by the manufacturing plant supplying product to this project. In addition, the manufacturer shall supply a letter of certification stating that the units supplied for this project conform to the required compressive strength. Tests shall conform to ASTM C140.
 - C. All testing shall be at the manufacturer's expense.
- 1.5 **Job Conditions:** Do not lay masonry when the temperature is below 40 degrees F. Keep walls dry by covering at the end of each day or during shut downs. Covering shall overhang at least 2'-0" on each side of the wall and shall be securely anchored.
- 1.6 **Quality Assurance:**

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- A. All work shall conform to the Concrete Masonry Handbook (Latest Edition), ACI 530-92, and ACI 530.1-92, in relation to proper workmanship, layout reinforcement, and bracing of concrete masonry.
- B. Provide 4' x 8' sample wall indicating typical color, mortar joint preparation and workmanship as a quality standard for the project. To be approved by the Architect.

PART 2 - PRODUCTS

2.1 Materials:

- A. Concrete masonry units shall be of modular dimensions and special shapes or sizes as required to complete the work as indicated. Units shall be of the same appearance and shall be cured by the same process, delivered to the project site in an air-dry condition. Units shall be made with light-weight aggregate and meet or exceed the following requirements:
 - 1. Hollow Load-Bearing Concrete Masonry Units: ASTM C90, Grade N-1. Units not to exceed 90 lb./cubic foot.
 - 2. Hollow Non-Load Bearing Concrete Masonry Units: ASTM C129, Grade U-1.
 - 3. Concrete Building Brick: ASTM C55, Grade N-1.
- B. **Masonry Cleaning Agent:** Cleaning agent for exposed concrete masonry units shall be Sure Klean No. 600 detergent cleaning compound as manufactured by the Process Solvent Company, Inc., or approved substitution.

2.2 Mixes:

- A. Aggregate: Blending or screening which will impair the insulation value of the unit is prohibited.
- B. Concrete: Concrete for lintel blocks, bond beams, and other reinforced masonry work shall be 3000 PSI concrete as specified in Section 03300, CAST-IN-PLACE, except that pea gravel aggregate shall be used.
- C. Masonry Cleaning Agent: One part agent to six-to-eight parts potable water.

PART 3 - EXECUTION

- 3.1 **Inspection:** Masonry installer must examine the areas and conditions under which masonry is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the masonry installer.
- 3.2 **Mortar Mix:** Mix ingredients for a minimum of 5 minutes in a mechanical batch mixer using potable water. Do not use mortar which has begun to set or which is over 2-1/2 hours old. **Do not use calcium chloride or admixtures to lower the freezing point.**
- 3.3 **Layout:** Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to properly locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half size units at corners, jambs and wherever possible at other locations.

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- 3.4 **Laying Masonry:** Lay-up walls plumb and true with courses level and accurately spaced. Lay dry units with full mortar coverage on horizontal and vertical face shell; also bed webs on starting courses. Remove masonry disturbed after laying; clean and relay in fresh mortar. If work is topped before completion, step down ½ unit in each course. Tothing is not permitted.
- 3.5 **Bond Pattern:** Standard running bond with vertical joint in each course centered on units in courses above and below.
- 3.6 **Joints:**
- A. All joints shall be struck flush, 3/8".
 - B. Rake out joints for application of control joint caulk where indicated on the Drawings.
- 3.7 **Horizontal Joint Reinforcing:** Provide continuous horizontal joint reinforcing as shown or specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 3/4" on exterior side of walls and ½" at other locations. Lap reinforcement a minimum of 6" at ends. Do not bridge control and expansion joints with reinforcing except at wall openings. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions. Space continuous horizontal reinforcing at 16" o.c. vertically, and at the first and second course above and below wall opening extending joint reinforcement at least 2' beyond sides of openings.
- 3.8 **Anchoring Masonry Unit:** Anchor masonry to structural members with metal ties embedded in masonry joints and secured to structure. Provide anchors with flexible tie sections. Space anchors not more than 16" o.c. vertically and 24" o.c. horizontally.
- 3.9 **Lintels:** Provide masonry lintels where shown and wherever openings of more than 1'-0" are shown without structural steel or other supporting lintels. Thoroughly cure pre-cast lintels before handling and installation. Temporarily support formed-in place lintels. Provide one #5 reinforcing bar for each 4" of wall thickness. Provide minimum bearing at each jamb, of 6" for openings less than 6'-0" wide, and 8" for wider openings. Fill side cells solid with grout. Coordinate lintels with Structural Drawings. Structural Drawings shall take precedence unless no specific lintel is shown.
- 3.10 **Control and Expansion Joints:** Provide vertical control and isolation joints in masonry where shown. Build-in related masonry accessory items as the masonry work progresses. Rake out mortar in preparation for application of caulking and sealant.
- 3.11 **Repair:** Remove and replace with new units any chipped, broken, stained or damaged units. Install new units in fresh mortar or grout.
- 3.12 **Pointing:** During the tooling of joints, enlarge any voids and completely fill with mortar. Point up all joints at corners, openings, and adjacent work to provide neat, uniform appearance, properly prepared for application of caulking sealant.

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3.13 **Cleaning:** Clean exposed CMU masonry by dry brushing at the end of each days work and after final pointing to remove mortar spots and droppings.

3.14 **Disposal:** Dispose of all debris material in appropriate containers.

END OF SECTION 04220

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
 - A. Work includes, but is not limited to, the following: Furnish and install all structural steel beams, lintels, columns, purlins, anchor bolts, temporary and permanent bracing, template designs of specified connections, etc., and supervision and testing of these items.
 - B. Related Work Specified Elsewhere:
 - 1. Steel Joists - Section 05210.
 - 2. Metal Decking - Section 05300.
- 1.4 **Applicable Codes and Standards:** Conform to applicable requirements of the following (Latest Editions):

Organization	Title
American Institute of Steel Construction	Code of Standard Practice for Steel Buildings and Bridges. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design - 1989. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, 1978.
American Welding Society	Structural Welding Code, D-1.1.
Research Council on Structural Connections of the Engineering	Specification for Structural Joints Using ASTM-A325 or A-490 Foundation Bolts

- 1.5 **Submittals:**
 - A. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

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- B. **Shop Drawings:** Contractor shall prepare complete Shop Drawings of a uniform size for the entire work, showing loose and shop assembled pieces, and all shop and field connections. The principle lines of all connecting members shall be indicated in details of all pieces. All Shop Drawings shall be prepared under the supervision of a Professional Engineer registered in the State of Florida and shall be duly sealed and signed by him.
 - 1. All Shop Drawings shall be checked by the Contractor and signed before forwarding copies to the Architect for approval.
 - 2. Contractor's Erection Drawings shall be complete with all necessary elevations and sections to definitely indicate the composition of complete members and their relative position vertically and horizontally from floor lines and column centers.
 - 3. Shop and Erection Drawings shall be submitted to and approved by the Architect before any work in the shop is commenced. The Erection Drawings submitted shall contain marks of all pieces detailed to date of submission.
 - 4. Immediately upon receipt of Engineer's approval, the Contractor shall furnish complete sets of approved Shop and Erection Drawings to the Shop Inspector. Also, the various trades whose work pertains to this work and is affected thereby.
 - 5. The Engineer's signature on the Shop Drawings is to be considered as an approval only for the general design of details and shall not relieve the Contractor from the necessity of correcting, without charge, all details on the Drawings and in the completed work which may be found thereafter to be deficient in strength or otherwise faulty, nor does the Architect's approval relieve the Contractor from the responsibility of having all figured dimensions shown correctly on the Shop Drawings.
- C. **Connection Designs:** See Section 3.5,C.
- D. **Templates:** Furnish for setting anchors and anchor bolts together with instructions.
- E. **Reports:** Upon request of Architect, certified copy of mill reports covering physical and chemical properties of steel supplied.
- F. **Erection Procedure:** Accompany Shop Drawings with description of detailed procedure, including sequence of erection and temporary staying and bracing.
- G. **Certificate:** Upon request of Architect, manufacturer's affidavit that materials meet requirements. Provide mill certification for all high strength fasteners used.

1.6 Quality Assurance:

- A. **Qualifications:**
 - 1. **Fabricator:** Shall possess a certificate for Category I as certified by American Institute of Steel Construction (AISC), and shall have five (5) years experience in fabricating structural steel and having facilities and personnel adequate to have produced three (3) projects of similar scope. However, Project Structural Engineer may waive this requirement at his sole discretion upon reviewing fabricator's resume of qualifications.
 - 2. **Erector:** Five (5) years experience in erecting structural steel and having equipment and personnel who have erected three (3) projects of similar size and complexity.

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3. **Welders (both shop and field):** Possess a certificate of competency issued by an Independent Testing Laboratory indicating qualification within the previous two (2) years by tests prescribed by AWS for the type of work to be performed.
- B. **Quality Control:**
1. Refer to AISC, Section 1.26.
 2. **Inspection:** The Contractor shall furnish, at his expense, an approved qualified Independent Testing Laboratory to provide inspection of all connections, and to verify conformance to applicable Codes and Standards.
 - a. **Shop Inspections:** Periodic and timely inspections of steel fabricator's facilities shall include, but not be limited to, the following;
 - (1) Qualification of Welders.
 - (2) Welding Procedures.
 - (3) Proper cleaning of steel prior to applying shop paint.
 - (4) Conformance to Shop Drawings concerning member sizes, connection assemblies, fabrication procedures.
 - b. **Field Inspections:** Periodic, timely inspections of steel erection at job site shall be made by Independent Testing Laboratory as follows:
 - (1) Establish and check the bolt torque calibration for impact wrenches, in conformance with referenced standards. This shall be done at least once per week during steel erection.
 - (2) Inspection of field welds, welder qualifications and procedures.
 - (3) Inspection of field connections to verify conformance with design and applicable Codes. This shall be done prior to being covered up. Minimum once per week during erection.
- 1.7 **Delivery, Storage and Handling:**
- A. **Storage:** Store materials on platforms, skids or other supports above the ground and so position as to minimize water-holding pockets. Keep free from dirt, grease and other foreign matter, and protect from corrosion.
 - B. **Handling:** Exercise care to maintain members in undamaged condition. Handle and temporarily brace members in such a manner as to prevent damage to work or creation of hazards to workmen or public. During erection, tie or brace the building frame to resist erection and wind forces.

PART 2 - PRODUCTS

2.1 Structural Steel:

- A. **Hot-rolled Shapes:** ASTM A36.
- B. **Tubular Sections:** ASTM A500, Grade B, $F_y = 46$ k.s.i.

2.2 Welding Electrodes:

- A. **Shielded Metal Arc:** ASWS A5.1.
- B. **Submerged Arc:** AWS A5.17.

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- C. Acceptable: Lincoln, Chemetron.
- 2.3 **Bolts and Nuts:** Length sufficient to extend entirely through, but not more than, quarter (1/4) inch beyond nuts. Bolts which transmit shear shall be threaded to such length that no more than one thread will be within the grip of the metal.
- A. **High Strength Bolts:** ASTM A-325. Bearing Type.
 - B. **Machine Bolts:** ASTM A-307 and ANSI #A18.2. Hex head unfinished bolts with hex nuts.
 - C. **Concrete Inserts:** "Liebig" safety bolts, approved equal, or as specified on Drawing.
- 2.4 **Washers:**
- A. **Plain:** ANSI #B-18.22.
 - B. **Hardened:** ASTM #F-436.
- 2.5 **Paint:**
- A. **Primer:** Red or zinc oxide pigment, linseed oil vehicle. Fed. Spec. TT-P-86, Type I; TT-P-641, Type I. No lead content permitted.
 - B. **Galvanizing Repair:** 85% zinc dust content in organic resin. Military Spec. MIL-P-21035. Acceptable: Ameron "Dimetcote"; Koppers "Zinodic-O"; Prucoat "Zincprime" #300; "Z.R.C."; Southern Coatings "Galvicon".
- 2.6 **Fabrication:** Fabricate in accordance with referenced standards and approved Shop Drawings.
- A. **Connections:** Shop connections shall be standard connections developing full strength of members, except as otherwise indicated on Drawings. Mill abutting section in compression. Punch, drill, tap, and ream holes as necessary for attachment of materials of other trades. Weld shop connections; field weld only where indicated. Drill holes in base or bearing plates. Punch, drill or cut (not burn) holes at right angle to the surface of the metal and one sixteenth (1/16) inch larger than the diameter of the bolt. Clean-cut holes without torn or ragged edges. Remove outside burrs resulting from drilling or reaming.
 - B. **Correction of Work:** Where items will remain exposed to view in the finished work, misspunched holes shall be plugged, welded and ground flush; repair notches or gouges by completely filling with weld metal, using procedures appropriate to the condition. Obtain Architect's approval prior to repair procedure and repaired section.
 - C. **Fastenings:** Furnish specified bolts and nuts for anchoring steel to steel, concrete, brace rods, connections, and ties.
- 2.7 **Shop Treatments:**
- A. **Surface Preparation:** Hand-tool clean surfaces to be painted by removing oil, grease, loose mill scale and rust, and foreign matter to the degree illustrated by SSPC-Vis-1-67T for SP-2; one-half (1/2) mil profile.
 - B. **Painting:** Apply 2.5 mil thick dry film of paint, worked well into joints. Finish surface smooth and uniform without voids or runs. Permit drying before handling.

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- C. **Galvanize (items exposed to weather):** Prepare members in accordance with ASTM A-385 and apply in accordance with ASTM A-386 to deposit 1.25 oz. per sq.ft. of surface per ASTM A-123. Finished surfaces shall be free of bare spots, stalactites, and inclusions of flux or ash.
- D. **Marking:** Mark each piece legibly in a protected location to correspond with match marks on approved Shop Drawings.

PART - EXECUTION

- 3.1 **Condition of Preceding Work:** Before commencing erection, inspect condition of prior work where connections will be made thereto. Report to Contractor, in writing, any condition that is unacceptable. Do not commence erection until unacceptable condition has been corrected. Commencing erection will be held as acceptance of conditions.
- 3.2 **Workmanship:** Erect in accordance with AISC Manual. After assembling the various members forming a portion of the framework, align and adjust properly before fastening. Use drift pins only to bring members together in such a manner as to prevent distortion or damage to the metal. Align holes using drift pins (so bolts will not bind but may be turned readily with a wrench). Erect structural steel frame in full story tiers.
- 3.3 **Base and Bearing Plates:** Support on steel shims and double nuts and washers as required; align using wedges, and tighten nuts.
 - A. **Grouting:** Specified in Section 03300 "Cast-In-Place-Concrete".
 - B. **Trimming:** Cut wedges and shims off flush with edges of plates, and leave in place.
- 3.4 **Cutting:** Use of a cutting torch for correction of fabrication errors will not be permitted on any essential member of the structural frame. Its use will be allowed only on minor members while not under stress, and only after such use is specifically authorized by the Engineer. Do not burn filed holes, drill and ream.
- 3.5 **Connection:**
 - A. **Bolting:** Use high tensile strength bolts and nuts for field connections of primary members (columns, beams, etc.), and machine bolts and nuts for secondary members and miscellaneous steel.
 - 1. Where structural joints are made using high strength bolts, hardened washers and nuts, the materials, methods of installation, tension control, type of wrenches to be used, and inspections methods shall control. Type of wrenches to be used and inspection methods shall conform to referenced Specification.
 - 2. High strength connections shall have hardened washers at each assembly of size as specified by ASTM for size of bolt used.
 - 3. Place washer under element (nut or head) which will be turned by the power wrench.
 - 4. Insert bolts into holes so heads will be toward decking and/or finish, except in places where clearance is generous (so projection of nuts and overrun of bolts present no problem).

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5. Draw bolts and nuts tightly against members using suitable wrench, fifteen (15) inches long. While tightening nut, tap bolt head with hammer.
 6. After tightening, lock nut.
 7. Tighten high strength bolts by turning with hand wrenches followed by pneumatic impact wrenches (to obtain proper bolt tension). Control air pressure by a properly calibrated regulator. Calibrate impact wrenches as specified for size of bolts currently being placed.
 8. Torque wrenches shall not be used for erection. Turn-of-nut method may be used when performed under inspection of an approved testing laboratory.
- B. **Welded:** Field weld only where indicated. Welding procedure shall be such as to minimize distortion and stress concentration and to produce connection of required strength.
- C. **Connection Design:** Bolted and welded connections shall be designed by the fabricator in accordance with referenced Standards and Specifications.
1. Unless noted otherwise, connections shall be designed for a minimum of one-half the total uniform load capacity shown in the tables of Uniform Load Constants, Part 2 of the AISC Manual, for the given beam, span, and grade of steel specified.
 2. Connection designs shall be by a Florida Registered Professional Engineer per FDPR Rule 21H-19.001(3). Signed and sealed calculations are required and shall be submitted for Architect's records only.
- 3.6 **Field Painting:**
- A. After assembly and testing, clean unprimed areas at connections, markings, welds, and bolt free of rust and loose mill scale. Touch-up these areas, bolts and burned, scratched or abraded shop coat with specified shop paint. Touch-up galvanized surfaces, applying zinc-rich organic coating 2.5 mils thick.
 - B. Columns with baseplates below finish grade shall be field painted with a rust inhibiting paint for 30" of its length measured from the underside of the baseplate.
- 3.7 **Disposal:** Dispose of all debris material in appropriate containers.

END OF SECTION 05120

SECTION 05210

STEEL JOISTS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The design, detailing, furnishing and erecting of the open web steel joists, including all bridging, bracing or shoring required. See Drawings for additional information.
- A. Related Work Specified Elsewhere:
1. Structural Steel, Section 05120.
 2. Steel Decking, Section 05300.
- 1.4 **Quality Assurance:**
- A. Applicable Codes and Standards: Comply with provisions of the following Codes, Specifications and Standards, except where more stringent requirements are shown or specified. All Codes, Specifications and Standards referred to shall be Latest Editions:
- | | |
|------|--|
| SJI | Standard Specifications for Open Web Steel Joists, K-Series |
| AISC | Manual of Steel Construction |
| AWS | Standard Qualification Procedure - D1.1, Section #5, Parts C, D and E.
Structural Welding Code - D1.1 |
- 1.5 **Submittals:**
- A. **Shop Drawings:** Shop Drawings shall be submitted for review before fabrication is started. Shop Drawings shall show locations, spacing, sizes and types of joist, splice locations and details, anchorage, bridging details, chord and web sizes and all dimensions, including panel points. Shop Drawing review shall be for general conditions only and not for design. All Shop Drawings shall be prepared under the supervision of a Professional Engineer registered in the State of Florida and shall be duly sealed and signed by him.
1. All Shop Drawings shall be checked by the Contractor and signed before forwarding copies to the Architect for approval.

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2. Contractor's Erection Drawings shall be complete with all necessary elevations and sections to definitely indicate the composition of complete members and their relative position vertically and horizontally from floor lines and column centers.
 3. Shop and Erection Drawings shall be submitted to and approved by the Architect before any work in the shop is commenced. The Erection Drawings submitted shall contain marks of all pieces detailed to date of submission.
 4. Immediately upon receipt of Engineer's approval, the Contractor shall furnish complete sets of approved Shop and Erection Drawings to the Shop Inspector. Also, the various trades whose work pertains to this work and is affected thereby.
 5. The Engineer's signature on the Shop Drawings is to be considered as an approval only for the general design of details and shall not relieve the Contractor from the necessity of correcting, without charge, all details on the Drawings and in the completed work which may be found thereafter to be deficient in strength or otherwise faulty, nor does the Architect's approval relieve the Contractor from the responsibility of having all figured dimensions shown correctly on the Shop Drawings.
- B. **Reports:** Upon request of Architect, certified copy of mill reports covering physical and chemical properties of steel supplied.
- C. **Erection Procedure:** Accompany Shop Drawings with description of detailed procedure, including sequence of erection and temporary staying and bracing.
- D. **Certificate:** Upon request of Architect, manufacturer's affidavit that materials meet requirements. Provide mill certification for all high strength fasteners used.

PART 2 - PRODUCTS

- 2.1 **General:** Joists shall be manufactured by a member of the Steel Joist Institute, with a satisfactory record of at least 5 years in the design and manufacture of the type joists covered in this Specification. All work shall be performed in a modern fabricating shop equipped to properly handle such work.
- 2.2 **Design:** Design of joists to meet all requirements of loads, shapes and spans called for in the Structural Drawings and/or SJI, shall be the responsibility of the manufacturer. Diagrams and notes showing the loads for which the joists are designed shall be included on the manufacturer's Shop Drawings. All requirements of OSHA shall be taken into account.
- 2.3 **Welding:** Each welder used in the manufacture or erection of these joists shall have an up-to-date Certificate (issued within the past year) issued by an Independent Engineering Testing Laboratory and meeting all requirements of AWS for the type of work being performed. Copies of these certificates shall be available to the Architect upon request.
- 2.4 **Mill Certificates:** Certified mill certificates covering all material going into the fabrication of the joists shall be available to the Architect upon request.

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- 2.5 **Shop Painting:** Chip all welds and wire brush all areas to remove all material detrimental to the bonding of the paint. Paint all areas except contact surfaces with a primer equal to Steel Structures Painting Council Specification 15-68T, Type 1 (red oxide), or Fed. Spec. TT-P-636 (red oxide).

PART 3 - EXECUTION:

- 3.1 **Damaged Joists:** Joists damaged so as to affect their structural properties will be rejected. Field repairs may be allowed only by the special permission of the Engineer.
- 3.2 **Delivery and Storage:** Deliver to site in a dry, undamaged condition. Store out of contact with the ground in an upright position, under a weathertight cover permitting good circulation of air.
- 3.3 **Erection:** Erection shall be done by a qualified erector using experienced personnel and suitable and adequate equipment. Care shall be exercised at all times in handling and placing joists. All joists shall be permanently anchored and all bridging in place prior to receiving any structural load. See details on Drawings. Comply with all requirements of OSHA.
- 3.4 **Bridging:** Attach bridging anchors in walls to concrete members with drilled-in inserts. These inserts shall not be drilled until joists are seated so that camber and deflection at joists can be considered in their locations,. See details on Structural Drawings. Touch-up field welds with specified shop paint. Bridging design shall account for uplift requirements.
- 3.5 **Notification:** Notify Architect for inspection of joists installation before any decking is applied.
- 3.6 **Disposal:** Dispose of all debris material in appropriate containers.

END OF SECTION 05210

SECTION 05300

STEEL DECKING

PART 1 - GENERAL:

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Work Included: Furnish and install steel roof decks complete, in accordance with the Drawings and this Specification, including closure strips, and any required miscellaneous framing for deck as may be required.
 - B. Work in Other Sections (of these Specifications):
 - 1. Structural Steel, Section 05120.
 - 2. Steel Joists, Section 05210.
- 1.4 **References:**
- A. The following Specifications and Standards, (including amendments, addenda and errata), referred to thereafter by basic designation only, form a part of this Specification.
 - SDI Design Manual for Composite Decks, Form Decks and Roof Decks.
 - ANSI Specification for the Design of Light Gauge Cold-Formed Steel Structural Members.
 - ASTM A611 - Flat-Rolled Carbon Steel Sheets of Structural Quality.
A446 - Zinc-Coated (Galvanized) Steel Sheets of Structural Quality, Coils and Cut Length.
- 1.5 **Submittals:**
- A. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
 - B. **Shop Drawings:** Indicate type of units, gauge of steel, lengths and laps of sheets, welding patterns, any necessary fabrication and framing and filler or closure strips required. Approval of Shop Drawings shall be for general requirements only and shall not relieve the Contractor of responsibility for correctness of details and conformance with the Drawings and Specifications.

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- 1.6 **Storage and Handling:** Store and handle in a method that will not cause damage to units. Do not use deck for storage of materials or as a working platform until all units are permanently anchored in place.
 - A. Temporary loads shall be limited so that overloading will not occur.
- 1.7 **Quality Assurance:** All welding shall be done by qualified welders. Qualification and duration of qualification shall be in accordance with the requirements of AWS D1.1, Section #5, Parts C, D and E.

PART 2 - PRODUCTS:

- 2.1 **Steel:** Yield strength min. 33 ksi
- 2.2 **Finish Coating:** Galvanized ASTM A525, Class G 90.
- 2.3 **Roof Deck:** 1-1/2", 22-ga. ribbed, type "B" galvanized steel, with structural properties as shown on Structural Drawings.
- 2.4 **Floor Deck:** 28 ga. 9/16" deep galvanized Corruform. See Structural for properties.
- 2.5 **Closures:** #26 ga. steel, 1.25 oz. zinc-coating or premolded neoprene.
- 2.6 **Paint:** 85 percent zinc dust content in organic resin. Military Spec. MIL-P-21035. See Painting Section for Field Painting.
 - A. **Sidelap Fasteners:** As shown on the Drawings.
- 2.7 **Accessories:** Furnish and install all the necessary and required accessories for the roof deck.

PART 3 - PRODUCTS:

- 3.1 **General:** Erect in accordance with manufacturer's recommendations, approved Shop Drawings and as specified herein. Apply deck units only over supports which are permanently anchored and properly aligned. Deck lengths shall be a minimum of three spans in length. Join ends only over supports.
- 3.2 **Fastening:** Fasten decking to supports by electric arc welding. Weld spacing to be as shown on Structural Drawings.
- 3.3 **Field Painting:** Clean and paint all welds. See Section 2.6.
- 3.4 **Disposal:** Dispose of all debris material in appropriate containers.

END OF SECTION 05300

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Work included in this section:
- A. Miscellaneous metal work and related items necessary to complete the work as indicated on the Drawings and described in Specifications.
 - B. Miscellaneous metal items for which drawing information is fully descriptive are not necessarily named herein, but shall be provided as shown.
- 1.4 **Submittals:**
- A. **Shop Drawings:** Submit Shop Drawings to the Architect in accordance with Section 01300 for approval of all fabricated miscellaneous items. Shop Drawings shall indicate the following: fastenings, supports and anchors, patterns, clearances, and all necessary connection to work of other trades.
 - B. **Catalog Cuts:** For standard manufactured items, catalog cuts may be submitted as specified in Section 01300.

PART 2 - PRODUCTS

- 2.1 **Basic Materials:**
- A. **Structural Shapes:** ASTM A36.
 - B. **Steel Pipe:** ASTM A120-76 seamless steel pipe, standard weight, Schedule 40, black. Sizes as noted on the Drawings or herein specified.
 - C. **Cast Iron:** ASTM A 48-74, Class 30, with a minimum tensile strength of 30,000 p.s.i.
 - D. **Malleable Iron Castings:** ASTM A47-74.
 - E. **Fastenings:** Furnish anchors, bolts, nuts, washers, screws, sleeves and other devices necessary for use in connection with or incidental to securing this work into the building.
 - F. **Bolts, Nuts, and Washers:** Machine bolts. Square head unfinished bolts with square nuts. ASTM Standard Specification A307-76 and ASA A-18.

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- G. **Power-actuated Anchors:** Hardened steel drive pins of size to provide withdrawal resistance of four times the anticipated load.
- H. **Drive Anchors:** Self-drilling (for hand-hammer installation), hardened steel, tapped (for bolts or studs), flush type, electro-cadmium plated with expander plug.
Approved: Phillips "Red Head"; Fastway Fasteners, 2157 East 28th Street, Lorain, Ohio.
- I. **Paint:**
 - 1. **Bituminous Paint:** Mil. Spec. MIL-P-6883.
Approved: Barrett; Koppers.
 - 2. **Rust Inhibitive:** Red, alkyd varnish-linseed oil. Type II, Fed. Spec. TT-P-86G. Approved: Devoe; Dozier & Gay; Steelcote: Sherwin Williams; Tnemec.
No lead content permitted.

END OF SECTION 05500

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The work specified in this Section includes structural framing, sheathing and miscellaneous ground, blocking and furring, and associated framing hardware.
- 1.4 **Quality Assurance:** Factory mark each piece or each bundle of lumber and plywood with the type, grade, mill and grading agency identification. Materials shall be graded as follows:
 - A. Framing (Dimensional) Lumber: SPIB per ASTM D245.
 - B. Plywood: APA per ASTM D2555-66T.
 - C. Connectors: ASTM D1761.
 - D. Pressure Treated Wood: AWWA P-18.
- 1.5 **Product Handling and Storage:** Keep materials dry during delivery, storage and handling. Store lumber to provide air circulation and protect against direct contact with damp or wet surfaces.
- 1.6 **Coordination:** Coordinate location of furring, nailers, blocking, grounds and similar deadwood with equipment and other trades so that attached work will comply with design requirements.

PART 2 - PRODUCTS

- 2.1 **General Framing Lumber:** Framing (dimensional) lumber shall be of standard nominal size and be No.2 Southern Pine or Hem Fir, surfaced dry (19% maximum moisture content) with bending stress (F_b) of 1400 PSI minimum.
- 2.2 **Structural Framing Lumber:** For structural framing lumber 6" and wider and from 2" to 4" thick provide No.1 grade (structural joist grade, Southern Pine, $F_b=1700$ PSI minimum).

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- 2.3 **Treated Lumber:** Use a boron-based preservative conforming to AWPA P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary (ACQ) compound to treat wood. Use boron-based preservatives for above-ground applications only.
- 2.4 **Plywood:** Plywood for roof sheathing and sub-flooring shall be exterior grade (C-D). Fir plywood in thickness shown. Backing panels for electrical or telephone equipment shall be fire-retardant treated plywood, 3/4" thickness, and painted according to the Paint schedule.
- 2.5 **Miscellaneous Lumber:** Provide wood supports and attachments for other work using standard grade light framing size lumber as required, any species.
- 2.6 **Framing Hardware:** Provide proper type, size, material and finish required for each application. Comply with the following:
- A. Nails and Staples: FS-FF-N-105.
 - B. Tacks: FS-FF-N-103.
 - C. Wood Screws: FS-FF-S-111.
 - D. Bolts and Studs: FS-FF-8-575.
 - E. Washers: FS-FF-W-92.
 - F. Lag Screws or Lag Bolts: FS-FF-8-561.
 - G. Masonry Anchoring Devices for Expansion Shields, Nails and Drive Screws: FS-FF-S-325.
 - H. Toggle Bolts: FS-FF-8-588.
 - I. Bar and Strap Anchors: ASTM A575 Carbon Steel Bars.
 - J. Framing hardware shall be mill-galvanized, have Code approval, and conform to ASTM A446-75, Grade A or better.

PART 3 - EXECUTION

- 3.1 Discard material which is unsound, warped, bowed, twisted, improperly treated or seasoned, or too small to fabricate the work with a minimum of joints. At carpentry, work accurately to required levels and lines with members plumb and true. Shim with suitable materials as required for full bearing on concrete or masonry substrates.
- 3.2 Securely attach carpentry work by anchoring and fastening as shown or required by recognized standards. Provide washers under bolt heads and nuts in contact with wood. Countersink nails on exposed carpentry work and fill voids.
- 3.3 **Fasteners:**
- A. **Nails:** Use galvanized annular ring-shank nails for framing hardware and connectors, hot-dipped galvanized where exposed to exterior, mill-galvanized for other wet locations, and common wire nails elsewhere, unless otherwise noted. Use finish nails for exposed work.

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- B. Select fasteners of size that will not penetrate members where opposite side will be exposed or will receive finish materials.
- C. Make tight connections between members. Install fasteners without splitting of wood - pre-drill as required. Do not drive threaded friction type fasteners, turn into place. Tighten bolts and lag screws at installation and re-tighten as required for good connections prior to closing in or at completion of work.

3.4 **Framing:**

- A. Frame members as shown, or if not shown, comply with recommendations of the National Forest Products Association (NFPA) "Manual for House Framing".
- B. All members shall be framed, anchored, tied, and braced so that they develop the necessary strength and rigidity. Provide adequate bracing and bridging to resist wind and other lateral forces.
- C. Provide temporary bracing as required until permanent bracing is installed. Do not overstress members or joints during construction.
- D. Notching of structural members, including beams, joists, girders, load bearing studs and plates is not permitted. Boring, grooving and dapping of structural members shall be restricted to 1/6 of the entering face dimension of the member and not located to the top or bottom third of the member or in the center third of a span.
- E. Framing members shall be anchored and nailed in compliance with the recommendations of NFPA
- F. Where wood sill rests on concrete or masonry, they shall be set in double row bed of continuous sealant.

- 3.5 **Miscellaneous Wood:** Miscellaneous wood framing, blocking, nailers, grounds, sleepers, furring and shims shall be installed where indicated or required.

END OF SECTION 06100

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Provision and installation of all finish carpentry, wood paneling, wood moldings, installation of finish hardware and wood doors, specified elsewhere. Scope of work as specified and indicated on the plans
- 1.4 **Related Sections:**
 - A. Section 08211 - Wood Doors
 - B. Section 08710 - Finish Hardware
- 1.5 **Coordination:** Time delivery and installation of carpentry work to avoid delaying other trades whose work is dependent on or affected by the carpentry work, and to comply with protection and storage requirements
- 1.6 **Inspection:** Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- 1.7 **Concealed Supports:** Correlate location of furring, nailers, blocking, grounds and similar supports to that attached work will comply with design requirements.
- 1.8 **Extent of Finish Carpentry:** Furnish all items shown on the Drawings and specified herein. Finish carpentry includes all woodwork exposed to view in finished building.
- 1.9 **Quality Control:** The Quality Standards of the Architectural Woodwork Institute (AWI) Custom Grade shall apply, and by reference, are made a part of this Section.

PART 2 - PRODUCTS

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- 2.1 **Materials:** Provide materials as indicated on the Drawings. The following items may or may not appear on the Drawings.
- A. **Moisture Content:** Lumber shall be air-dried or kiln-dried. The maximum moisture content of interior finish and millwork and treated or untreated finish lumber, trim and siding shall be 15% at the time of delivery to the job site.
 - B. **Plywood:** Cabinet grade, thickness and veneer species as indicated in the plans.
 - C. **Mouldings:** Clear, Red Oak for Stained locations, White Pine or Poplar for painted applications. Sizes, finish and profiles are indicated in the Plans.
 - D. **Paneling:** Clear, Red Oak size and profiles as indicated in the plans.

PART 3 - EXECUTION

- 3.1 Finished carpentry materials and work shall be carefully protected from damage during transit, storage and after erection until Final Completion and Acceptance of the building.
- 3.2 Fasteners shall be concealed where possible. Where surface fastening is necessary, fastener heads shall be countersunk with holes plugged to match the finished surface. Finishing nails, where required, shall be well set for puttying.
- 3.3 Mitered corners shall have full surface contact throughout its length and flushness tolerance within a maximum of 0.015". Only flush or rounded edge trim shall be sanded at the joints.
- 3.4 Machine doors for hardware as required by the Hardware Schedule.

END OF SECTION 06200

SECTION 06650

SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The extent of solid polymer fabrications is shown on the Drawings and includes:
- A. Window Sills
- 1.4 **References:**
- A. Applicable Standards: Standards of the following, as referenced herein:
1. ANSI American National Standards Institute
 2. ASTM American Society for Testing and Materials
 3. NEMA National Electrical Manufacturers Association
 4. FS Federal Specifications
- 1.5 **Submittals:**
- A. **General:** Submit the following in accordance with Conditions of Contract and Section 01300.
- B. **Shop Drawings:** Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- C. **Samples:** Submit minimum 2-inch by 2-inch samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.
- D. **Product Data:** Indicate product description, fabrication information and compliance with specified performance requirements.

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- E. **Maintenance Data:** Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions, and maintenance video. Provide maintenance kit for specified finishes. Include in project close-out documents per Section 01700.

1.6 **Delivery, Storage and Handling:**

- A. Deliver no components to project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 **Quality Assurance:**

- A. **Allowable Tolerances:**
 - 1. Variation in component size: + 1/8-inch.
 - 2. Location of openings: + 1/8-inch from indicated location.

1.8 **Warranty:**

- A. Provide manufacturer's warranty against defects in materials, fabrication and installation, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for replacement or repair of material and labor for a period of ten years, beginning at Date of Substantial Completion.
- B. For fabrications with installed warranty coverage, identify by affixing manufacturer's fabrication/installation source plate.
- C. Maintain surfaces in accordance with manufacturer's care and maintenance instructions.

PART 2 - PRODUCTS

2.1 **Solid Polymer Fabrications:**

- A. **Acceptable Products:**
 - 1. E. I. du Pont de Nemours and Company, CORIAN® Surfaces.

2.2 **Material:**

- A. Cast, filled, acrylic; not coated, laminated or of composite construction, meeting ANSI Z124 1986, Type Six, and FS WW-P-541E/GEN dated August 1, 1980.
- B. Material shall have minimum physical and performance properties specified.

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- C. Superficial damage to a depth of 1/32-inch shall be repairable by sanding or polishing.
- D. **Colors:** As selected by Architect from manufacturer's standard selection. There shall be no limit on the number of different colors selected on the project.
- E. **Edge Treatments:** Built-up half-round bullnose as shown on Drawings.

2.3 Accessory Products:

- A. **Joint Adhesive:** Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints by chemical bond.

2.4 Fabrication:

- A. Factory-fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
- B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints. Reinforce with strip of solid polymer material, 2" wide.
- C. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the Drawings.
- D. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges.
- E. Repair or reject defective and inaccurate work. The Architect shall be the final judge of the acceptance of any repair or inaccurate work. If any work is rejected it shall be replaced at the Contractor's expense.
- F. **Finish:** Provide surfaces with a uniform finish: Matte: Gloss range of 5-20.
- G. **Thermoforming:** Comply with manufacturer's data.
- H. Construct molds of plywood in "male/female" sections. Construct molds matching component shape.
- I. Form pieces to shape prior to seaming and joining.
- J. Cut pieces to finished dimensions. Sand edges. Remove nicks and scratches.
- K. Heat entire component. Material shall be uniform, between 275 and 325 degrees Fahrenheit during forming.

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- L. Prevent blistering, whitening and cracking of solid polymer material during forming. Reject defective material.
- M. **Color inlay:** Comply with manufacturer's product data.
- N. Rout groove for inlay to straight edge or pattern indicated on the Drawings.
- O. Completely fill groove using bulk acrylic material furnished by polymer manufacturer, without air bubbles or voids. Overflow inlay area.
- P. Sand cured inlay: touch up to uniform appearance.
- Q. **Material inlay:** Comply with polymer manufacturer's product data. Install as shown on the Drawings.

PART 3 - EXECUTION

3.1 Installation:

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Reinforce joints as required.
- C. Provide backsplashes and side splashes as indicated on the Drawings. Adhere to tops using manufacturer's standard color-matched silicone sealant.
- D. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.
- E. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Architect's satisfaction.

END OF SECTION 06650

SECTION 07212

RIGID WALL INSULATION

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The work included under this Section is Rigid Wall Insulation.

PART 2 - PRODUCTS

- 2.1 **Basic Materials:**
- A. **Wall Insulation:** Shall be a closed-cell foam plastic polyisocyanurate insulation, foil faced on both sides, in sizes and thickness required, equal to Celotex Thermax.
 - B. Physical properties of the insulation shall be as follows:
 - 1. Density: 2 pcf
 - 2. Compressive Strength: 25 psi minimum
 - 3. Water Vapor Transmission: Less than .03 perms
 - 4. Flame Spread: 25 or less
 - 5. Smoke Developed: 120 or less
 - 6. Thickness: 1.5"
 - 7. R-Value: "Stabilized" R-Value of 10.8 minimum
- 2.2 **Approved Manufacturers:**
- A. **Manufacturers:**
 - 1. Celotex

PART 3 - EXECUTION

- 3.1 **Installation:**
- A. **Walls:** Install the 16" x 8'-0" x 1-1/2" thick boards horizontally between courses of wall ties. Fasten the board to the masonry wall with approved mastic.

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- B. Stagger joints of insulation a minimum of 2'-0" to prevent thermal gaps. Install no more insulation than can be properly covered by the end of each days work.

END OF SECTION 07212

SECTION 07214

RIGID ROOF INSULATION

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The work included under this Section is Tapered Rigid Roof Insulation.
- 1.4 **Submittals:**
 - A. Refer to Section 01300, Submittals, and Section 01150, Substitution Requests (during bidding).
 - B. Submit manufacturer data.

PART 2 - PRODUCTS

- 2.1 **Basic Materials:**
 - A. **Insulation:** Insulation shall be a closed-cell, polyisocyanurate foam core integrally laminated to heavy, black (non-asphaltic), fiber-reinforced organic felt facers, in sizes and thickness and taper as required. Physical properties of the insulation shall be as follows:

1. Density:	2 pcf
2. Compressive Strength:	25 psi minimum
3. Water Vapor Transmission:	Less than .03 perms
4. Flame Spread:	25 or less
5. Smoke Developed:	450 or less
6. Class:	Class 1
7. Thickness:	as indicated on the drawings
8. R-Value:	average R-value of 30
 - B. **Cover Board:** 1/2" expanded perlite cover board.
- 2.2 **Approved Manufacturers:**
 - A. **Products:**
 - 1. Johns-Manville Tapered ENRGY 3 25 PSI.
 - 2. Atlas ACFoam II

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3. Dyplast ISO-C1/2.0
 4. Dow THERMAX Metal Building Board
- B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

PART 3 - EXECUTION

3.1 Installation:

- A. **Roof:** Install the insulation boards as indicated on the drawings. Board width and thickness must match existing roof panel width and rib height. Length shall be as determined by the sub-purlin spacing. Top layer of insulation can be maximum size production board.
- B. Stagger joints of insulation a minimum of 2'-0" to prevent thermal gaps. Install no more insulation than can be properly covered by the end of each days work.

END OF SECTION 07214

SECTION 07261

SELF-ADHERING AIR AND VAPOR BARRIER

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. This Section specifies a water-resistant self-adhering sheet air and vapor barrier in exterior wall assemblies.
 - B. Related Work in other Sections include the following:
 - 1. Section 01500, Temporary Facilities; requirement to schedule work to prevent sunlight and weather exposure of materials beyond limits established by manufacturer; requirement to protect materials from damage after installation and prior to installation of enclosing work.
 - 2. Section 03300, Cast-In-Place Concrete; requirement that backup concrete be free of fins, protrusions and large holes.
 - 3. Section 04210, Brick Masonry; requirement that backup masonry joints are flush and completely filled with mortar, and that excess mortar on brick ties will be removed; requirement for gap at deflection joints and fillers; coordination with sequencing of through-wall flashing.
 - 4. Section 06461, Gypsum Sheathing; requirement that backup gypsum sheathing has been installed with damaged corners repaired, joints filled and surface flush with compatible material as acceptable to the self-adhering air and vapor barrier manufacturer; requirement for gap at deflection joints and fillers.
 - 5. Section 07535, Modified Bitumen Sheet Roofing; requirement for coordination with sequencing of membrane roofing; requirement to seal roof membrane to wall air and vapor barrier.
- 1.2 **Performance Requirements:**
- A. **Material Performance:** Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 pounds per square foot) when tested according to ASTM E 2178, and a vapor permeance of 0.1 perms or less when tested according to ASTM E 96.

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- B. **Assembly Performance:** Provide a continuous air and vapor barrier assembly that has an air leakage not to exceed 0.040 cubic feet per square foot per minute under a pressure differential of 0.3 in. water (1.57 pounds per square foot) when tested in accordance with ASTM E 2357. Assembly shall perform as a liquid drainage plane flashed to discharge condensation or water penetration to the exterior. Assembly shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air and vapor seal materials at such locations, changes in substrate and perimeter conditions.
1. Assembly shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure.
 2. Assembly shall not displace adjacent materials under full load.
 3. Assembly shall be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations and creep, and anticipated seismic movement.
- C. **Connections to Adjacent Materials:** Provide connections to prevent air leakage and vapor migration at the following locations:
1. Foundation and walls, including penetrations, ties and anchors.
 2. Walls, windows, curtain walls, storefronts, louvers or doors.
 3. Different wall assemblies, and fixed openings within those assemblies.
 4. Wall and roof connections.
 5. Floors over unconditioned space.
 6. Walls, floor and roof across construction, control and expansion joints.
 7. Walls, floors and roof to utility, pipe and duct penetrations.
 8. Seismic and expansion joints.
 9. All other leakage pathways in the building envelope.

1.3 Submittals:

- A. Refer to Section 01300, Submittals, and Section 01150, Substitution Requests (during bidding).
- B. **Quality Assurance Program:** Submit evidence of current accreditation and certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of contractor and certification number of installers.
- C. **Product Data:** Submit manufacturer's product data, manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
 2. Include statement that materials are compatible with adjacent materials proposed for use.
 3. Submit reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.

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- D. **Samples:** Submit clearly labeled samples, 3 by 4 inch (75 mm by 100 mm) minimum size of each material specified.
- E. **Shop Drawings of Mock-Up:** Submit shop drawings of proposed mock-ups showing plans, elevations, large-scale details, and connections to the test apparatus.
- F. **Field Test Results of Mock-Up:** Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards, including retesting if initial results are not satisfactory.
- G. **Shop Drawings:** Submit shop drawings showing locations and extent of air and vapor barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the air and vapor barrier are secured with air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.
 - 1. Include VOC content of each material, and applicable legal limit in the jurisdiction of the project.
 - 2. Include statement that materials are compatible with adjacent materials proposed for use.
 - 3. Include recommended values for field adhesion test on each substrate.
- H. **Compatibility:** Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

1.4 Quality Assurance:

- A. **Air Barrier Contractor Qualifications:** Currently accredited by the Air Barrier Association of America (ABAA) whose applicators are certified in accordance with the ABAA Quality Assurance Program.
- B. **Manufacturer:** Obtain primary materials from a single manufacturer regularly engaged in manufacturing air and vapor barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.
- C. **Accredited Laboratory Testing for Materials:** Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).
- D. **VOC Regulations:** Provide products which comply with applicable regulations controlling the use of volatile organic compounds.
- E. **Preconstruction Meeting:** Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

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- F. **Field Quality Assurance:** Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air and vapor barrier membrane until it has been inspected, tested and accepted.
- G. **Mock-Ups:** Build mock-up representative of primary exterior wall assemblies and glazing assemblies including backup wall and typical penetrations as acceptable to the Architect. Mock-up shall be approximately 8 feet long by 8 feet high and include all components in the exterior wall assembly.
- H. **Mock-Up Tests for Air and Water Infiltration:** Test mock-up for air and water infiltration in accordance with ASTM E 1186 (air leakage location), ASTM E 783 (air leakage quantification), and ASTM E 1105 (water penetration). Use smoke tracer to locate sources of air leakage. If deficiencies are found, reconstruct mock-up and retest until satisfactory results are obtained. Deficiencies include air leakage beyond values specified, uncontrolled water leakage, unsatisfactory workmanship.
 - 1. Perform the air leakage tests and water penetration test of mock-up prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements.
- I. **Mock-Up Tests for Membrane Adhesion:** Test mock-up of membrane for adhesion in accordance with ASTM D 4541 using a Type 1 pull tester except that the disk used shall be 100mm in diameter and the membrane shall be cut through to separate the material attached to the disk from the surrounding material. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with ASTM D 4541. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, then the inspector shall simply record the value.

1.5 Delivery, Storage, and Handling:

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air and vapor barrier membrane manufacturer. Protect stored materials from direct sunlight.
- C. Handle materials in accordance with manufacturer's recommendations.

1.6 Project Conditions:

- A. **Temperature:** Install air and vapor barrier within range of ambient and substrate temperatures recommended by air and vapor barrier manufacturer. Do not apply air and vapor barrier to a damp or wet substrate.
- B. **Field Conditions:** Do not install air and vapor barrier in snow, rain, fog, or mist. Do not install air and vapor barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.7 Warranty:

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- A. **Material Warranty:** Provide manufacturer's standard product warranty, for a minimum 3 years from date of Substantial Completion.
- B. **Installation Warranty:** Provide installer's 2 year warranty from date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 - PRODUCTS

2.1 Materials:

- A. **Sheet Air and Vapor Barrier:** Self-adhering membrane composed of flexible facing material coated completely and uniformly on one side with adhesive material, formed into uniform, flexible sheets, interleaved with disposable release liner that is removed prior to application. Use regular or low-temperature formulation depending on site conditions, within temperature ranges specified by manufacturer. Provide related accessories including primer, seam tape, mastic, fluid and sealant recommended by manufacturer. Subject to compliance with requirements, provide one of the following:
 - 1. Carlisle Coatings and Waterproofing:
 - a. Air and Vapor Barrier Membrane: CCW-705, 40 mils thick.
 - b. Water-Based Primer: CCW-AWP Water-Based Primer.
 - c. Solvent-Based Primer: CCW-702 Solvent-Based Primer.
 - d. Solvent-Based Aerosol Primer: CAV-GRIP.
 - e. Counterflashing for Masonry Through-Wall Flashings: CCW-705 TWF.
 - f. Mastics, Adhesives and Tapes: CCW-704 Solvent-Based Rubberized Asphalt Mastic.
 - 2. Grace Construction Products:
 - a. Air and Vapor Barrier Membrane: Perm-A-Barrier, 40 mils thick.
 - b. Water-Based Primer: Perm-A-Barrier WB Primer.
 - c. Solvent-Based Primer: Bituthene Primer B-2.
 - d. Counterflashing for Masonry Through-Wall Flashings: Perm-A-Barrier Flashing.
 - e. Mastics, Adhesives and Tapes: As recommended by manufacturer.
 - 3. Henry:
 - a. Air and Vapor Barrier Membrane: Blueskin SA, 40 mils thick.
 - b. Water-Based Primer: Aquatac.
 - c. Solvent-Based Primer: Blueskin Primer.
 - d. Counterflashing for Masonry Through-Wall Flashings: Blueskin TWF.
 - e. Mastics, Adhesives and Tapes: Henry 570-05 Polybitume.
 - 4. Protective Coatings Technology, Inc.:
 - a. Air and Vapor Barrier Membrane: Poly-Wall Crack Guard, 25 mils thick.
 - b. Water-Based Primer: As recommended by manufacturer.
 - c. Solvent-Based Primer: Poly-Wall AirLok or AirLok Flex as recommended.
 - d. Counterflashing for Masonry Through-Wall Flashings: Poly-Wall Crack Guard.

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- e. Mastics, Adhesives and Tapes: As recommended by manufacturer.
- 5. Tremco, Inc.
 - a. Air and Vapor Barrier Membrane: ExoAir 110, 40 mils thick.
 - b. Water-Based Primer: ExoAir WB Primer.
 - c. Solvent-Based Primer: ExoAir Primer or GM Primer or ExoAir 10 Primer as recommended.
 - d. Counterflashing for Masonry Through-Wall Flashings: ExoAir TWF.
 - e. Mastics, Adhesives and Tapes: As recommended by manufacturer.
- 6. W. R. Meadows, Inc.:
 - a. Air and Vapor Barrier Membrane: Air-Shield, 40 mils thick.
 - b. Water-Based Primer: Mel-Prime Water Base.
 - c. Solvent-Based Primer: Mel-Prime VOC.
 - d. Counterflashing for Masonry Through-Wall Flashings: Detail Strip.
 - e. Mastics, Adhesives and Tapes: As recommended by manufacturer.

2.2 Auxiliary Materials:

- A. **Sealant at Transitions in Substrate and Connections to Adjacent Elements:**
Low-modulus pre-cured silicone extrusion and sealant for bonding extrusions to substrates; Tremco Silicone Extruded Sheet by Tremco, Spectrem EZ Seal by Tremco, or Bondaflex Silbridge 300 by May National Associates.
- B. **Transition Membrane Between Air and Vapor Barrier Membrane and Roofing and Other Adjacent Materials:** Comply with both air and vapor barrier manufacturer's recommendations and material manufacturer's recommendations.

PART 3 - EXECUTION

3.1 Examination:

- A. Examine substrates, areas, and conditions under which air and vapor barrier assemblies will be applied, with Installer present, for compliance with requirements.
 - 1. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 2. Do not proceed with installation until after minimum concrete curing period recommended by air and vapor barrier manufacturer.
 - 3. Ensure that the following conditions are met:
 - a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
 - b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
 - c. Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
 - 4. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 and take suitable measures until substrate passes moisture test.

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5. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.
6. Notify Architect in writing of anticipated problems using air and vapor barrier over substrate prior to proceeding.

3.2 Surface Preparation:

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for air and vapor barrier application.
 1. Prime masonry, concrete substrates with conditioning primer.
 2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
 3. Prime wood, metal, and painted substrates with primer.
 4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air and vapor barrier and at protrusions.

3.3 Installation:

- A. **Self-Adhering Sheet Air and Vapor Barrier:** Install membrane to provide continuity throughout the building envelope. Install materials in accordance with manufacturer's recommendations and the following:
 1. Apply primer at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.
 2. When membrane is properly positioned, press into place and roll membrane with roller immediately after placement.
 3. Apply membrane sheets to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.
 4. Position subsequent sheets of membrane applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll into place with roller.
 5. Overlap horizontally adjacent pieces a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll seams with roller.
 6. Seal around all penetrations with termination mastic, extruded silicone sealant, membrane counterflashing or other procedure in accordance with manufacturer's recommendations.
 7. Connect air and vapor barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors and other intersection conditions and perform sealing of penetrations, using accessory materials and in accordance with the manufacturer's recommendations.
 8. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.

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9. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.
10. At through-wall flashings, provide an additional 6 inch wide strip of manufacturer's recommended membrane counterflashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic as recommended by manufacturer.
11. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
12. At expansion and seismic joints provide transition to the joint assemblies.
13. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer.
14. At end of each working day, seal top edge of membrane to substrate with termination mastic.
15. Do not allow materials to come in contact with chemically incompatible materials.
16. Do not expose membrane to sunlight longer than as recommended by the manufacturer.
17. Inspect installation prior to enclosing assembly and repair punctures, damaged areas and inadequately lapped seams with a patch of membrane lapped as recommended by manufacturer.

3.4 **Protecting and Cleaning:**

- A. Protect air and vapor barrier assemblies from damage during application and remainder of construction period, according to manufacturer's written instructions.
 1. Coordinate with installation of materials which cover air and vapor membrane, to ensure exposure period does not exceed that recommended by the air and vapor barrier manufacturer.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 07262

SECTION 07262

UNDER-SLAB VAPOR BARRIER

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Requirements, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Products supplied under this section:
 - 1. Vapor barrier, seam tape, and mastic for installation under concrete slabs.
- 1.4 **References:**
- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - 2. ASTM E154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 3. ASTM E96-05 Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM F1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
 - 5. ASTM E1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - B. American Concrete Institute (ACI):
 - 1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- 1.5 **Submittals:**
- A. Submit in accordance with Section 01300, Submittals.
 - B. Submit the following information:
 - 1. Summary of test results as per paragraph 8.3 of ASTM E1745.
 - 2. Manufacturer's samples, literature.
 - 3. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.

PART 2 - PRODUCTS

2.1 Materials:

- A. Vapor barrier must have all of the following qualities:
 - 1. Permeance of less than 0.01 Perms as tested in accordance with ASTM E1745 Section 7.
 - 2. **Other performance criteria:**
 - a. Strength: ASTM E1745 Class A.
 - b. Thickness: 15 mils minimum
- B. **Vapor barrier products:**
 - 1. **Basis of Design:**
 - Stego Wrap Vapor Barrier (15-mil)
 - Stego Industries LLC
 - (877) 464-7834
 - www.stegoindustries.com.
- C. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 Accessories:

- A. **Seam tape:** Stego Tape by Stego Industries LLC.
- B. **Vapor-proofing mastic:** Stego Mastic by Stego Industries LLC.

PART 3 - EXECUTION

3.1 Preparation:

- A. Ensure that the base material is approved by Architect.
- B. Level and compact base material.

3.2 Installation:

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement.
 - 2. Lap vapor barrier over footings and/or seal to foundation walls.
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 - 6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

END OF SECTION 07262

SECTION 07410

METAL ROOFING, FASCIA AND SOFFIT

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Requirements of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Section includes factory-formed metal panels with a minimum 1" high standing seam, continuous interlock and concealed fastener clip system:
 - 1. Roofing
 - 2. Fascia (vertical wall) panels
 - 3. Vented Soffit
 - 4. Flashing and accessories.
 - B. Related Sections:
 - 1. Metal Roof Deck: Section 05300, Steel Decking.
 - 2. Flashing and Trim: Section 07621, Flashing, Misc Trim and Accessories.
 - 3. Coping: Section 07710, Pre-fabricated Metal Coping System.
 - 4. Sealants: Section 07920, Sealants.
- 1.4 **References:**
- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM E283/1680 Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
 - 3. ASTM E331/1646 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
 - 4. ASTM 1592-95 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
 - B. Underwriters Laboratories (UL Classified Tests):

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1. UL 580 - Test for Wind-Uplift Resistance of Roof Assemblies
 - C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 1. SMACNA Architectural Sheet Metal Manual
- 1.5 **Performance Requirements:** Provide sheet metal roofing that has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer's performance criteria without defects, damage, failure of infiltration of water.
- A. **Wind-Uplift:** Roof panel assembly shall comply with UL Classification 580 for UL Classified 90 rated assemblies and meet the required wind loads listed on the Structural Drawings.
 - B. **Static Air Infiltration:** Completed roof system shall have a maximum of .06 cfm/sf with 6.24 kPa air pressure differential as per ASTM E283/1680.
 - C. **Water Infiltration:** No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf and not more than 12.0 psf as per ASTM E331/1646.
- 1.6 **Submittal Procedures:**
- A. **Product Data:** Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products.
 - B. **Shop Drawings:**
 1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer, to the Architect for review. Do not proceed with manufacturer of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the Architect for shop or erection drawings.
 2. Shop drawings show roof plans, elevations, methods of erection, and flashing details.
 - C. **Performance Tests:**
 1. Submit certified test results by a recognized testing laboratory in accordance with specified test methods for each panel system.
 - D. **Samples:** Submit selection and verification samples for finishes, colors and textures.
 - E. **Quality Assurance Submittals:** Submit the following:
 1. **Certificates:** Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
 2. **Manufacturer's Instructions:** Manufacturer's installation instructions.
 3. **Design Calculations:** Submit calculations and attachment requirements designed by a registered structural engineer licensed by the State of Florida. Calculations shall job specific and indicate area of roof design was performed, along with anchors, sizes and spacing.
 - F. **Closeout Submittals:** Submit the following:
 1. **Operation and Maintenance Data:** Operation and maintenance date for installed products in accordance with Section 01730, Operation and Maintenance Data. Include methods for maintaining installed products and

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precautions against cleaning materials and methods detrimental to finishes and performance.

2. **Project Warranty:** Warranty documents specified herein.
 - a: **Manufacturer's Warranty:** Submit, for owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not limited of, other rights the owner may have under the contract documents. Provide a non-prorated warranty covering the finish, including color, fade, chalking and film integrity.
 - b. **Warranty Period:** 20 years commencing on Date of Substantial Completion.
3. **Record Documents:** Project record documents for installed materials in accordance with Section 01720, Project Record Documents.

1.7 **Quality Assurance:**

- A. **Installer Qualifications:** Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.
 1. **Certificate:** When requested, submit certificate indicating qualifications.
- B. **Sheet Metal Industry Standard:** Comply with Sheet Metal and Air Conditioning Contractors National Association(SMACNA) Architectural Sheet Metal Manual.
- C. **Pre-Installation Meetings:** Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01400, Quality Requirements.

1.8 **Delivery, Storage and Handling:**

- A. **Ordering:** Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. **Delivery:** Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 Classified label where appropriate.
- C. **Storage and Protection:** Store materials protected from exposure to harmful conditions. Store material in dry, above ground location.
 1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.
 2. Prevent contact with material that may cause corrosion, discoloration or staining.
 3. Do not expose to direct sunlight or extreme heat trim material with factory-applied strippable film.

1.9 **Project Conditions:**

- A. **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.

PART 2 - PRODUCTS

2.1 Manufacturers:

- A. **Basis of Design:** A. This project is detailed around the roofing products of Petersen Aluminum Corporation.
- B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 Sheet Metal Panels:

A. Standing Seam Metal Roof Panels:

- 1. Type: **TITE-LOC PLUS**
- 2. Seam Height: 2" high seams that are mechanically seamed together @ 180 degrees. Panels to be produced with Factory-supplied hot melt mastic in the seams.
- 3. Material: 0.040" gauge, 3105-H14 aluminum alloy
- 4. Panel Dimension: 12" on center
- 5. Texture: Smooth
- 6. Rating: UL Classified 90 rated (wind uplift) panel assembly
- 7. Flashing and Trim: 0.040" gauge aluminum
- 8. Fasteners: Concealed fastener clips, spaced as required by the manufacturer to provide for both positive and negative design loads, while allowing for the expansion and contraction of the entire roof system resulting from variations in temperature. Include bearing plates for direct bearing on rigid insulation
- 9. Sealant Bead: Factory-applied sealant bead.
- 10. Forming: Use continuous end rolling method. No end laps on panels. No portable roll-forming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.

B. Fascia (Vertical Wall) Panels:

- 1. Type: **7/8" Corrugated Panel**
- 2. Material: 0.040" gauge, 3105-H14 aluminum alloy
- 3. Panel Dimension: 39.75" wide, 7/8" high
- 4. Texture: Corrugated

A. Soffit Panels:

- 1. Type: **PAC-750**
- 2. Material: 0.032" gauge, 3105-H14 aluminum alloy
- 3. Panel Dimension: 12" on center, V grooved panels
- 4. Texture: Smooth
- 5. Venting: Half-vented

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- 2.3 **Accessories:** Manufacturer's standard flashing and trim profiles, factory-formed, gauge as recommended by manufacturer (in no case less than 0.32), color and finish to match metal roofing panels.
- 2.4 **Related Materials:** Coordinate use of related materials:
1. **Underlayment:** 40 mil self-adhesive bituminous rubber membrane. Shall be rated for high temperature (HT).
 2. **Rigid Insulation:** Polyisocyanurate foamed plastic. Refer to Section 07223, Roof Board Insulation.
 3. **Sealants:** Joint sealants. Refer to Section 07920, Sealants.
- 2.5 **Fabrication:**
- A. **Continuous Length:** Fabricate panels 55 feet and less in one continuous length.
 - B. **Trim and Flashings:** Fabricate trim and flashings from same material as roof system material.
 - C. **Portable Roll Former:** Panels fabricated by portable roll former shall not be approved.
- 2.6 **Factory-applied Finish:**
- A. **Topside:** Full-strength fluoropolymer (70% Kynar 500 or Hylar resin) system of 1.0 mil total dry film thickness.
 - B. **Underside:** Wash coat of 0.3 - 0.4 mil dry film thickness.
 - C. **Texture:** Smooth texture, dull matte specular gloss 25 - 35% at 60.
 - D. **Protective film:** Strippable vinyl film applied during panel fabrication and finishing.
 - E. **Color:**
 1. To be selected from the manufacturer's standard color line.
 2. **LEED Requirement:** SRI=29 or higher for slopes greater than 2:12; SRI=78 or higher for slopes less than 2:12.
 3. Roof, fascia and soffit panels may be of different colors, at the Architect's discretion.

PART 3 - EXECUTION

- 3.1 **Manufacturer's Instructions:**
- A. **Compliance:** Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.
 - B. **Strippable Film:** Remove manufacturer's protective film, if any, from surfaces of roofing panels.
- 3.2 **Examination:**
- A. **Site Verification of Conditions:** Verify substrate conditions, which have been previously installed under other sections, are acceptable for project installation in accordance with manufacturer's instructions.
- 3.3 **Preparation:**

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- A. **Coordination:** Coordinate metal roofing with other Work (drainage, flashing and trim, deck substrates, parapets, copings, walls) and other adjoining work to provide a non-corrosive and leak-proof installation.
 - B. **Dissimilar Metals:** Prevent galvanic action of dissimilar metals.
- 3.4 **Installation:** Install metal roofing panels to profiles, patterns and drainage indicated and required for leak-proof installation. Provide for structural and thermal movement at work. Seal joints for leak-proof installation.
- A. **Seams:** Provide uniform, neat seams.
 - B. **Fasteners:** Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leak-proof installation.
 - C. **Sealant-Type Joints:** Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Section 07920, Sealants.
- 3.5 **Field Quality Requirements:**
- A. **Site Tests (Post Installation Testing):** Owner reserves right to perform post installation testing of installed sheet metal roofing.
 - B. **Manufacturer's Field Services:** Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions
- 3.6 **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.
- 3.7 **Protection:** Protect installed product from damage during construction.
- 3.8 **Disposal:** Dispose of all debris material in appropriate containers.

END OF SECTION 07410

SECTION 07535

**MODIFIED BITUMEN SHEET ROOFING
(STYRENE-BUTADIENE-STYRENE (SBS))**

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** It is the intent of this section to provide for the furnishing, installing and warranting of the roofing and all associated work and accessories described herein or necessary for a complete secure installation.
- 1.4 **Work Included**
- A. Work included is a convenient listing of the significant items describing within this section and shall not be constructed as the only work applicable or related to this section.
 - B. Work includes, but is not limited to:
 - 1. Roof Accessories
 - 2. Flashing
 - 3. Roofing Membrane
 - 4. Removal and replacement of defective, unsuitable roof fill and nailers, etc.
 - 5. Temporary Roofing
 - 6. Rigid Insulation
- 1.3 **Related Work Specified Elsewhere**
- A. Flashing and Sheet Metal, Section 07621
- 1.4 **Quality Assurance**
- A. **Manufacturer Qualifications:** Actively engaged in the manufacture of roofing products for no less than five (5) years
 - 1. Roofing manufactured in accordance with requirements and standards of the Factory Mutual, National Roofing Contractors Association (NRCA) and Underwriters Laboratories, Inc.

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- B. **Applicator Qualifications:** Actively engaged in the application of and thoroughly familiar and experienced with roofing membrane manufacturer's products and certified by roofing manufacturer for application and installation.
 - 1. Provide a field supervisor who shall be completely familiar with, and experienced in, the application of specified roof membranes, and who shall be responsible for application and installation and who shall direct all field operations at all times.
 - a. Such a field supervisor shall be readily available and completely accessible by School Board Field Representative and Architect.
 - C. **Source Quality Control:** All roofing materials, to include, but limited to, roofing membrane and accessories shall be manufactured and produced by and under the control of a single manufacturer.
 - D. **Other Products:** All other roofing materials and related products necessary for a complete, secure installation shall be acceptable by the roofing membrane manufacturer as being compatible and suitable for roof warranty.
- 1.5 **References:** All work as specified in this section shall be governed by, and in accordance with, the following codes and standards:
- A. National Roofing Contractors Association (NRCA), Roofing and Waterproofing Manual.
 - B. Factory Mutual Approval Guide for Class I-90.
 - C. American Society for Testing of Materials (ASTM).
 - D. Florida Building Code, Latest Edition.
 - E. SREF, State Requirements for Educational Facilities, Latest Edition.
 - 1. **Wind Loads:** Minimum 121 mph.
- 1.6 **Submittals:**
- A. Submit the following shop drawings, product data and certificated in accordance with Submittals Section 01300:
 - 1. Roofing manufacturer's product data.
 - 2. Certification of UL "Class A" fire rating.
 - 3. Certification of Factory Mutual I-90 uplift requirements.
 - 4. Shop Drawings
 - a. Flashing details
 - 5. Roofing Warranty
 - B. Submit, if applicable, all pertinent data for product substitutions proposed and a letter stating cause and effect of such substitutions for Owner and Architect's consideration and approval.
 - C. Submit, if applicable, all proposed changes in materials and methods of construction, construction sequences and construction techniques for Owner and Architect's consideration and approval.
 - D. **Closeout Submittals:** Provide a minimum of 5 rolls of roof membrane and applicable mastics, sealants, etc., necessary for maintenance work by Owner.
- 1.7 **Tests:**

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- A. **Testing Laboratory Services:** Acceptable to Owner and currently certified and qualified by the following:
 - 1. "Recommended Requirements for Independent Laboratory Qualifications": latest edition, by American Council of Independent Laboratories.
 - 2. Testing equipment calibrated at maximum 12 month intervals.
- B. **Testing Costs:** Shall be borne by the contractor.
- C. **Test Reports:**
 - 1. Submit on testing laboratory letterhead and test tabulations sheets, to include, but not limited to:
 - a. Statement by testing laboratory as to whether test results meet specification requirements.
 - b. Date of filed tests and locations.
 - 2. Submit test results to Architect within seven (7) days following field tests.
 - 3. Submit test results in triplicate.
- D. **Field Tests:**
 - 1. Field tests shall be arranged for and schedules by Contractor.
 - 2. Owner and Architect shall be notified no less than 24 hours in advance of scheduled tests so that they may be present during testing operations.
 - 3. Test locations will be field determined or approved by Owner and Architect.
 - 4. Testing conducted without the presence of the Owner and Architect, unless approved prior to time of testing, may be disregarded by Owner and Architect as invalid and subject to retesting at Contractor's costs.
- E. **Tests to be Performed:**
 - 1. Tests where conditions of roof fill is, or appears to be, unsuitable and unacceptable for roof warranty. Physical testing shall include "Pull-Out" properties of substrate along with moisture content. Note all discrepancies affecting system warranty must be resolved prior to continuing work.
 - 2. **Water Test:**
 - a. Test roofing membrane integrity at completion of application of the base sheet and interply and prior to application of cap membrane.
 - b. Test for water run-off and proper drainage to include, but not limited to:
 - (1) Roof Drains
 - (2) Roof Projections
 - (3) Roof Slope

1.8 Field Samples:

- A. Field samples are defined as physical examples illustrating finishes and finish materials as well as methods and techniques of construction.
- B. Field samples may be required and requested by Owner and Architect at such times that materials being applied are suspected to be inadequate to meet specifications as to materials and products or methods and techniques of application/installation.
 - 1. Tests that may be required to determine the characteristics and properties of a material or product shall be at Contractor's cost if tested materials or products fail.
 - 2. Costs of tests for those materials or products passing successfully will be borne by the Owner.

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1.9 Product Handling:

- A. **Delivery:** Deliver roofing materials and accessories in manufacturer's original, unopened, standard containers and packaging with labels and seals intact.
- B. **Protection:** Store all materials in a safe, dry area. Protect from damage due to moisture, before, during and after installation.
- C. **Replacement:** Be responsible for and make all repairs and replacements of damaged or defective materials or work at no additional cost to Owner.

1.10 Job Conditions:

- A. **Weather Conditions:**
 - 1. Proceed with work only when weather conditions will permit installation of materials without harm or damage.
 - 2. Provide temporary protection of all materials, stored or installed, and all openings in event of rain or other unsuitable weather conditions.
 - 3. Be responsible for repairing and replacing materials, stored or installed, damaged by rain or other unsuitable weather conditions.

1.11 Warranty:

- A. Provide a 20-year, written **JM Peak Advantage Guarantee with Blister-Free Enhancement and Edge Metal with Wind Rider** warranty from the roof membrane manufacturer to include, but not limited to, roof membrane and accessories to provide for repairs to correct roof leaks and damage resulting from:
 - 1. Roof membrane deterioration due to ordinary wear and tear and effects thereof.
 - 2. Flashing membrane deterioration due to wear and tear and effects thereof.
 - 3. Improper workmanship and installation by roofing contractor of roof membrane or flashing membrane.
 - 4. Blistering, buckles, wrinkles or ridges in roof membrane.
 - 5. Splits in roofing or flashing membrane.
 - 6. Temperature fluctuations or thermal shock.
 - 7. Roofing or flashing membrane slippage.
 - 8. Asphalt vent stacks, new or retrofit, drains and scuppers, if required, pitch pans, roof projections, insulation and metal flashings.
 - 9. Wind damage to a maximum of 121mph.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

- A. **Basis of design:**
 - 1. **Over New Insulated Deck:** Johns-Manville SBS System **3FID**. Products specified are Performance Specifications and shall be used herein as a standard and basis for all specified roofing and related products.
 - 2. **Over Existing Lightweight Concrete Deck:** Johns-Manville SBS System **3FLD**. Products specified are Performance Specifications and shall be used herein as a standard and basis for all specified roofing and related products.

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- B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 **Modified Bitumen Sheet Roofing:**

A. **Roof Membranes:**

1. **Base Sheet (3FLD):**

- a. Single-ply, asphalt-coated, fiberglass, base sheet.
Johns-Manville, ***Permaply 28*** or approved equal.
- b. **Physical characteristics minimum:** ASTM D 4601, Type II.
- c. **Weight:** 75 lbs per square.

2. **Interply:**

- a. Fiberglass-reinforced membrane impregnated with asphalt.
Johns-Manville ***DynaBase*** or an approved equal.
- b. **Physical characteristics minimum:** ASTM 6163.
- c. **Thickness:** 90 mils.
- d. **Weight:** 60 lbs per square.

3. **Cap Membrane:**

- a. **SBS Modified Bitumen Membrane:** 160 mil glass-reinforced mat with factory embedded granules.
Johns-Manville, ***DynaGlas FR*** or an approved equal.
- b. **Physical characteristics minimum:** ASTM 6163 Type I, Grade G.
- c. **Thickness:** 160 mils.
- d. **Weight:** 100 lbs per square.

B. **Membrane Flashings:**

1. Johns-Manville ***DynaFlex*** or an approved equal.
 - a. **Thickness:** Minimum 160 mils.
 - b. **Weight:** Minimum 100 lbs per square
 - c. **Reinforced:** Combination of polyester/fiberglass composite mat.
 - d. **Minimum:** ASTM D 6221, Type I

C. **Flexible Flashings:**

1. Provide Johns-Manville ***Permaflash*** flexible flashing assembly to all mechanical piping, mechanical supports, electrical equipment, electrical supports, roof membrane terminations, scuppers and flashings in accordance to manufacturer's recommendations.
2. It is the intent by use of this product to minimize the differing assemblies.
3. ***The use of pitch pans and mechanical fastenings on roof deck or in water stream will not be accepted.***

D. **Expansion Flashings:**

1. Provide Johns-Manville ***Expand-O-Flash*** horizontal and vertical expansion joint cover assemblies to all joints between the new roof and parapets and the existing roof, and where indicated in the Drawings, in accordance to manufacturer's recommendations.

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2. Include **black EPDM** over **insulated neoprene bellows**, and **aluminum flanges**.
- E. **Coping System:**
1. Provide Johns-Manville **Presto Lock** coping system in accordance to manufacturer's recommendations.
 2. **Coping cover** to be **aluminum** with **Kynar 500** finish, color to be selected by Architect.
 3. **Galvanized Steel Base** to be engineered to allow for **cantilever installation** with brick veneer or EIFS as indicated on the Drawings.
- F. **Fasteners:**
1. **Anchors:**
 - a. Use **stainless steel anchors** unless otherwise approved in writing by the Architect.
 - b. Anchors and anchor assemblies shall be rated for the term of the warranty.
 - c. **No lead shall be used in any products on the school property.**
 2. Meet the manufacturer's requirements for single-source warranty.
- G. **Asphalt:** ASTM D-312, Type IV
- H. **Cold Ply Adhesives:** ASTM D-3019, Type II, fast dry.

2.3 Miscellaneous:

- A. **Roof Drains:** Provide aluminum **Hercules RetroDrain** roof drain assembly by Johns-Manville or approved equal for all existing roof drains.
- B. **Walkway Mats:**
1. Provide walkway mats as recommended by the manufacturer and as indicated on the plans.
 2. Walkway mats are to be adhered to roof membrane and must be resistant to the wind loading as specified.
 3. Mats shall not be installed in a manner as to not prohibit proper water flow.

2.3 Temporary Roof Membrane:

- A. **General:** At no time shall existing roof fill, sheathing or nailers be exposed to the weather or elements for a period extending beyond working hours or during anticipated rain or other damaging weather conditions.
1. A temporary roof membrane as herein specified shall be applied and installed over roof surfaces exposed by removal of existing roofing membranes.
 2. The cost to remove and replace existing roof fill or sheathing in those sections and areas found to be unsuitable and unacceptable shall be determined at the unit price rate times area and shall include, but not limited to, cost of removal, disposal, materials, labor, application of replacement and clean-up. Refer to 01026, Unit Prices.
- B. **Temporary Roof Felts:** Asphalt-saturated organic felts, No. 30, ASTM D-226, plain.

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- C. **Bitumen:**
 - 1. **Primer:** ASTM D-41
 - 2. **Asphalt:** ASTM D-312, Type I
 - 3. **Asphalt Base Emulsion:** ASTM C-122T, Type I
- D. **Alternative Temporary Membrane Roofing:** The specified base membrane and interply membrane shall be acceptable as a temporary roof.

PART 3 - EXECUTION

3.1 Inspection:

- A. **Substrate:** Inspect and examine substrate to assure surface conditions are suitable for application of work.
 - 1. Examine nailers, curbs and other roof accessories to assure soundness, strength and suitability for accepting new work without damage or adversely affecting workmanship.
 - 2. Examine surfaces for any deviations beyond allowable tolerances for installation of work.
 - 3. Correct any conditions in substrate or roofing accessories deemed as unacceptable and which adversely affect workmanship of new work installation.
- B. Do not proceed with installation of work until unsatisfactory conditions are corrected.
- C. Starting of work constitutes acceptance of existing surface conditions as satisfactory and suitable and applicator/installer shall be held responsible for good workmanship, to include, but not limited to, adhesion, slopes for drainage, installation of roof accessories, membrane slippage, blisters and other defects.
- D. **Cementitious Wood Fiber Roof Deck (Tectum):**
 - 1. As needed, replace damaged, deteriorated and/or panels with bacterial growth with panels of like kind.
 - 2. Prior to installing the base sheet over the cementitious wood fiber (Tectum) roof deck, the Contractor shall have pull-out tests performed by the insulation fastener supplier to confirm required pull-out value. The Contractor shall supply a report of the testing to the Architect. Do not proceed with installing the insulation system if pull-out values do not meet the minimum required pull-out values required to meet the design loads. Frequency of pull-out test shall be per the recommendations of the fastener manufacturer.

3.2 Demolition

- A. Existing single-ply membrane is to remain.
 - 1. All associated pitch pans and mechanical penetration flashings are to be removed.
 - 2. Remove all other products, as determined by the manufacturer and approved in writing by the Architect, which may void the warranty by leaving in place.
- B. Remove existing roof fill in those sections or areas that roof fill is unsuitable and unacceptable by roof membrane manufacturer for roof warranty.
 - 1. Notify Owner and Architect of those areas of roof fill found to be unsuitable and unacceptable prior to removal.
 - 2. Do not begin removal without Owner and Architect's proper approval.

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- C. Any damages suffered by Owner, to include, but not limited to; interior furnishings, ceiling tiles, light fixtures, books and other such school property shall be repaired or replaced without additional cost to Owner
- D. Provide all proper protection to Owner's exterior properties, including but not limited to, shrubs, grass and sidewalks.
- E. Replace all nailers, cants, curbs and other such accessories with sound, suitable materials meeting roof membrane manufacturer's approval and acceptable for roof warranty.
- F. Remove all existing roof drains and lead flashing as required for installation of new metal flashing and Johns-Manville aluminum RetroDrain assembly or approved equal.
 - 1. **Note:** All lead flashings shall be removed. Drain assemblies may remain in place as required for new drain installation.
- G. Remove all lead flashing from roof and replace with appropriate flashing.
 - 1. **Note:** Lead must be removed and can not be covered or concealed under roof membrane.

3.3 Preparation:

- A. **Roof Openings:** Seal and protect openings to remain in new work.
- B. Install roof curbs, pipe extensions, nailers and other roof accessories or extensions.

3.4 Application/Installation:

- A. Acceptance of the roof deck shall be obtained from the Architect, Owner and roof membrane Manufacturer's Representative before covering.
- B. Apply the fiberglass base sheet with approved fasteners with disc, approved per FM 4470, and fasten 7-1/2 inches on the seams and staggered 12 inches in the field of the roof. Fasteners shall be applied per I-28 FM standards on the perimeter, or doubling.
- C. Apply interply layer of membrane in hot asphalt, meeting NRCA recommended standards.
 - 1. Apply asphalt at approximately 25 lbs. per square.
- D. Apply cap membrane in hot type IV asphalt applied at 25 lbs. per square, following manufacturer's requirements.
- E. Flash all penetrations, vents and stacks using approved products.
- F. Install new aluminum flashing and gravel stops.

3.5 Field Quality Control

- A. **Manufacturer's Acceptance:** Roof deck and roof membrane shall be approved and accepted by manufacture as properly applied and covered by manufacturer's warranty prior to acceptance and approval of Owner and Architect.

3.6 Adjusting and Cleaning

- A. Make all adjustments, repairs, corrections and replacements as directed by manufacturer, Owner and/or Architect, to include, but not limited to, roof deck, roof membrane and roof accessories.

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- B. Perform cleaning not limited to, removing stains, overruns, removing scraps and cleaning all surfaces, new and existing.

- 3.7 **Protection:** Provide protection of new, completed work until accepted by Owner and Architect.

END OF SECTION 07535

INSTALLER RÉSUMÉ OF COMPARABLE ROOFING WORK

(to be included with Bid)

Project Number: _____ Project Name: _____
Bid Date: _____

I hereby certify that my company, as the roofing installer for the above project, is authorized by the roofing manufacturer, and the actual work shall be supervised by personnel trained by the manufacturer in the proper application of the product. I also certify that my company will execute 100% of roofing system installation with my company's own forces.

(If prime) I certify that my company will provide a payment and performance bond equal to 100% of the subcontract amount.

And I hereby certify that my company has a minimum of five (5) years experience with the manufacturer under my current company name, and herewith provide a list of at least five (5) projects of equal size or larger that my company has completed with the specified manufacturer using the manufacturer's specific, approved product.

1. Name of Project: _____
Owner: _____ Phone No.: _____
Architect: _____ Phone No.: _____
General Contractor: _____ Phone No.: _____
Date Completed: _____ Size (SF): _____
Manufacturer: _____ Product: _____

2. Name of Project: _____
Owner: _____ Phone No.: _____
Architect: _____ Phone No.: _____
General Contractor: _____ Phone No.: _____
Date Completed: _____ Size (SF): _____
Manufacturer: _____ Product: _____

3. Name of Project: _____
Owner: _____ Phone No.: _____
Architect: _____ Phone No.: _____
General Contractor: _____ Phone No.: _____
Date Completed: _____ Size (SF): _____
Manufacturer: _____ Product: _____

4. Name of Project: _____
Owner: _____ Phone No.: _____
Architect: _____ Phone No.: _____
General Contractor: _____ Phone No.: _____
Date Completed: _____ Size (SF): _____
Manufacturer: _____ Product: _____

5. Name of Project: _____
Owner: _____ Phone No.: _____
Architect: _____ Phone No.: _____
General Contractor: _____ Phone No.: _____
Date Completed: _____ Size (SF): _____
Manufacturer: _____ Product: _____

The signer below is authorized to bind the roofing company to the above certifications:

By: _____ Title of Signator: _____
(Print Name) Company Name: _____
Company Address: _____

(Signature) Phone Number: _____

SECTION 07621

FLASHING, MISCELLANEOUS TRIM & ACCESSORIES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Work included in this section is aluminum sheet metal, flashings, gutters, downspouts, and fascia as needed when not specified elsewhere.

PART 2 - PRODUCTS

- 2.1 **Type and Location:**
 - A. The type and location of the various kinds, gauges, thickness, and finish of sheet metal to be used is specified hereinafter under the individual items; however, where sheet metal is indicated on the Drawings and kind or type of metal is not definitely specified or noted, it shall be aluminum, gauge as specified in the SMACNA Manual for the particular function.
 - B. **Aluminum Alloy Sheet and Plate:** ASTM B209, alloy 3003, Finish to be Kynar 500. Temper H14.
 - C. **Gauges:** The gauges for the following items are minimums. Where size of item requires heavier materials, gauges shall be in accordance with the SMACNA Manual.

DESCRIPTION	GAUGE
1. Gutters	.040
2. Eave Drips	.032
3. Flashings	.032

- 2.2 **Accessories:**
 - A. All accessories or other items essential to the completeness of the sheet metal installation, though not specifically shown or specified, shall be provided. All such items shall be of the same materials or compatible to the base materials to which applied and the gauge shall conform to SMACNA Manual recommendations.
 - B. **Fasteners:**

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1. All nails, screws, bolts, rivets and other fastenings for sheet metal, unless otherwise noted, shall be aluminum, and of size and type suitable for the intended use and in accordance with the Florida Building Code for the wind speed specified for the site.
2. Nails shall be minimum 12-gauge, flat-head annular-threaded type, and of sufficient length to penetrate backing at least 3/4-inch.
3. Stainless steel fasteners shall be used to fasten dissimilar materials.

END OF SECTION 07621

SECTION 07830

DAMPPROOFING

PART 1 - GENERAL:

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Provide dampproofing coatings, where indicated on Drawings and as specified herein.
- 1.4 **Related Work Specified in other Sections:**
 - A. Cast-In-Place Concrete, Section 03300.
 - B. Concrete Masonry Unit Work, Section 04200.
 - C. Rigid Insulation, Section 07212.
- 1.5 **Quality Assurance:** 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 methods needed for proper performance of the work of this Section.
- 1.6 **Submittals:**
 - A. Submit manufacturer's catalog data for approval prior to installation.

PART 2 - PRODUCTS

- 2.1 **Manufacturers:**
 - A. Vertical dampproofing material shall be one of the following:
 1. Hydrocide Mastic by Sonnenborn
 2. Trowel-Mastic by W. R. Meadows
 3. Karnak 920 by Karnak Chemical Corporation
 4. Or approved equal.
- 2.2 Other materials not specifically described but required for a complete and proper installation will be approved as selected by the Contractor, pending approval of the Architect.

PART 3 - EXECUTION

- 3.1 **Inspection:** Examine the areas and conditions under which work of the Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected. See that all receiving surfaces are dry and clean.
- 3.2 Vertical dampproofing shall be provided for the full height exterior CMU walls and concrete beams, from top of footing to top of wall, prior to the installation of the rigid insulation.
- 3.3 **Location:** Unless indicated otherwise or to the contrary, provide dampproofing on the exterior face of all concrete masonry units which are scheduled to receive face brick veneer.

END OF SECTION 07830

SECTION 07921

SEALANTS

PART 1 - GENERAL

1.1 Section Includes:

- A. Application of sealants at control and expansion joints on exterior vertical and horizontal intersections to provide a water and air tight barrier, as stated below and as noted on drawings.
- B. Associated materials and preparatory work to insure a successful sealant application.

1.2 References:

- A. ASTM C 920 - Specification for Elastomeric Joint Sealants.
- B. ASTM D 2240 - Test Method for Rubber Property-Durometer Hardness.
- C. ASTM C 1248 and C 510 - Staining.

1.3 Submittals:

- A. **Product Literature:** Refer to Section 01300, *Submittals*. Submit product data sheets and manufacturer's installation instructions. Note specifically which (if any) sealants are to be in physical contact (such as parapet and reglet intersections), confirming compatibility of submitted products.
- B. **Samples:** A 2" cured sample of each chosen color and type of sealant.

1.4 Quality Assurance:

- A. **Compatibility with Substrate and Coatings:** Applicator shall be responsible for verifying with sealant manufacturer that sealants used are compatible with joint substrates and coatings to which sealants will come in contact.
- B. **Joint Design Criteria:** Applicator shall be responsible for verifying with sealant manufacturer that installed joint dimensions are adequate for movement capabilities for extreme and significant moving joint sealants.
- C. Applicator shall be responsible for providing a completely sealed building and ensure that all exterior joints between surfaces are properly sealed even if not detailed in Contract Documents.

1.5 Qualifications:

- A. **Manufacturer:** Company specializing in manufacturing Products specified in this section with minimum ten (10) years experience.
- B. Applicator and job foreman shall have minimum five (5) years experience on equivalent projects.
- C. Use personnel specifically trained in proper application procedures who are thoroughly familiar with joint details shown on drawings and installation requirements as specified in this section.

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1.6 **Delivery, Storage and Handling:**

- A. Deliver in manufacturer's original, unopened containers identifying each product specified, relating to product literature submitted.
- B. Store in accordance with manufacturer's recommendation; take precautions to ensure material fitness when installed for design performance.

1.7 **Warranty:**

- A. Warrant sealed joints against adhesive or cohesive failure of sealant and watertightness of sealed joint for a period of five (5) years for labor and material.
- B. Provide material warranty of five (5) years for polyurethanes and twenty (20) years for silicones.

PART 2 - PRODUCTS

2.1 **Sealants (See schedule for use of each sealant type)**

- A. **Type 1:** ASTM C 920; low modulus, one component, nonsag, neutral cure silicone.
 - 1. **Elongation Capability:** +100% to -50%; total elongation, 1600%.
 - 2. **Service Temperature Range:** -20 to 160° F.
 - 3. **Shore A Hardness Range:** 15-20; ASTM D 2240.
 - 4. **Staining:** None; ASTM C 1248.
 - 5. **Manufacturers:** Dow Corning Corp. 790.
- B. **Type 2:** ASTM C 920; intermediate modulus, one component, nonsag, neutral cure silicone.
 - 1. **Elongation Capability:** +/-50%.
 - 2. **Service Temperature Range:** -40 to 300° F.
 - 3. **Shore A Hardness Range:** 30; ASTM D 2240.
 - 4. **Staining:** None, ASTM C 510.
 - 5. **Manufacturers:** Dow Corning Corp. 795; 995.
- C. **Type 3:** ASTM C 920; high modulus, one component, nonsag, acetoxycure silicone.
 - 1. **Elongation Capability:** +/-25%.
 - 2. **Service Temperature Range:** -35 to 140° F.
 - 3. **Shore A Hardness Range:** 23; ASTM D 2240.
 - 4. **Manufacturers:** Dow Corning Corp. 999A; Pecora 863; GE 1200.
- D. **Type 4:** ASTM C 920; medium modulus, one component, nonsag, neutral cure silicone.
 - 1. **Elongation Capability:** +/-50%.
 - 2. **Service Temperature Range:** -20 to 120° F.
 - 3. **Shore A Hardness Range:** 25-30; ASTM D 2240.
 - 4. **Staining:** None; ASTM 510.
 - 5. **Manufacturers:** Dow Corning Corp. 791; GE Silpruf.
- E. **Type 5:** ASTM C 920, low modulus, two component, nonsag, polyurethane.
 - 1. **Elongation Capability:** +/-25%.
 - 2. **Service Temperature Range:** -20 to 120° F.
 - 3. **Shore A Hardness Range:** 20-25; ASTM D 2240.

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4. **Manufacturers:**
 - a. Mameco International, Vulkem 922
 - b. Mameco International, Vulkem 45 (self leveling)
 - c. Sika Corporation, Sikaflex 2C/SL
 - d. Tremco, Dymeric 511
 - e. Pecora, Dynatrol II
- F. **Type 6:** ASTM 920; medium modulus, one component, nonsag, polyurethane.
 1. **Elongation Capability:** +/-25%.
 2. **Service Temperature Range:** -20 to 120° F.
 3. **Shore A Hardness Range:** 25-40; ASTM D 2240.
 4. **Manufacturers:**
 - a. Mameco International, Vulkem 116
 - b. Sika Corporation, Sikaflex 1a
- G. **Type 7:** ASTM C 920; one component, self-leveling, fuel resistant, low modulus silicone sealant.
 1. **Elongation Capability:** +100% to -50%.
 2. **Service Temperature Range:** -20 to 160° F.
 3. **Shore A Hardness Range:** 15-20; ASTM D 2240.
 4. **Manufacturers:** Dow Corning 890 SL, 888.
- H. **Type 8:** ASTM 834; single component, modified acrylic latex sealant, interior sealant.
 1. **Elongation Capability:** +/-7.5%.
 2. **Service Temperature Range:** 32 to 95° F.
 3. **Manufacturers:**
 - a. Pecora AC 20
 - b. Tremco 834.

2.2 Primers:

- A. Comply with manufacturer's instructions. Manufacturer shall be consulted for all surfaces not specifically covered in submitted application instructions.

2.3 Backer Rod - Tape:

- A. Closed-cell polyethylene, open-cell polyurethane, or open-cell polyethylene soft-type baker rod as recommended by sealant manufacturer. Bond breaker tape shall be used to prevent three-sided adhesion in location where backer rod cannot be used.
- B. **Acceptable Manufacturers:**
 1. **Closed-Cell:**
 - a. ITP, Standard Baker Rod
 - b. Nomaco Standard Backer Rod
 2. **Open-Cell:**
 - a. Denver Foam
 - b. ITP Tundra Foam
 - c. Nomaco.
 3. **Soft-Type:**
 - a. ITP Soft-type
 - b. Nomaco Sof-rod

4. **Bond Breaker Tape:** Pecora Corp.

PART 3 - EXECUTION

3.1 **Examination:**

- A. Protect adjacent exposed surfaces.
- B. Prepare joints in accordance with manufacturer's recommended instructions for maximum adhesion; prime as required by manufacturer.
- C. Consult manufacturer for surfaces not specifically covered in application instructions.
- D. Installation of sealant shall be evidence of acceptance of substrate.

3.3 **Installation:**

- A. Sealant shall be mixed (if multi-component) and installed in accordance with manufacturer's recommendations and instructions to ensure complete mixing and an installed proper width/depth ratio with maximum adhesion contact. Three sided adhesion must be prevented.
- B. Backer rod shall be installed using only blunt or rounded tools which will ensure a uniform(+ or -1/8") depth without puncturing the material. Backer rod shall be a minimum of 33% oversized for closed cell and a minimum of 50% oversized for open cell backer rod, unless otherwise required by the manufacturer.
- C. Surrounding surfaces shall be protected as required to ensure no sealant contaminates these surfaces.
- D. Both temperature and dampness conditions may restrict application of these sealants. Comply with manufacturer's instructions.
- E. Force sealant into joint to ensure conformance with manufacturer's recommended width/depth ratios. Tool to ensure full contact with sidewalls and backing. Tooling pressure shall cause a wetting for maximizing sealant adhesive contact to substrate.
- F. Unless otherwise indicated, finish horizontal joints flush, vertical joints distinctly concave in shape.
- G. Finished bead shall be smooth, free from wrinkles, air pockets, and foreign matter.

3.4 **Cleaning:**

- A. Remove excess material adjacent to joint.
- B. Remove unused materials for jobsite.

3.5 **Schedule:**

Joint Type:

- 1. Structural Glazing. Type 2
- 2. Glass to Glass (Nonstructural).. . . . Type 3
- 3. Perimeter Window Sealant. Type 2 and Type 4
- 4. Aluminum to Brick. Type 4
- 5. Brick to Brick. Type 5
- 6. Wood to Wood and Wood to Vinyl.. . . . Type 6
- 7. Metal to Metal. Type 2 and Type 4
- 8. Metal to Stucco. Type 4

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- 9. Aluminum to Concrete..... Type 4
- 10. Concrete to Concrete.. Type 1
- 11. Stone to Stone..... Type 1
- 12. Paving on Grade (Concrete to Concrete).. Type 7
- 13. Exterior Finish System (EIFS to EIFS)..... Type 1
- 14. EIFS to Masonry. Type 1 and Type 2
- 15. EIFS to Metal..... Type 2 and Type 4
- 16. Wood Trim to Wood. Type 8
- 17. Wood Trim to Gypsum..... Type 8

END OF SECTION 07921

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SECTION 08110

STEEL DOORS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **References:**
- A. **ASTM - American Society for Testing and Materials:**
 - 1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 924 - Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot Dip Process.
 - B. **ANSI - American National Standards Institute:**
 - 1. ANSI/DHI A115 - Specifications for Hardware Preparations in Standard Steel Doors and Frames.
 - 2. ANSI/DHI A115.IG - Installation Guide for Doors and Hardware.
 - 3. ANSI A156.7 - Hinge Template Dimensions.
 - 4. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
 - 5. ANSI A 250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 6. ANSI/SDI 250.11 - Recommended Erection Instructions for Steel Frames
 - C. **SDI - Steel Door Institute:**
 - 1. SDI 105 - Recommended Erection Instructions for Steel frames.
 - 2. SDI 111 - Recommended Details and Guidelines for Standard Steel Doors and Frames and Accessories.
 - 3. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
 - 4. SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
 - 5. SDI 124 - Maintenance of Standard Steel Doors and Frames.
 - D. **NAAMM/HMMA - Hollow Metal Manufacturers Association:**
 - 1. HMMA 840 - Guide Specification for Installation and Storage of Hollow Metal Doors and Frames
 - 2. HMMA 820 TN01- Grouting Hollow Metal Frames

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3. HMMA 820 TN03 - Guidelines for Glazing of Hollow Metal Transom, Sidelight and Windows

E. **Building Code references:**

1. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
2. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives
3. NFPA 252 - Standard Method of Fire Tests of Door Assemblies
4. ANSI/UL 10C - Standard for Safety for Positive Pressure Fire Tests of Door Assemblies
5. Miami-Dade County test protocols PA 201, PA 202 and PA 203.
6. Florida Building Code test protocols TAS 201, TAS 202 and TAS 203

- 1.4 **Requirements of Regulatory Agencies:** Conform to applicable codes for fire ratings. It is the intent of this specification that door hardware and its application comply or exceed the standards for labeled openings. In case of conflicts in required fire protection ratings, provide fire ratings as required by NFPA and UL. Fire door assemblies in exit enclosures and exit passageways: maximum transmitted temperature end point of not more than 450°F (121°C) above ambient at the end of 30 minutes of the standard fire test exposure.

1.5 **Submittals:**

- A. Submit in accordance with Section 01300, Submittals. Include required number of complete copies of the hollow metal shop drawings covering complete identification of items required for the project. Include manufacturer's names and identification of product. Include complete copies of catalog cuts and/or technical data sheets and other pertinent data as required to indicate compliance with these specifications.
 1. **Shop Drawings:** submit complete and detailed with respect to quantities, dimensions, specified performance, and design criteria, materials and similar data to enable the Architect to review the information as required.
 2. ***Include NOA or FBC numbers validating compliance with Miami-Dade County Product Control Approval System of the Florida Building Code Approval System.***
- B. Indicate frames configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive hardware.
- C. Indicate door elevations, internal reinforcement, closure method, and cutouts for glass lights and louvers.
- D. Submit manufacturer's installation instructions, including a current copy of ANSI A250.11 as part of the shop drawing submittal.
- E. **Shop drawings, product data, and samples:** stamp with Contractor's stamp verifying they have been coordinated and reviewed for completeness and compliance with the contract documents.
- F. Shop drawings submitted without the above requirements will be considered incomplete, will NOT be reviewed, and will be returned directly to the Contractor.
- G. Follow the same procedures for re-submittal as the initial submittal with the appropriate dates revised.
- H. Provide evidence of manufacturer's membership in the Steel Door Institute.

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1.6 **Quality Assurance:**

- A. Select a qualified hollow metal distributor who is a direct account of the manufacturer of the products furnished. In addition, that distributor must have in their regular employment an Architectural Hardware Consultant (AHC), a Certified Door Consultant (CDC) or an Architectural Openings Consultant (AOC), who will be available to consult with the Architect and Contractor regarding matters affecting the door and frame opening.
- B. Conform to requirements of the above reference standards. Submit test reports upon request by the Owner or Architect.
- C. Underwriters' Laboratories and Intertek Testing Services / Warnock Hersey, labeled fire doors and frames:
 - 1. Label fire doors and frames listed in accordance with Underwriters Laboratories standard UL10C, and Positive Pressure Fire Tests of Door Assemblies.
 - 2. Construct and install doors and frames to comply with applicable issue of ANSI/NFPA 80.
 - 3. Manufacture Underwriters' Laboratories labeled doors and frames under the UL factory inspection program and in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
 - 4. Manufacture Intertek Testing Services / Warnock Hersey labeled doors and frames under the ITS/WH factory inspection program and in strict compliance to ITS/WH procedures, and provide the degree of fire protection capability indicated by the opening class.
 - 5. Affixed physical label or approved marking to fire doors and/or fire door frames, at an authorized facility as evidence of compliance with procedures of the labeling agency. Labels to be metal, paper or plastic. Stamped or die cast labels are not permitted. Labels are not to be removed, defaced or made illegible while the door is in service as covered in NFPA 80.
 - 6. Conform to applicable codes for fire ratings. It is the intent of this specification that hardware and its application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.
- D. **Manufacturer Qualifications:** Member of the Steel Door Institute.
- E. **Installer:** Minimum five (5) years documented experience installing products specified in this Section.

1.7 **Delivery, Storage, and Handling:**

- A. **Storage of Doors:**
 - 1. Store doors vertically in a dry area, under proper cover. Place the units on at least 4" high wood sills on floors in a manner that will prevent rust and damage. Avoid storage in non-vented plastic or canvas shelters, which create a humidity chamber and promote rusting. If the door becomes wet, or moisture appears, remove protective wrapping immediately. Provide a 4" space between the doors to permit air circulation. Proper storage is required to meet the requirements of ANSI/SDI A250.10 and HMMA 840.

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B. **Storage of Frames:**

1. Store frames in an upright position with heads uppermost under cover on 4" wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters, which create a humidity chamber and promote rusting. Store assembled frames in a vertical position, five units maximum in a stack. Provide a 2" space between frames to permit air circulation.
2. Provide proper storage for doors and frames, to maintain the quality and integrity of the factory applied paint, and maintain the requirements of ANSI/SDI A250.10 and HMMA 840.
3. Sand, touch up and clean prime painted surfaces prior to finish painting in accordance with the manufacturer's instructions.

1.8 **Coordination:**

- A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
- B. Coordinate work with frame opening construction, door and hardware installation.
- C. Sequence installation to accommodate required door hardware.
- D. Verify field dimensions for factory assembled frames prior to fabrication.

PART 2 - PRODUCTS

2.1 **Manufacturers:**

- A. Acceptable manufacturers for doors and frames specified are listed below. Only the products of the listed manufacturers will be accepted. No alternates will be accepted.
 1. Steelcraft, Cincinnati, Ohio
- B. Provide steel doors and frames from a single manufacturer.

2.2 **Doors:**

- A. Provide doors designed to resist the cyclic pressures and static pressures as detailed in the Miami-Dade County Product Control Approval System of the Florida Building Code Approval System and meets the requirements of Miami-Dade County test protocols PA 201, PA 202, PA 203 and Florida Building Code test protocols TAS 201, TAS 202 and TAS 203. Provide mylar Florida Building Code and Miami-Dade labels on all exterior doors.
- B. **Construct Exterior/interior Doors to These Designs and Gages:**
 1. **Exterior Doors:** zinc-iron alloy-coated galvanized steel, ASTM A 653, Class A60, 16 gage or 14 gage zinc-iron alloy-coated galvanized steel, with closed tops.
 - a. Include galvanized components and internal reinforcements with galvanized doors.
 - b. Close tops of exterior swing-out doors to eliminate moisture penetration. Galvanized steel top caps are permitted.
 2. Factory prime painted doors indicated on door schedule as HM.
 3. **Hardware Reinforcements:**

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- a. **Hinge reinforcements for full mortise hinges:** minimum 7 gage.
 - b. **Lock reinforcements:** minimum 16 gage.
 - c. **Closer reinforcements:** minimum 14 gage, 20" long.
 - d. **Galvannealed doors:** include galvannealed hardware reinforcements.
 - e. Projection welded hinge and lock reinforcements to the edge of the door.
 - f. Provided adequate reinforcements for other hardware as required.
4. **Glass moldings and stops (both labeled and non-labeled doors):**
- a. Fabricate glass trim from 24 gage [.6mm] steel conforming to:
 1. Interior openings: ASTM designation A 366 cold rolled steel
 2. Exterior openings: ASTM designation A 924 Zinc-Iron Alloy-Coated galvannealed steel with a zinc coating of 0.06 ounces per square foot (A60) for exterior openings.
 - b. Install trim into the door as a four sided welded assembly with mitered, reinforced and welded corners.
 - c. **Trim:** identical on both sides of the door.
 - d. Exposed fasteners are not permitted. Labeled and non-labeled doors: use the same trim.
 - e. Acceptable mounting methods:
 1. Fit into a formed area of the door face, not extending beyond the door face, and interlocking into the recessed area
 2. Cap the cutout not extend more than 1/16" from the door face.
- C. **Full Flush Type Doors Construction:**
1. ANSI-A250.4 criteria and tested to 5,000,000 operating cycles.
 2. **Approved door core constructions:** Reinforced, stiffened, sound deadened and insulated with a rigid polystyrene core bonded to the inside faces of both panels with contact adhesive. Fill voids around the perimeter of the door with honeycomb.
 3. **Welded Vertical Edges (W):** Continuous vertical mechanical interlocking joint; edge seams welded, epoxy filled, and ground smooth.
 4. Bevel hinge and lock door edges 1/8 inch in 2 inches. Square edges on hinge and/or lock stiles are not acceptable.
 5. Reinforce top and bottom of doors with galvannealed 14 gage, welded to both panels.
- D. **Schedule:**
1. **Exterior Classroom Doors & Other Flush Doors:** Provide HE16 Series Embossed Panel Door, with Miami-Dade NOA 07-0829.04 (Florida Approval FL12400).
 2. **Exterior Double Entry Doors:** Provide HE16 Series Embossed Panel Doors with half-lite (E2G configuration), with Miami-Dade NOA 07-0829.05 (Florida Approval FL12400).

2.3 Fabrication:

- A. **Face Welded Frames:**
1. Continuous face weld the joint between the head and jamb faces along their length either internally or externally. Grind, prime paint, and finish smooth face joints with no visible face seams.

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2. Externally weld, grind, prime paint, and finish smooth face joints at meeting mullions or between mullions and other frame members per a current copy of ANSI/SDI A250.8.
 3. Provide two temporary steel spreaders (welded to the jambs at each rabbet of door openings) on welded frames during shipment. Remove temporary steel spreaders prior to installation of the frame.
- 2.4 **Finish:** Doors, frames and frame components are required to be cleaned, phosphatized, and finished with one coat of baked-on rust inhibiting prime paint in accordance with the ANSI/SDI A250.10 "Test Procedures and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

PART 3 - EXECUTION

3.1 **Installation:**

- A. Install doors and frames in accordance with Steel Door Institute's recommended erection instructions for steel frames ANSI A250.11.
- B. Install label doors and frames in accordance with NFPA-80.
- C. Remove temporary steel spreaders prior to installation of frames.
- D. Set frames accurately in position; plumb, align and brace until permanent anchors are set. After wall construction is complete, remove temporary wood spreaders.
- E. Provide full height 3/8" to 1-1/2" thick strip of polystyrene foam blocking at frames requiring grouting where continuous hinges are specified. Apply the strip to the back of the frame, where the hinge is to be installed, to facilitate field drilling or tapping.
- F. Where grouting is required in masonry, provide and install temporary bottom and intermediate wood spreaders to maintain proper width and avoid bowing or deforming of frame members. Refer to ANSI A250.11-2001, Standard.
 1. Hollow Metal Frames to receive grouting: comply with a current copy of ANSI/SDI Standard A250.8, paragraph 4.2.2, whereby grout will be mixed to provide a 4" maximum slump consistency and hand troweled into place. Do not use grout mixed to a thinner, pumpable consistency; this practice is not recommended and not permissible. Refer to HMMA 820 TN01 Grouting Hollow Metal Frames.
- G. Provide a vertical wood brace during grouting of frame at openings over 4'0" wide, to prevent sagging of frame header.
- H. Glaze and seal exterior transom, sidelight and window frames in accordance with HMMA-820 TN03.
- I. Apply hardware in accordance with hardware manufacturers' instructions and Section 08710, Finish Hardware, of these Specifications. Install hardware with only factory-provided fasteners. Adjust door installation to provide uniform clearance at head and jambs, to achieve maximum operational effectiveness and appearance.

3.2 **Adjusting:**

- A. **Final Adjustments:** Adjust operating doors and hardware items just prior to final inspection and acceptance by the Owner and Architect. Leave work in complete and

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proper operating condition. Remove and replace defective work, including doors or frames that are damaged, bowed or otherwise unacceptable.

B. **Prime Coat Touch-Up:** Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

3.3 **Protection:** Provide protective measures required throughout the construction period to ensure that door and frame units will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08110

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SECTION 08111

STEEL FRAMES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** This Section includes hollow metal frames for doors, transoms and windows, and all related items necessary for the work indicated and specified.
- 1.4 **Related Work Specified Elsewhere:**
- A. Finish Hardware, Section 08710, Finish Hardware.
- 1.5 **Submittals:**
- A. Comply with Section 01300, Submittals.
 - B. Before fabricating any item, submit properly identified manufacturer's catalogs and literature on proposed items, and Shop Drawing layouts, complete enough in detail for review.
 - C. Shop Drawings shall indicate elevations of each frame type, location in the building for each item, conditions at openings with various wall thickness and materials, typical and special details of construction, methods of assembling sections, location and installation requirements for hardware, size, shape and thickness of materials, joints and connections, method of frame anchorage, and material finishes.
 - D. Where fire labels are indicated, doors and frames shall conform to all applicable requirements and shall bear F.M. or UL fire labels. Place fire labels in jamb between top and middle hinges.
- 1.6 **Product Handling:** Store frames on end, with spacers between doors for ventilation, and in protected area.

PART 2 - PRODUCTS

- 2.1 **Manufacturers:**
- A. Approved Manufacturers:
 - 1. Steelcraft

2.2 Door and Transom Frames:

A. Material:

1. Electro-zinc coated bonderized sheet steel.
2. Sheet steel shall conform to requirements of ASTM A366.
3. Electro-zinc coating shall conform to requirements of ASTM A591 or ASTM B-633-78.
4. Frames shall be 16 gauge steel minimum thickness.

B. Workmanship:

1. Weld units to sizes and shapes detailed in the Drawings.
2. Exposed welds shall be ground smooth and filled so that welds are invisible.

C. Heads: Door and transom frame heads shall have a minimum 12 gauge reinforcement for closers, holders, and similar items, as required.

D. Hardware Reinforcement:

1. Reinforce door frames as necessary for installation of hardware, in accordance with ANSI A-115 and A-156.7 with minimum hinge reinforcement of 7 gauge.
2. Punch door stops to receive rubber silencers as required.
3. Provide for three silencers on lock side of single door frame and two (2) silencers at head of double door frames.

E. Frames Set in Masonry or Concrete:

1. Provide ten (10) inch long adjustable 16 gauge "T" shaped anchors spaced not over 24" o.c., 3 each side, equally spaced, extending from each side of jamb.
2. Provide 16 gauge floor clips welded to each jamb, punches for anchoring to floor. Where indicated on Drawings, provide adjustable floor clips.

F. Spreaders: Provide temporary steel spreaders fastened across bottom of door frames. Leave spreaders in place after installation.

G. Provide for Frame Connections: Where hollow metal window frames are indicated abutting door frames, and where connection of dissimilar frames is required, make provisions in frames for welding, or to receive connector splines or connector plates.

2.3 Fixed Interior Window Frames:

A. Window Frames:

1. Standard sizes and shapes as indicated on the Drawings.
2. Prepared for fixed sash glazing with removable steel glazing beads.
3. Verify glass thickness with details and schedules.

B. Workmanship: Continuously weld frame corners and grind off exposed welds smooth and flush, and filled so that welds are invisible.

C. Glazing Beads: Provide 18 gauge electro-zinc coated steel removable channel type glazing beads punched and countersunk for fasteners. Provide cadmium or zinc plated oval head screws at maximum three (3) inches from each end and approximately 12 inches o.c. between, tapped into frames.

2.4 Finishing: All manufacturing defects shall be filled with a two-part epoxy type filler and sanded to result in a smooth surface after priming. Clean all zinc-coated and bonderized surfaces to assure maximum paint adherence. Provide all frames with a full immersion

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dip coat of rust-inhibitive metal primer to reach all accessible and hidden surfaces. Provide all door and transom panels with a full cover spray coat of rust-inhibitive metal primer. Frames, doors and panels shall be dried by passing through a baking oven process.

PART 3 - EXECUTION

3.1 Installation:

- A. Erect door, transom and window frames plumb, level, parallel to walls, and at height and locations indicated.
- B. Secure each jamb floor clip to concrete floors with two 1/4-inch diameter galvanized bolts set in drilled in tamp-ins. Power nailing to floor may be used where practical.
- C. Brace frames in masonry adequately so that walls and partitions may be erected against same. Brace frame jambs and heads receiving poured concrete adequately to resist concrete pressure.
- D. Secure door frames set against previously placed masonry or concrete by 3/8-inch diameter galvanized countersunk flat head screws in suitable shields or toggles as required.
- E. Erect fixed window frames at height and locations indicated, plumb and level, by means of the adjustable clips or suitable supports. Anchor frames to structure as indicated.

3.2 Protection:

- A. Frames shall be protected from damage by other trades until final acceptance of the project.
- B. Frames which have been damaged shall be repaired as follows:
 1. Minor dents shall be filled with a two-part epoxy type filler and sanded to result in a smooth surface after priming.
 2. Clean all zinc-coated and bonderized surfaces to assure maximum paint adherence.
 3. Repair shall be inspected by the Architect prior to painting. If the repair is not satisfactory, the door shall be replaced at the Contractor's expense.

END OF SECTION 08111

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SECTION 08211

WOOD DOORS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Work includes, but is not limited to, furnishing flush wood doors, installation of flush wood doors, and accessories.
- 1.4 **Quality Assurance:**
- A. Allowable tolerances for fabrication of doors:
 - 1. **Size:**
 - a. Plus or minus 1/16" overall dimensions scheduled in the Drawings.
 - b. Maximum Warp: 1/8".
 - c. Squareness: Length of diagonal measured on the face of the door from upper right hand corner to lower left hand corner between the length of the diagonal measured on upper left corner to lower right corner. Maximum difference of 1/4".
 - d. Prefitting and pre-machining for hardware: AWI standard procedures and recommendations.
- 1.5 **Submittals:**
- A. Comply with Section 01300, Submittals.
 - B. **Samples:** Submit two (2) samples showing face veneers and finish of doors.
 - C. **Shop Drawings:**
 - 1. Show details of Door Construction:
 - a. Full size molding section detail for glass light installation.
 - b. Glazing material.
 - c. Face Veneer Species.
 - 2. **Prefitting and Pre-Machining Doors:** Prepare in accordance with Hollow Metal Frame Shop Drawings and Schedule, Hardware Schedule and templates, furnished before doors are fabricated. Refer to Drawings for special mounting heights for door latches and vision panels as required for Educational Facilities for handicapped children.

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3. **Door Schedule:** Indicate opening, identifying symbol, sizes, door type and grade, and show swing and like cut-out sizes and location and undercuts.
- D. Furnish certificates of compliance for fabrication and test requirements signed by authorized representative of door manufacturing company.

1.6 Product Handling:

- A. **Delivery:**
 1. Deliver door to site after all masonry has dried and the building has reached average prevailing relative humidity of locality.
 2. Deliver pre-finished doors in manufacturer's original unopened protective material or container, clearly marked with manufacturer's name, brand name, size, thickness and identifying symbol and covering.
 3. Seal all four edges of doors when delivered to project site.
- B. **Storage:**
 1. Store flat on 2" x 4" lumber laid 12" from ends and across center.
 2. Under door bottom and over top of stack, provide plywood or corrugated cardboard to protect door surface.
 3. Store doors in area where there will be no great variations in heat, dryness, and humidity.
- C. **Handling:** Do not drag doors across one another.
- D. **Damaged Doors:** Reject all doors that are damaged, abused, scratched, or otherwise marred. Final decision on damaged doors rests with the Architect.

1.7 Guarantee:

- A. Manufacturer's written life-time warranty for material and workmanship.

PART 2 - PRODUCTS

2.1 Approved Manufacturers:

- A. The following manufacturers are approved:
 1. Algoma
 2. Eggers
 3. Weyerhaeuser

2.2 Materials:

- A. **Door Standards:** AWI flush door standards.
- B. **Wood Veneer:**
 1. **Quality Grade:** AWI premium for smooth-cut veneer joints.
 2. **Species:** Rotary-cut Birch. Face veneers to match as close as possible to all doors.
 3. **Core:** Staved Lumber Core Door: AWI Spec. Sec. 1300 and 1500.
 - a. 5-ply pre-manufactured hardwood skins, glued block core, styles and rails bonded to cores.

2.3 Fabrication:

- A. **Moisture Content:** 12% maximum at time of fabrication for all wood material.

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- B. **Solid Core:**
 - 1. Glued block core, blocks 2-1/2" maximum width, bonded together, end joints staggered in adjacent rows.
 - a. Bond face panels to core.
 - b. Style and rail edge bands 5/8" minimum width bonded to core.
- C. **Light Openings:**
 - 1. Wood vision panel frames with space bar for 1/4" tempered glass lite. Frame is to be finished to match the door face.
- D. **Factory Preparations:**
 - 1. **Prefitting:**
 - a. **Swinging Doors:** Standard clearance allowances of 1/8" at each side and 1/2" from bottom to decorative floor covering,.
 - b. Bottom of clearance allowance of doors with threshold, 1/4" from bottom of door to top of threshold.
 - 2. **Pre-Machining:**
 - a. Bevel on Vertical Edges of Single Door: 1/8" in 2".
 - b. Locate hinge moors from top of doors to top of hinge, 1/32" clearance in height and width with depth sufficient to provide a flush surface when installed.
 - c. **Mortise for Face Plates:** 1/64" larger in width and height, depth to provide a flush surface when installed.
 - d. Lock clearances as recommended by finish hardware manufacturer.
- E. **Pre-Finishing:**
 - 1. Factory-finish door faces, moldings, lights and side edges with manufacturer's standard finishing system.
 - 2. Seal top and bottom edges.
 - 3. Color as selected by Architect from standard range.

PART 3 - EXECUTION

3.1 Inspection:

- A. Verify that door frames are of type required for door and are installed as required for proper installation of doors.
- B. Do not install doors in frames which would hinder the operation of the doors.

3.2 Installation:

- A. **Fitting and Machining:**
 - 1. Provide template from Hardware Supplier for butt placement.
 - (a) Cut light openings in doors, not exceeding maximum sizes as specified in the Drawings and as permitted by door manufacturer.
- B. **Installation of Doors:**
 - 1. Follow door manufacturer's written instructions for all installation work.
 - 2. **Clearances:**
 - a. Allow maximum 1/8" of jam and head job fit doors.
 - b. Allow maximum of 3/16" at jamb and head for pre-fit doors.
 - c. Allow maximum of 3/16" over thresholds or saddles.

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- d. Allow maximum of ½" over decorative floor coverings.

3.3 Adjust and Clean:

- A. Replace or rehang doors which are hinge-bound, or do not swing or operate freely in the opinion of the Owner or Architect.
- B. Replace refinished doors damaged during installation to include, but not be limited to, scratches, damaged, or marred surfaces. The Architect shall be the final judge on the extent of damage and the need to replace the door.
- C. Refinish or replace job finished doors damaged during installation. If the refinished door does not meet the satisfaction of the Architect, it shall be replaced at the Contractor's expense.

END OF SECTION 08211

SECTION 08400

ALUMINUM STOREFRONT WINDOWS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Furnish and install aluminum architectural storefront system complete with hardware and related components as shown on drawings and specified in this section.
 - B. The Basis of Design for the storefront systems shall be ***EFCO System 402 Flush-Glazed Screw Spine Storefront.***
 - C. **Glass:** Glass is described in this Section.
 - D. **Single Source Requirement:** All products shall be by the same manufacturer.
- 1.4 **Related Work Specified Elsewhere:**
Section 08710, Finish Hardware.
Section 07921, Sealants.
- 1.5 **Quality Assurance:**
- A. For purposes of designating type and quality for aluminum storefront work, the products of EFCO are shown on the Drawings and referenced in the Specifications. Other manufacturers who offer similar or equal products in design and performance may be considered.
 - B. Drawings, elevations and details shown indicate spacing of members, and profile and similar dimensional requirements of the work. Minor deviations may be accepted in order to utilize manufacturer's standard products when, in the Architect's judgement, such deviations do not materially detract from quality, design concept, or intended performances. Indicate proposed deviations clearly on Shop Drawings.
 - C. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.6.
 - D. Test reports shall be accompanied by the storefront manufacturer's letter of certification stating that the tested storefront meets or exceeds the referenced criteria for the appropriate storefront type.

1.6 **Performance Requirements:**

- A. **Standard:** Comply with applicable sections of ASTM and provisions of "*Metal Curtain Wall, Window, Storefront and Entrance Guide Specifications Manual*" by AAMA.
- B. **Structural Performance:** Provide aluminum storefront capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
 - 1. **Design Wind Loads:** Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2 - Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - a. **Basic Wind Speed:** 110 mph
 - b. **Importance Factor:** 1.10
 - c. **Exposure Category:** B
 - 2. ***Provide evidence of Florida Product Approval or Miami-Dade Notice of Acceptance reports as evidence of compliance with Florida codes.***
- C. **Deflections and Thermal Movements:** Provide systems which are capable of withstanding building movements and accommodating deflections within the following provisions or limitations:
 - 1. Normal-to-wall deflection not exceeding 1/180 of span.
 - 2. Parallel-to-wall deflections not exceeding 75% of glass edge clearance.
 - 3. Thermal movements resulting from maximum ambient temperature range of 40°F.
- D. **Leakage Resistance, Water and Air:** Provide system which has been tested to demonstrate permanent resistance to leakage as follows, with a test pressure differential of 20% of design loading, excluding operable door edge joints.
 - 1. Air infiltration of not more than 0.06 CFM per square foot, per ASTM E283.
 - 2. No uncontrolled penetration of water, per ASTM E331.
- E. **Test Procedures and Performance for Storefront:**
 - 1. **Air Infiltration Test:**
 - a. Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf (299 Pa).
 - b. Air infiltration shall not exceed 0.06 cfm/SF (.30 l/som²) of unit.
 - 2. **Water Resistance Test:**
 - a. Test unit in accordance with ASTM E 331.
 - b. There shall be no uncontrolled water leakage at a static test pressure of 12.0 psf (575 Pa).
 - 3. **Uniform Load Deflection Test:**
 - a. Test in accordance with ASTM E 330.
 - b. Deflection under design load shall not exceed L/175 of the clear span.
 - 4. **Uniform Load Structural Test:**
 - a. Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in 1.6.B.

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- b. At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.

1.7 Submittals:

- A. Comply with Sections 01150 and 01300, Submittals.
- B. Submit manufacturer's data on system, including both published data and supplementary data, for project, and including certified test reports where required. Submit fabrication specifications and installation instructions, including erection and glazing.
- C. Submit Shop Drawings showing adaptation of manufacturer's standard system to project. Include elevations and details to show dimensioning, members, anchorage system, interface with building construction and glazing. Show erection moduli of wind-load-bearing members, and calculations for stresses and deflections under design loading.
- D. Provide written warranty, agreeing to repair or replace defective materials and workmanship of aluminum storefront work during warranty period. "Defective" is defined to include abnormal deterioration, aging or weathering, glass breakage, failure of operational parts to function normally, deterioration or discoloration of finishes, and failure of system to meet performance requirements, including structural and infiltration.
- E. **Maintenance Instructions:** Submit manufacturer's printed cleaning and maintenance instructions and recommendations for each installed item.
- F. **Product Test Reports:**
 1. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.6.
 2. Test reports shall be accompanied by the storefront manufacturer's letter of certification stating that the tested storefront meets or exceeds the referenced criteria for the appropriate storefront type.
 3. Test reports shall be accompanied by the entrance door manufacturer's letter of certification stating that the tested door meets or exceeds the referenced performance standard for the appropriate door type.

1.8 Warranties:

- A. **Total Storefront Installation**
 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total storefront installation. This includes the glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the specifications and approved shop drawings.
 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
- B. **Window Material and Workmanship**
 1. Provide written guarantee against defects in material and workmanship for 5 years from the date of final shipment.

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C. **Glass**

1. Provide written warranty for insulated glass units that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.
2. Warranty period shall be for 10 years.

D. **Finish**

1. Warranty period shall be for 10 years from the date of final shipment.

PART 2 - MATERIALS

2.1 **Manufacturers:**

A. **Acceptable Manufacturers:**

1. EFCO System 402 Flush-Glazed Screw Spline Storefront.
2. Kawneer Trifab 451 Storefront.

B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 **Materials and Components:**

- A. **Framing:** Extruded aluminum shall be 6063-T6 alloy and temper. Vertical and horizontal framing members shall have a nominal face dimension of 2".
- B. **Glass:** Insulating-Glass Units shall be factory-assembled units consisting of dual-sealed lites of glass separated by a dehydrated interspace, with manufacturer's standard spacer material and construction, per ASTM E774 and E2190.
 1. **Exterior Insulated Glazing:** Solar Control Low-E Clear Insulating-Glass Units (IG#4):
 - a. **Unit Overall Thickness:** 25 mm.
 - b. **Interspace Content:** Argon.
 - c. **Outdoor Lite:** Class 1 (clear) float glass, 6 mm minimum thickness.
 - (1) **Kind:** FT (fully tempered) - all locations.
 - (2) **Solar Control Low-E Coating:** Sputtered (soft coat) on second surface.
 - (3) **Basis of Design Product:** PPG Industries, Inc., Solarban 60.
 - d. **Indoor Lite:** Class 1 (clear) float glass, 6 mm minimum thickness.
 - (1) **Kind:** FT (fully tempered) - all locations.
 - e. **Visible Light Transmittance (VLT):** 70 percent minimum.
 - f. **Winter Nighttime U-Factor:** 0.29 maximum.
 - g. **Summer Daytime U-Factor:** 0.27 maximum.
 - h. **Solar Heat Gain Coefficient (SHGC):** 0.38 maximum.
 - i. **Outdoor Visible Light Reflectance:** 11 percent maximum.
 - j. **Light to Solar Gain (LSG):** 1.84 minimum.
- C. **Doors:** All Exterior Doors are Steel in Steel Frames. See Sections 08110 and 08111.
- D. Fasteners, where exposed, shall be aluminum or stainless steel.

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- E. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
- F. All screws and miscellaneous fasteners shall be aluminum, stainless steel, or zinc-plated, in accordance with ASTM A-164.

2.3 Fabrication:

A. General:

- 1. All aluminum frame extrusions shall have a minimum wall thickness of .080" (2 mm).
- 2. All exposed work shall be carefully matched to produce continuity of line and design with all joints. System design shall be such that raw edges will not be visible at joints.

B. Frame:

- 1. Depth of frame shall not be less than 4 1/2" (114 mm).
- 2. Face dimension shall not be less than 2" (50 mm).
- 3. Frame components shall be screw spline construction.

C. Glazing:

- 1. All units shall be "dry-glazed" with gaskets on both exterior and interior of the glass.

D. Glazed framing members shall provide for fully resilient glass settings.

2.3 Finishes:

A. All exposed surfaces of aluminum framing members, accessories and fasteners, shall be free of scratches and other serious surface blemishes.

B. Anodic:

- 1. Finish all exposed areas of aluminum windows and components in accordance with Architectural Class I Type AA-M10-C22 A44.
- 2. Thickness shall be 7 mils min.
- 3. Color shall be **Dark Bronze**.

PART 3 - EXECUTION

3.1 General:

- A. Comply with manufacturer's instructions for protection, handling, and installation of fabricated components, with particular attention and care in preservation of applied finishes. Discard or remove and replace damaged members.
- B. **Erection Tolerances:** Limit variations from plumb and level to 1/8" to 12' vertically, 1/8" in 20' horizontally. Limit variation from theoretical location to 1/4" for any member at any location. Limit offsets in theoretical end-to-end and edge-to-edge alignments to 1/16" for flush surfaces not more than 2" apart and 1/8" for surfaces more than 2" apart.
- C. Anchor components securely in place in a manner indicated, shimming and allowing for required movements, and provide separators and isolators to prevent corrosion and electrolytic deterioration, and to prevent "freeze-up" of moving joints.

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3.2 **Installation:**

- A. All items specified under this Section shall be set in their correct locations as shown in the details, and shall be level, square, plumb, and at proper elevations and in alignment with other work, in accordance with the manufacturer's installation instructions and approved Shop Drawings. All joints between framing and the building structure shall be sealed in order to secure a watertight installation.
- B. All frame materials shall be fastened in place using backing, masonry plugs, or anchor straps as required.

- 3.3 **Protection and Cleaning:** After installation, adequately protect exposed portions of the aluminum storefront work from damage by grinding and polishing compounds, plaster, lime, acid, cement, or other contaminants. Final cleaning shall be as recommended by the manufacturer.

END OF SECTION 08400

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Work under this section consist of furnishing and installing items known commercially as builders hardware as specified in this section and noted on the drawings for a complete and operational system, including electrified hardware, controls, finish hardware for aluminum entrance doors and door operators.
 - B. Items include but are not limited to the following:
 - 1. Hinges
 - 2. Mullions
 - 3. Flush Bolts
 - 4. Coordinators
 - 5. Locks
 - 6. Exit Devices
 - 7. Door Closers
 - 8. Push Plates
 - 9. Door Pulls
 - 10. Protective Plates
 - 11. Door Stops and Holders
 - 12. Thresholds and Weather-stripping
 - 13. Silencers
- 1.4 **Related Work:**
- A. Refer to the following sections for these products:
 - 1. Section 08110: Standard Steel Doors
 - 2. Section 08111: Standard Steel Frames
 - 3. Section 08210: Wood Doors
- 1.5 **Quality Assurance:**
- A. **Standard of Quality:** Manufacturers and model numbers listed in Part 2 of this section have been set to establish a standard of quality, design and function. Only

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those manufacturers and model numbers listed herein as approved and meet the requirements are to be furnished on this project. Obtain each type of hardware (Hinges, Locks, Exit Devices, Closers, etc.) from a single manufacturer, although several may be listed as acceptable.

B. **Substitutions:**

1. Only those products specifically listed in Part 2 of this section as approved or equal by manufacturer name and product number are acceptable.
2. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

C. **Supplier:** The Hardware supplier is to be a qualified direct distributor of the products to be furnished, and is to regularly engage in furnishing products on projects of similar size and requirements. In addition, the supplier is to have in their regular employment a Certified Architectural Hardware Consultant who will be made available at reasonable times to consult with the Architect, General Contractor and/or the owners representative regarding any matters that affect the project, inspect and direct detailing, applying, and adjusting of all hardware.

D. **Fire-rated Hardware:** Furnish hardware for fire-rated openings that meet NFPA 80 and the local building codes. Furnish only hardware that has been tested and listed by UL or FM for fire-rated openings. All labeled doors to have ball-bearing steel hinges, a door closer and a lockset to meet the requirements of NFPA 80. Where exit devices are specified or required on Fire Rated Doors furnish only those devices that have been tested and listed "FIRE EXIT HARDWARE."

1.7 **References:**

- ### A. The following codes are referenced for this work:
1. NFPA 80 Fire Doors and Windows 1995 Edition
 2. NFPA 101 Life Safety Code 1994 Edition
 3. NFPA 105 Installation of Smoke-Control Door Assemblies 1989 Edition
 4. ADA The Americans with Disabilities Act: Title III Public Accommodations
 5. ANSI A117.1: American National Standards Institute: Accessible and Usable Buildings and Facilities.
 6. UL: Underwriter's Laboratories
 7. WHI: Warnock Hersey International
 8. DHI: Door and Hardware Institute
 9. FBC: Florida Building Code

1.8 **Submittals:**

- ### A. Submit schedules in accordance with Section 01300, Submittals.
- ### B. **Schedules:** Provide Finish Hardware Schedules detailing each opening individually within two weeks after receipt of purchase order. Use the Vertical format scheduling method as outlined in the DHI brochure "Sequence and Format for the Hardware Schedule". The horizontal format will not be allowed. Schedule each floor and each building separately. Separate fire rated doors and non-rated doors using different headings. Separate doors of different sizes in headings that have all doors of the same size and like hardware. Provide six (6) copies.

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- C. **Samples:** Provide samples of the products listed in the Schedule as required by the Architect. Furnish one (1) item that is representative of the manufacturer series that is being supplied.
- D. **Templates:** Within one (1) week after receipt of an approved Hardware Schedule provide template information to related door and frame suppliers to prepare for the installation of mortise hardware and reinforcement of surface-mounted hardware. Provide three (3) copies for distribution.
- E. **Product Data:** Together with the Finish Hardware Schedule provide catalog cuts highlighting each item that is being proposed, including appropriate ANSI/BHMA criteria and special mounting instructions. Provide six (6) copies.
- F. **Keying Schedule:** Keying will be provided by the Owner during construction.
- G. **Cycle Testing:** Submit independent lab test verifying the minimum cycle test requirements listed with this specification for locksets, door closers and exit devices. Provide six (6) copies.

1.9 **Delivery, Storage and Handling**

- A. **Delivery:** Deliver hardware to the job site in the manufacturer's original packages. Tag and mark each item of package to correspond with the door and heading number on the finish hardware schedule. Include installation instructions and custom wiring diagrams for electrified hardware. Inventory hardware jointly with a representative of the General Contractor and the Hardware Supplier until both are satisfied with the count.
- B. **Storage:** Store material in a dry, secured area, within the building, free from dust and dirt within a controlled environment.
- C. **Handling:** Provide strict control over access to the storage area so that completion of the work will not be delayed due to hardware losses.

1.10 **Warranty:** Submit warranties in accordance with Division 1, General Requirements and Contract Documents. This requirement does not take the place of Division 1 requirements but is in addition to the Warranties and Bonds section. This warranty shall cover against defects in materials and workmanship, commencing with Substantial Completion of the project.

1.	All Finish Hardware	1 Year
2.	Locks	5 Years
3.	Exit Devices	3 Years
4.	Door Closers	10 Years

PART 2 - PRODUCTS

2.1 **Materials:**

- A. **Screws and Fasteners:** Provide all necessary screws, bolts and fasteners of suitable size and type to anchor the hardware properly. Fasteners are to match the finish and the base metal of the applied item. Provide the manufactures standard and recommended fasteners to template. Furnish fasteners where required with expansion shields, toggle bolts, and other anchors designated by the Architect according to the hardware requirements. All door closers and exit devices applied to labeled wood doors shall be thru-bolted. Thresholds are to be secured with machine

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screws and set with an adjustable sill anchor. All hardware applied to exterior doors shall be of non-ferrous material matching the finish of the hardware specified for interior openings or as specified in 3.6 of this section.

- B. **Hinges:** Provide hinges as specified in 3.6 of this section. Furnish five-knuckle, heavy duty, button tip, full mortise template type hinges with non-rising loose pins at exterior doors, interior openings with exit devices and high frequency openings. Provide five-knuckle, standard duty, button tip, full mortise template hinges with non-rising loose pins at all other interior openings. At exterior locations and reverse bevel openings provide with non-removable pins. Furnish one (1) hinge for every 30 inches in door height or fraction thereof with a minimum of two (2) hinges per leaf. For doors up to 36 inches in width provide hinges 4.5 inches in height; for doors over 36 inches and up to 48 inches in width provide hinges 5.0 inches in height. The width of the hinges are to be sufficient to clear all trim and allow the door to swing 180 degrees. Exterior doors and secured reverse bevel doors are to be furnished with non-removable pins or security stud. Use ball bearing steel hinges on labeled door openings and non-ferrous hinges on exterior doors or doors located in high humidity areas.
1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Hager
 - b. Stanley
 - c. McKinney
- C. **Mullions:** Provide keyed removable mullion. Removable mullions are to be hardware type with cylinder latch for mullion removal. Latch cylinder shall be a keyed removable core cylinder. All mullions are to be steel (aluminum is not allowed).
1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Von Duprin
- D. **Flush Bolts:** Provide flush bolts of the type listed in 3.6 of this section. Manual flush bolts are to have a length that will position the lever at no more than 6 feet above the finished floor. Automatic flush bolts are to be applied at labeled pairs of doors. Furnish a dust-proof strike at each set of flush bolts specified.
1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Ives
 - b. Rockwood
- E. **Coordinators:** Provide a coordinator wherever the specified hardware requires that one door close before the other or when an overlapping astragal is used. Coordinator is to be of the type that mounts flat to the stop and extends through the

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full width of the frame with the use of a filler bar. A coordinator that mounts on the face of the frame is not acceptable.

1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Ives
 - b. Rockwood

- F. **Locks:** Provide locks of the type and function listed in 3.6 of this section. Provide heavy-duty commercial mortise locks that exceed ANSI A156.13, Series 1000, Grade 1 Operational and Grade 1 Security and have been cycle tested to 6,000,000 cycles. Provide certification of cycle testing by independent lab testing organization with complete documentation and must be submitted to the Clay County School Board to show compliance with this specification. Provide lock body that can be rehanded on site without disassembling the lock case. High strength steel alloy cylinder retainer and a replaceable breakaway spindle preventing damage to lever trim and internal lock case components as standard. All lever trim shall be of the solid cast type, no hollow levers will be accepted. Trim is to be applied by threaded bushing with no exposed screws. The latchbolt is to be a 2-piece anti-friction stainless steel mechanism, with 3/4 inch throw. Deadbolts are to have a 1-inch throw. Provide manufacturers standard wrought box strike for each latchset, with curved lip extended to protect the frame.

1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Schlage L9000 17A
 - b. Best 35H 14H
 - c. Sargent LNP

- G. **Exit Devices:** Furnish exit devices of the type and function listed in 3.6 of this section. Provide devices that are UL Listed for Accident Hazard, or when applied to fire rated doors, UL Listed "Fire Exit Hardware" and meets or exceeds ANSI A156.3 Grade 1 and have been cycle tested to 1,000,000 cycles. Provide certification of cycle testing by independent lab testing organization with complete documentation and must be submitted to the Clay County School Board to show compliance with this specification. All devices are to have deadlatch feature. Supply a dampener as standard that will decelerate the push pad to reduce the noise of operation. Provide break away lever trim at locations exposed to abuse or vandalism free wheeling levers are not acceptable. Provide all accessories necessary for a complete and proper installation. Where molding from lite kits may interfere with the exit device provide glass bead kits to secure the device to the door.

1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Von Duprin 99 Series
 - b. Equals as approved by the Architect and the Clay County School Board.

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- H. **Door Closers:** Furnish door closers of the type listed in 3.6 of this section. Closers are to exceed ANSI A156.4 Grade 1 and have been cycle tested to 10,000,000 cycles. Provide certification of cycle testing by independent lab testing organization with complete documentation and must be submitted to the Clay County School Board to show compliance with this specification. Provide fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons, aluminum closers are not acceptable. The pinion shaft to have a minimum diameter of 11/16". Hydraulic regulation controlled by tamper proof non-critical valves with separate adjustments for backcheck, latch and closing speed. Door closers shall not have pressure relief valves (PRV's), these valves are not acceptable. Arms are to be constructed of forged steel stamped steel not acceptable. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 (1997) and UL 10C. Provide closers with regular arm, parallel arm or top jamb mount as required to keep corridors clear and for proper installation. Provide all brackets, arms and plates as necessary for complete installation. Size closers according to the manufacturer's recommendations for the size and location of the door. Where multi-sized closers are required size closers to the proper setting at the factory. Provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.
1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. LCN 4010/4110
 - b. Rixson PRM2020
 - c. Sargent 250
 2. **S.R.I.** = Special Rust Inhibiting process
- I. **Protective Plates:** Furnish armor plates, kick plates and mop plates as specified in 3.6 of this section. Provide armor plates, kick plates and mop plates 32 inches, 8 inches and 4 inches in height respectively. For the width of the plates furnish 2 inches less the door width on the push side of the door for single doors and 1 inch less the door width on the pull side and on the push side of pairs of doors. Bevel three edges and provide in 0.05 in thickness.
1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Ives
 - b. Rockwood
 2. **L.D.W.** = Less Door Width
- J. **Door Trim:** Furnish push plates, door pulls, wall stops and floor stops as specified in 3.6 of this section. Provide with fasteners as required for proper installation.

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1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Ives
 - b. Rockwood

 - K. **Overhead Holders:** Furnish overhead holders of the type listed in 3.6 of this section. Holders and Stops to meet or exceed ANSI A 156.8 Grade 1 requirements. They shall be non-handed and field reversible and have adjustable holding force. Provide all brackets necessary for proper installation. Provide overhead stops wherever wall stops will not stop the door.
 1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Glynn-Johnson
 - b. Rixson

 - L. **Thresholds and Weatherstripping:** Furnish in the type listed in 3.6 of this section. Use vinyl or silicone inserts in face of stop at exterior doors. Verify threshold requirements with drawings and sill conditions for proper application. For exterior doors provide a threshold anchor channel assembly that sets firmly into the concrete and secures the threshold. Provide an abrasive, skid and corrosion resistant threshold at all exterior locations. For weatherstrip provide at the jambs and head of the frame. On pairs of doors provide an overlapping astragal with a seal running the full height of the door or two split astragals at the meeting stile to seal doors that require independent operation.
 1. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:
 - a. Hager
 - b. NGP
 - c. Pemko
 2. **L.A.R.** - Length as Required.
- 2.2 **Finishes:** Unless noted otherwise, the following finishes shall be used:
- | | | |
|----|-------------------|-----|
| A. | Hinges, Exterior | 630 |
| B. | Hinges, Interior | 652 |
| C. | Pivots, Exterior | 626 |
| D. | Locksets | 626 |
| E. | Exit Devices | 626 |
| F. | Closers | 689 |
| G. | Door Trim | 630 |
| H. | Protection Plates | 630 |
| I. | Thresholds | AL |

2.3 Keying:

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- A. Provide a construction master key system tied into the existing small format interchangeable core (SFIC) Everest system as directed by the Owner's Representative. All locks are to be factory-keyed.
- B. Furnish keys in the following quantities;
 - 2 ea Change Keys per lock
 - 6 ea Master Keys for each system used
 - 6 ea Grand Master Keys
 - 12 ea Construction Keys
 - 100 ea Key blanks
 - 10 ea Additional Permanent Cores
- C. Send all permanent keys directly from the manufacturer to the owner by registered mail.
- D. Furnish one SITEMASTER 200 key control system complete with indexed door numbers, key codes, bittings, room numbers, lock function, design and finish.

PART 3 - EXECUTION

- 3.1 **Inspection:** After installation has been completed a representative of the hardware supplier is to inspect the installation of the finish hardware to ensure that each item of hardware is operating properly and installed according to the approved hardware schedule.
- 3.2 **Installation:**
 - A. Mount hardware units at heights indicated in "*Recommended Locations for Builders Hardware for Standard Steel Doors and Frames*" by the Door and Hardware Institute except as specifically indicated or required to comply with governing regulations, and as may be indicated otherwise by the Architect.
 - B. Install each hardware item in compliance with the manufacturer's instructions and recommendations (failure to install hardware correctly and to make proper adjustments will result in monetary penalties applied to the installation team to correct improper installation). Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished, coordinate removal, storage and reinstallation of items. Do not install surface mounted hardware until finishes have been applied.
 - C. Set units level, plumb and true. Adjust and reinforce the surface material as necessary for proper installation and operation.
 - D. Drill and countersink units that are not factory prepared for anchors and fasteners.
 - E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant to completely fill voids and exclude moisture. Remove excess sealant.
 - F. Before installation and after approved hardware submittals the manufacturer's representative is to provide pre installation training of hardware to the sub contractor and or installation team.
- 3.3 **Adjusting and Cleaning:**
 - A. Adjust and check each operating item of hardware at each door to ensure proper operation and function. Replace units that cannot be adjusted to operate freely as

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intended. Make final adjustments to door closers and floor closers to ensure that all valves are set properly for proper functioning of the door.

- B. After installation and before turning the building over all hardware shall be left clean and free from dirt, dust or disfigurement.
- C. Instruct the owners personnel in the proper adjustment and maintenance of hardware and electrical security systems. Turn over installation instructions, final approved finish hardware schedules, custom wiring diagrams and any special tools that were required for installation.

3.4 **Protection:** The General contractor shall be responsible for protecting all hardware and finishes of each item of hardware until the owner accepts the project as complete.

3.5 **Extra Stock:** At the completion of the project, supply to the Owner the following items:

- A. Complete bitting list of keys cut
- B. One (1) set of instruction sheet for each item furnished
- C. One (1) each of any nonstandard tool for installation of items furnished

3.6 Provide finish hardware as specified in the previous articles in sets according to the following Schedule:

HARDWARE SCHEDULE

HARDWARE SET NO. 1

Entry, Pair, HM, Exterior

Door Numbers: 107A, 107B, 121

Each to Have:

6	EA	HINGE	BB1199	4-1/2" X 4-1/2"	630	HAG
1	EA	PANIC DEVICE	99NL	X 299F	626	VON
1	EA	PANIC DEVICE	99DT	X 299F	626	VON
1	EA	MULLION	KR4954		689	VON
1	EA	MULLION STABILIZER	154		689	VON
1	EA	MULLION STORAGE KIT	MT54		689	VON
1	EA	MORTISE CYLINDER	80-132		626	SCH
1	EA	RIM CYLINDER	80-159		626	SCH
1	EA	PERM CORE	80-037		626	SCH
2	EA	SURFACE CLOSER	4020	X 4020-18G S.R.I.	689	LCN
2	EA	OVERHEAD STOP	100S		630	GLY
2	EA	KICK PLATE	8400	16" X 2" L.D.W.	630	IVE
1	SET	GASKET	891S-N	Head and Jambs	AL	HAG
1	EA	THRESHOLD	950S	X L.A.R.	AL	NGP

Weatherstrip by Door Supplier

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HARDWARE SET No. 2

Entry, Pair, HM, Interior

Door Numbers: 107C

Each to Have:

6	SET	HINGE	BB1199	4-1/2" X 6"	626	IVE
2	EA	PUSH PLATE	8200	6" X 16"	630	IVE
2	EA	PULL PLATE	8303-0	6" X 16"	630	IVE
2	EA	SURFACE CLOSER	4020	X 4020-18G SRI	689	LCN
2	EA	FLOOR STOP/HOLDER	FS497		626	IVE
2	EA	KICK PLATE	8400	16" X 2" L.D.W.	630	IVE
6	EA	DOOR SILENCER	SR64		GRY	IVE

HARDWARE SET No. 3

Single, HM, Interior

Door Numbers: 113A, 113B, 113C, 113D

Each to Have:

3	EA	HINGE (WIDE THROW)	BB1168	4-1/2" X 6"	652	HAG
1	EA	CLASSROOM LOCK	L9071HD		626	SCH
1	EA	PERM CORE	80-037		626	SCH
1	EA	FLOOR STOP/HOLDER	FS497		626	IVE
1	EA	KICK PLATE	8400	16" X 2" L.D.W.	630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE SET No. 4

Single, HM, Exterior

Door Numbers: 115

Each to Have:

3	EA	HINGE	BB1168	4-1/2" X 4-1/2"	626	HAG
1	EA	PANIC DEVICE	99NL	X 299F	626	VON
1	EA	RIM CYLINDER	80-159		626	SCH
1	EA	PERM CORE	80-037		626	SCH
1	EA	LOCK GUARD	LG1		630	IVE
1	EA	SURFACE CLOSER	4110	S.R.I.	689	LCN
1	EA	OVERHEAD STOP	100S		630	GLY
1	EA	KICK PLATE	8400	16" X 2" L.D.W.	630	IVE
3	EA	DOOR SILENCER	SR64		GRY	IVE

Weatherstrip by Door Supplier

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HARDWARE SET No. 5

Office, Single, HM, Interior

Door Numbers: 118

Each to Have:

3	EA	HINGE	1279	4-1/2" X 4-1/2"	626	HAG
1	EA	CLASSROOM LOCK	L9070HD		626	SCH
1	EA	PERM CORE	80-037		626	SCH
1	EA	DOME STOP	FS438		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE SET No. 6

Storage, Double, HM, Interior

Door Numbers: 122

Each to Have:

6	SET	HINGE	BB1199	4-1/2" X 6"	626	IVE
1	EA	STOREROOM LOCK	L9080HD		626	SCH
1	EA	PERM CORE	80-037		626	SCH
1	SET	FLUSH BOLTS	FB31P		630	IVE
2	EA	HOLD OPEN	904H		US32D	GLY
2	EA	KICK PLATE	8400	16" X 2" L.D.W.	630	IVE
6	EA	DOOR SILENCER	SR64		GRY	IVE

SECTION 09120

CEILING SUSPENSION SYSTEM

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Work includes suspension system, acoustical materials, and, where applicable, integrated lighting, heating and ventilating service components. Work done by others includes heating and cooling plants, duct work, piping, electrical, and telephone services.
- 1.4 **Qualifications:**
 - A. Manufacturing of materials shall conform to ASTM C635. Construction conditions and installation shall comply with ASTM C636. Acoustical material and suspension systems, including all necessary hangers, grillage, splines and supporting hardware, shall be supplied.
 - B. Manufacturer must certify that the metal suspension system is UL classified to be load compliant per ASTM C635. For load compliance, each carton of main tees must carry the Underwriters' Laboratory certification for the required load.
 - C. **Subcontractor Qualifications:** Installer shall have not less than three years of successful experience in installation of ceiling suspension systems on projects with requirements similar to requirements specified.
 - D. **Regulator Agencies:** Codes and regulations of authorities having jurisdiction shall apply.
 - E. **Source Quality Control:** Manufacturer will provide test certification for suspension for system as required to meet performance standards specified by various agencies.
- 1.5 **Delivery, Storage and Handling:** All materials shall be delivered and stored in original unopened packages. Storage shall be in a dry, enclosed shelter on site, protected from construction activity. Stack and handle to insure against racking, distortion, or physical damage.
- 1.6 **Project Conditions:**

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- A. **Environmental Requirements:** Building shall be enclosed with all windows and exterior doors in place and glazed, and roof watertight before installation of suspension system. Wetwork in place, completed and nominally dry. Climate conditions range of 60 degrees F. (15.56 degrees C.) to 85 degrees F. (29.44 degrees C.) and relative humidity of not more than 70 percent (70%) should be maintained before installation of suspension system.
- B. **Coordination with other work:**
 - 1. **General:** Coordinate with other work supported by or penetrating through ceiling, including electrical and mechanical work and partition system.
 - 2. **Mechanical Work:** Ductwork above suspension system shall be complete and permanent heating and cooling system operating.
 - 3. **Electrical Work:** Installation of conduit above suspension system shall be complete before installation of suspension system.
 - 4. Painting shall be completed prior to installation of suspension system or safeguarded.

1.7 Submittals:

- A. Comply with Section 01300, Submittals.
- B. **Samples:** Submit samples of suspension system main and cross tees for acceptance.
- C. **Manufacturer's Data:** Submit manufacturer's catalog cuts or standard drawings showing details of system with recommended installation instructions.
- D. **Maintenance Materials:** Submit (1%) one percent of amount of main tees and amount of cross tees.

PART 2 - PRODUCTS

2.1 Manufacturers:

- A. **Acoustical Ceiling Grid:**
 - 1. USG Interiors, Donn XLA, intermediate duty, hot-dipped, galvanized steel, 15/16" wide, aluminum-capped, with baked polyester paint finish, white.
- B. **Furring Systems:**
 - 1. **Gypsum Board Ceilings:** USG Drywall Suspension System, intermediate duty, hanger spacing of 4'-0" o.c., 1-1/2" web height, 48" cross ties at 24" o.c., for a maximum ceiling load of 12 PSF .
- C. **Approved Manufacturer:** US Gypsum (USG)

2.2 Materials:

- A. Provide all necessary wall angle and hardware as required for complete installation.
- B. **General:** ASTM C635 intermediate medium duty classification commercial quality, cold-rolled steel, exposed surfaces prefinished.
- C. **Dimensions:** System to consist of main tees and cross tees, built to snap together to form modules of 24 inch x 24 inch as shown on the drawings, for installation of lay-in acoustical panels, light fixtures, and air diffusers.

2.3 Fabrication:

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- A. Suspension system components shall be designed to support the ceiling assembly indicated on Project Drawings, with maximum deflection of 1/360 of the span, including appropriate load-carrying capacity for acoustical panels, light fixtures, and HVAC elements. Minimum of 12 PSF.
- B. **Exposed Tee System:** 1-1/2-inch high main tees combined with 1-1/2-inch high cross tees; components concealed with plug-in positive lock insertion. Pull-out tension valves in excess of 300 lbs.

PART 3 - EXECUTION

- 3.1 **Inspection:** Examine materials and the areas to receive materials for conditions which will adversely affect installation. Do not start work until unsatisfactory conditions are corrected.
- 3.2 **Installation:**
 - A. Acoustical material and suspension system shall be installed square, level, and true, in accordance with ASTM C636, CIASCA Standards, and the job's Contract Documents.
 - B. Installer shall verify actual field dimension prior to installation, and provide all materials and labor necessary to insure proper installation.
 - C. **Hanger Wire:** Pre-stretched non-corrosive 12-gauge hanger wire with a yield strength of 394 lbs. **Hanger wires shall be installed at each corner of each light fixture and air boot. Hangers shall be attached to structural members capable of, and designed for, supporting the weight.**
 - D. Mechanical fasteners and hold-down clips shall be provided in compliance with building codes and sound construction practice.
- 3.3 **Cleaning:** Perform general cleaning maintenance with non-solvent based commercial cleaner.

END OF SECTION 09120

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SECTION 09150

ACOUSTICAL CEILINGS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The extent of each type of acoustical ceiling is shown on the Drawings and in Schedules.
- 1.4 **Quality Assurance:**
- A. Standards for Terminology and Performance: Applicable publications by the Acoustical and Insulating Materials Associations (IAMA), including "Performance Data, Architectural Acoustical Materials".
 - B. **Flame Spread Classification:** Tested, listed and labeled as 25 or under UL or 0-25 ASTM E-84.
- 1.5 **Submittals:**
- A. Comply with Section 01300, Submittals.
 - B. **Manufacturer's Data:**
 - 1. Submit five (5) copies of manufacturer's product Specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data, as required to show compliance with these Specifications.
 - 2. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.
 - C. Submit Shop Drawings to describe any portions of the systems not fully shown on Data Sheets.
 - D. Submit two (2) 12" square samples for each acoustical unit required. Architect's review will be for color and texture only. Compliance with technical requirements is the exclusive responsibility of the Contractor.
 - E. **Maintenance Stock:** At the time of completing the installation, deliver stock of maintenance material to the Owner. Furnish full-size units matching the units installed, packaged with protective covering for storage, and identified with

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appropriate labels. Furnish an amount equal to 2% of the amount installed of each type.

- 1.6 **Job Conditions:** Do not install interior acoustical panels until the space has been enclosed and is weather-tight, and until the space is nominally dry, and until work above ceilings has been completed and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 Ceiling Units:

- A. **Approved Products:** Except as otherwise indicated, provide lay-in panels of the types specified. Provide sizes shown on Reflected Ceiling Plan.
- Type 1: **Standard Acoustical Panels:**
- a. **Series:** USG Interiors, Radar ClimaPlus (2210)
 - b. **Size:** 24" x 24" x 5/8"
 - c. **Finish:** White
- Type 2: **Kitchen Areas:**
- a. **Series:** USG Interiors, Clean Room ClimaPlus Class 100, nonperforated (56099)
 - b. **Size:** 24" x 24" x 5/8"
 - c. **Finish:** White
- B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

- 2.2 **Ceiling Suspension Materials:** Refer to Section 09120.

PART 3 - EXECUTION

3.1 Inspection and Preparation Work:

- A. Install acoustical panels in coordination with recessed suspension system. Install hold-down clips for each panel where shown or required for fire-resistance ratings. Scribe, cut and route panels to fit accurately at walls and penetrations and provide moldings or trim as indicated.
- B. If a condition exists where panels of less than 6 inches would be installed at edge conditions, cut ceiling panels from 2 x 4 panels to match field of ceiling and extend to partition on edge condition. Do not install panels of less than 6" width unless acceptable to the Architect.

3.2 Cleaning and Protection:

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
- B. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

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- C. Verify required protection for the acoustical ceilings, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance.

END OF SECTION 09150

SECTION 09250

GYPSUM WALL BOARD

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. The extent of the gypsum wall board work is shown on the Drawings and in Schedules.
 - B. The types of work required includes the following:
 - 1. Gypsum wall board partitions and ceilings.
 - 2. Thermal Sound and Fire Control above CMU walls.
 - 3. Wall board finishing (joint tape-and-compound treatment).
 - 4. Bullnose Corner Treatment.
 - 5. Knockdown Ceiling Texture.
- 1.4 **Quality Assurance:**
- A. **Fire-Resistance Rating:** Where work is indicated for fire-resistance ratings, including those required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including FM, UL, NFPA, and ASTM.
 - B. **Industry Standard:** Comply with applicable requirements of ASTM C476 and "Application and Finishing of Gypsum Board" by the Gypsum Association except where more detailed or more stringent requirements are indicated, including the recommendations of the manufacturer.
 - C. **Allowable Tolerances:** 1/16" offsets between planes of board faces, and 1/8" in 8'-0" for plumb, level, warp and bow. Where substrates have been installed by other trades, tolerances may vary to those specified for that trade.
 - D. **Manufacturer:** Obtain gypsum boards, trim accessories, adhesives and joint treatment products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum board.
- 1.5 **Submittals:**
- A. Comply with Section 01300, Submittals.

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- B. Submit manufacturer's product Specifications and installation instructions for each gypsum wall board component, including other data as may be required to show compliance with these Specifications.

1.6 **Product Handling:**

- A. Deliver gypsum wall board materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; store in a dry well-ventilated space, protected from the weather, under cover and off the ground.

1.7 **Job Conditions:**

- A. Maintain ambient temperatures at not less than 55 degrees F. for the period of 24 hours before wall board finishing, during installation, and until compounds are dry.

PART 2 - PRODUCTS

2.1 **Gypsum Board Products:**

- A. Gypsum boards with tapered edges, 4' wide x maximum length available (8' minimum).
- B. Provide the following types:
 - 1. 5/8" standard type: all ceilings where exposed for finish.
 - 2. 5/8" Type-X at fire walls and ceilings.
 - 3. 5/8" standard type: where indicated by wall types.

2.2 **Joint Treatment Materials:**

- A. **General:** ASTM C475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
- B. **Joint Tape:** Perforated type.
- C. **Joint Compound:** Ready-mixed vinyl-type for interior use. Commercial quality general purpose grade specifically formulated for bedding tapes, filling depression, and topping and sanding. Comply with ASTM C475.

2.4 **Miscellaneous Materials:**

- A. **General:** Provide auxiliary materials for gypsum wall board work of the type and grade recommended by the manufacturer of the gypsum board.
- B. **Laminating Adhesive:** ASTM C893.
- C. **Gypsum Board Fasteners:** ASTM C646, Type S Bugle head screws for steel and ASTM C894, Type W Bugle head, and ASTM C514 nails for wood.

PART 3 - EXECUTION

3.1 **Installation of Gypsum Wall Boards:**

- A. **General Standards:** In addition to compliance with GA-216, comply with manufacturer's instructions and requirements.
- B. **Ceilings:** Install ceiling boards by screws (prior to adjacent wall boards) in the direction and manner which will minimize the number of end-butt joints, and which will avoid end

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- joints in the central area of each ceiling. Stagger end joints in ceilings at least 1'-0". All joints shall have solid backing.
- C. **Walls:** Install wall/partition boards with screws and glue at all supports. At high walls install boards horizontally with end joints staggered over studs. Cut boards as required around joists, beams, decking, etc., as required to provide the least practical voids.
 - D. **Double-layer Walls and Partitions (if any):** Install base layer of gypsum backing board and face layer of exposed gypsum board, both vertically and with all joints offset at least 10". Use fire-resistant gypsum boards for fire-rated construction.
 - 1. Fasten base layer with screws.
 - 2. Laminate face layer to base layer with laminating adhesive, and supplement with either temporary or permanent screws, or nails where permitted, through base layer and into support.
 - 3. Stagger joints as required by Code.

3.2 Installation of Wall Board Trim Accessories:

- A. **General:** Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Do not fasten trim by crimping.
- B. **Exposed Work:**
 - 1. Install paper-covered metal bull-nose corner beads at all external corners of vertical wall board work.
 - 2. Install metal edge trim or wall board moldings whenever edges of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-flashing type is indicated. Install L-Type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-Type trim. Install J-Type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints). Install W-Type moldings where masonry abuts wall board work.
 - 3. Install metal control joint (beaded-type) where indicated or required for crack control.

3.3 Wall Board Finishing:

- A. **General:** Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Pre-fill deep joints and rounded or beveled edges, using type to compound specified.
 - 1. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
 - 2. Apply joint compound in three (3) coats (not including prefill) and sand between last two (2) coats and after last coat.
- B. **Base for Tile: Do not install wall board where tile is to be applied.** Tile base shall be Dens-Shield Gold.
- C. **Partial Finishing:** Omit third coat and sanding on concealed wall board work. **In no case will work that is simply taped and bedded be accepted.**
- D. Ceilings to receive texture shall be sprayed and knocked-down trowel finished.

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- E. Ceilings shall be skim-coated where indicated to receive smooth finish. The levelness and smoothness of the finish shall be inspected by the Architect and if not acceptable, it shall be reskimmed until acceptable.

3.4 **Protection of Work:**

- A. Protect gypsum wall board and maintain conditions necessary to ensure the work will be without damage or deterioration at the time of acceptance.

END OF SECTION 09250

SECTION 09255

FIBERGLASS-FACED GYPSUM SHEATHING

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:**
- A. Work in this section includes, but is not limited to: exterior wall, ceiling and soffit fiberglass-faced gypsum sheathing.
 - B. Related work specified elsewhere:
 - 1. Section 04210, Brick Masonry
 - 2. Section 05400, Cold-formed metal framing
 - 3. Section 06100, Rough carpentry
 - 4. Section 07241, Exterior Insulation Finish Systems (EIFS)
 - 5. Section 07920, Caulking and Sealants
 - 6. Section 09900, Paint
- 1.4 **Submittals:**
- A. Comply with 01300, Submittals.
 - B. **Product date:** Submit manufacturer's descriptive literature indicating material composition, thickness, sizes and fire resistance.
 - C. **Certificates:** Submit manufacturer's written certification that product meets specified requirements.
- 1.5 **Quality assurance:**
- A. **Fire resistance ratings:** Where applicable, provide materials and construction which are identical to those of assemblies whose fire resistance ratings are indicated.
- 1.6 **Delivery, Storage and Handling:**
- A. **Delivery:** Deliver materials to the job site in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible.
 - B. **Storage and handling:** Store level and handle materials to protect against contact with damp and wet surfaces, exposure to weather, breakage and damage to edges. Provide

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air circulation under covering and around stack of materials.

1.4 Limitations:

- A. Do not use fiberglass-faced gypsum sheathing as a base for nailing or mechanical fastening.
- B. Do not laminate fiberglass-faced gypsum sheathing to masonry surfaces, use furring strips or framing spaced at manufacturer's specifications.

1.5 Warranty:

- A. **Materials Warranty:** Provide sheathing manufacturer's standard warranty covering sheathing materials for five (5) years commencing on Date of Substantial Completion.
- B. **Weathering Warranty:** Provide sheathing manufacturer's standard warranty covering in place exposure damage to sheathing for six (6) months commencing on date of purchase by Contractor.

PART 2 - PRODUCTS

2.1 Sheathing board:

- A. **Acceptable products:**
 - 1. 5/8" Dens-Glass Gold, Georgia-Pacific Corporation.
 - 2. No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.
- B. **Characteristics:**
 - 1. **Size:** Nominal 5/8" (16mm) thick by 4', 8', 9' or 10'.
 - 2. **Composition:** Gypsum sheathing board core in accordance with ASTM C1177 with fiberglass mats both sides and long edges.
 - 3. **Fire Resistance:**
 - a. Noncombustible when tested in accordance with ASTM E136.
 - b. Flame spread 0, smoke developed 0, when tested in accordance with ASTM E84.

2.2 **Building paper:** No. 15, nonperforated, asphalt-saturated felt complying with ASTM D226, Type 1, or equal.

2.3 Accessories:

- A. **Joint tape:** 2" wide, 10 by 10 fiberglass mesh tape.
- B. **Joint Compound:** setting-type joint compound.
- C. **Screws, metal framing:**
 - 1. Type S-12, bugle head, self-taping, rust-resistant, fine thread for heavy steel gauge (12 to 22).
 - 2. Type S, bugle head, rust-resistant sharp point, fine thread for light gauge metal framing or furring.
- D. **Screws, metal framing:** Wafer head, rust-resistant, Type S-12 drill or hi-lo, min 1-1/4" length.

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- E. **Trim:** Fabricated of materials for exterior exposure in accordance with ASTM D1784.

PART 3 - EXECUTION

- 3.1 **Preparation:** Examine subframing; verify that surface of framing and furring members to receive sheathing does not vary more than 1/4" from the place of faces of adjacent members.

- 3.2 **Sheathing:**

- A. Provide fiberglass-faced gypsum sheathing where indicated on drawings. Install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253.
- B. Install fiberglass-faced gypsum sheathing with primed fiberglass face side out.
- C. Use maximum lengths possible to minimize number of joints. Locate edge joints parallel to and with vertical orientations on framings. Stagger intermediate end joints of adjacent lengths of sheathing.
- D. **Metal framing:** Attach Dens-Glass Gold to metal framing with screws spaced 8" o.c. at perimeter and 8" o.c. in field.
- E. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
- F. Locate fasteners minimum 3/8" from edges and ends of sheathing panels.
- G. **Joint treatment and finish preparation:**
 - 1. **Veneer systems:** If required, provide joint treatment in accordance with sheathing manufacturer's instructions and requirements of local governing authorities.
 - 2. **Painted ceilings and soffits:**
 - a. Apply joint tape over joints and embed in setting type joint compound specified.
 - b. Skim coat surface with joint compound for smooth finish.
- I. **Building paper:**
 - 1. Install building paper or equal with flashing around openings.

END OF SECTION 09255

SECTION 09665

**VINYL SHEET FLOORING
WITH INTEGRAL COVE BASE**

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Description of Work:** The extent of homogenous vinyl sheet flooring with integral cove base and accessories as shown on drawings and in schedules.
- 1.4 **Quality Assurance:**
- A. **Manufacturer:** Provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.
 - B. **Installer:** Select an installer who is experienced and competent in the installation of resilient sheet flooring using heat-welded seams and the use of required subfloor preparation products.
 - 1. Engage installers certified as manufacturer's Certified Installers
 - 2. Confirm installer's certification by requesting their credentials
 - C. **Performance Requirements:** Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
 - D. **Fire Performance Characteristics:** Provide resilient vinyl sheet 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 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
 - 2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less
 - 3. CAN/ULC-S102.2 - Flame Spread Rating and Smoke Developed - Results as tested
 - E. **Administrative Requirements:**
 - 1. **Pre-installation Meeting:** Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation

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instructions and manufacturer's warranty requirements. Comply with Section 1200, Job Site Administration.

2. **Pre-installation Testing:** Conduct pre-installation testing as follows: moisture test, bond test, and pH test to ensure compliance with Manufacturer requirements.
- F. **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.

1.5 Submittals:

- A. Comply with Section 01300, Submittals.
- B. **Product Data:** Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.
- C. **Samples:** Submit the manufacturer's standard samples showing the required colors for flooring, welding rods, and applicable accessories.
- D. **Maintenance Instructions:** Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.
- E. Submit Safety Data Sheets (SDS) available for adhesives, weld rod, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.
- F. Submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
- G. **Closeout Submittals:** Submit the following:
 1. **Operation and Maintenance Data:** Operation and maintenance data for installed products in accordance with Section 1300, Operation and Maintenance Manuals. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. **Warranty:** Warranty documents specified herein

1.6 Resilient Flooring Limited Warranty:

- A. 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: **10 years**
- 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

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not using the specific instructions from the Guaranteed Installation System will void the warranty.

1.7 **Extended System Limited Warranty:**

- A. 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. 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, 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.
- D. 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. 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.

1.8 **Project Conditions:**

- A. Installation of resilient flooring shall not proceed until the work of all other trades has been completed, including painting. Areas shall be clean, d fully enclosed, and weathertight. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F and a maximum temperature of 85°F for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F 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.
- B. Concrete sub-floors shall be steel trowel finished, smooth, flat, and level. Concrete shall be adequately cured and dry (maximum content of moisture 2.5%). If needed, sand concrete sub-floors to loosen dirt and other foreign materials. Vacuum to remove dust, loose dirt, and other imperfections with latex powder and liquid patching materials. Areas to receive resilient flooring must be adequately lighted to allow for proper installation and seaming.

1.9 **Delivery, Storage, and Handling:**

- A. Comply with Section 01620, Materials Storage and Protection.
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

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- 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.

PART 2 - PRODUCTS

2.1 Manufacturers:

- A. Resilient sheet flooring, wall base, adhesives and subfloor preparation products and accessories by Armstrong Flooring Inc., 2500 Columbia Avenue, Lancaster, PA 17603.
- B. The Basis of Design is "ColorArt Medintone with Diamond 10 Coating".
- C. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 Materials:

- A. Provide Homogeneous Sheet Vinyl Flooring: ***ColorArt Medintone with Diamond 10 Coating*** manufactured by Armstrong Flooring Inc.
 - 1. **Description:** An unbacked, nonlayered, homogeneous sheet vinyl flooring. Protected by a diamond-infused UV-cured polyurethane finish, the colors and pattern detail are dispersed uniformly throughout the thickness of the product. Color pigments are insoluble in water and resistant to cleaning agents and light.
 - 2. Homogeneous sheet flooring shall conform to the requirements of ASTM F1913 Standard Specification for Vinyl Sheet Floor Covering Without Backing
 - 3. Pattern and Color: **Up to 4 colors selected from the range currently available** from Armstrong Flooring Inc.
 - 4. **Width:** 6 ft. 7 in.
 - 5. **Length:** up to 65.6 lineal feet
 - 6. **Thickness:** 0.080 in.
- B. **Vinyl Weld Rod:**
 - 1. Provide patterned vinyl weld rod as produced by Armstrong Flooring Inc., and intended for heat welding of seams. Color shall be compatible with field color of flooring or as selected by Architect to contrast with field color of flooring. Color selected from the range currently available from Armstrong Flooring Inc.
- C. **Seam Adhesive:**
 - 1. Provide Armstrong Flooring S-761 Seam Adhesive at seams as recommended by the resilient flooring manufacturer.

2.3 Wall Base Materials:

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- A. **For integral flash cove base:** Provide integral flash cove wall base by extending sheet flooring 6 in. up the wall using adhesive, welding rod, and accessories recommended and approved by the flooring manufacturer.

2.5 **Adhesives:**

- A. Provide Armstrong S-599 Vinyl Sheet Flooring Adhesive Premium Commercial adhesive for field areas and Armstrong S-580 Flash Cove Adhesive at flash coving as recommended by the flooring manufacturer.

2.7 **Accessories:**

- A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Armstrong S-456 Patch Strong flexible patching and smoothing compound.
- B. For priming porous substrates to aid in adhesive bond strength and reducing subfloor porosity, provide S-454 Prime Strong acrylic primer for porous substrates. For non-porous substrates, provide S-455 Prime Strong acrylic primer for non-porous substrates].
- C. For creating a moisture barrier, provide S-452 Seal Strong two-part moisture mitigation system.
- D. 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.
- E. Provide top edge trim caps as approved by the Architect.
- F. Provide transition/reducing strips tapered to meet abutting materials.

PART 3 - EXECUTION

3.1 **Inspection:**

- 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.

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- 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.

3.2 Preparation:

- A. 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. **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 S-456 Patch Strong flexible patching and smoothing compound as recommended by the flooring manufacturer.
- C. **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 S-456 Patch Strong flexible patching and smoothing compound as recommended by the flooring manufacturer.
- D. **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.
- E. When using S-599 Adhesive, perform subfloor moisture testing in accordance with ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride and Bond Tests as described in publication F-5061, Armstrong Flooring Guaranteed Installation Systems, manual, 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 90%. MVER shall not exceed 5 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.
- F. **Concrete pH Testing:** Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

3.3 Installation of Flooring:

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- 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 Sections 1.6 and 1.7.
- 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 or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.
- F. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.
- G. 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.
- H. Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with vinyl welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.
- I. Provide integral flash cove wall base where shown on the drawings, including cove fillet support strip and top edge cap trim. Construct flash cove base in accordance with the flooring manufacturer's instructions. Heat-weld seams as specified for those on the floor.

3.4 Installation of Accessories:

- A. 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.
- B. Apply butt-type metal edge strips where shown on the drawings, after flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.5 Cleaning and Protection:

- A. Perform following operations immediately upon completion of resilient flooring:
 - 1. Sweep or vacuum floor thoroughly.
 - 2. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
 - 3. Damp-mop floor being careful to remove black marks and excessive soil.

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- 4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.
- B. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.
- C. Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer.

END OF SECTION 09665

SECTION 09670

**RESINOUS FLOORING (EPOXY)
WITH INTEGRAL COVE WALL BASE**

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Description of Work:**
- A. Furnish and install the epoxy resinous flooring system as specified and indicated. Prior to installation, provide decontamination and cleaning as specified. The term "epoxy flooring system" as used in this section will include the primers, resin systems and aggregate materials, topcoats, cove building materials, and any related materials for the project.
 - B. Complete the epoxy flooring system installation in strict accordance with these specifications, the coating system manufacturer's most current requirements for surface preparation, application and inspection, and the instructions for safety. In the event of a conflict between these specifications and the manufacturer's instructions, the more stringent requirements will apply.
 - C. The Contractor shall be responsible for providing ventilation, initial cleaning, inspection, supervision, dust control and equipment protection as specified herein and related sections for the work associated with this Section. The Contractor is responsible for all other work associated with this Section including protection of existing equipment and structures in the work area, surface preparation, flooring application, curing, coating repair, rework, inspection and supervision.
- 1.4 **References:**
- A. Society for Protective Coatings (SSPC) Specifications and Standards:
 - B. SSPC-PA-3: "A Guide to Safety in Paint Application".
 - C. SSPC-SP-13: "Surface Preparation of Concrete".
 - D. NACE (National Association of Corrosion Engineers)
 - E. NACE Publication 6D-173, "A Manual for Painter Safety".
 - F. NACE Publication 6G-164, "Surface Preparation Abrasives for Industrial Maintenance Painting".
 - G. ASTM (American Society for Testing and Materials)
 - H. ASTM D4541 - L.R. "Standard Method for Pull-Off Strength of Coatings using Portable Adhesion Testers".
 - J. ASTM E337 - L.R. "Standard Practice Test Method for Measuring Humidity with a Psychrometer".

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- K. ASTM D4263-83 (1999), "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method".
- L. ASTM F1869-98, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride".
- M. ASTM D4414-95, "Standard Practice for Measurement of Wet Film Thickness by Notched Gages".
- N. ICRI Guide No. 03732, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays," International Concrete Repair Institute, Sterling, VA.
- P. ASTM 4262, "Standard Test Method for Measuring Surface pH of Acid Etched Concrete".
- Q. ASTM D4259, "Standard Practice for Abrading Concrete".

1.5 Definitions:

- A. Terms used in this Section are defined as follows:
 - 1. **Epoxy:** The aspects involved with proper application flooring work of the specified high solids flooring system, including but not limited to cleaning, surface preparation, mixing, application, curing, and quality control.
 - 2. **Approved Materials:** The coating system, blast media, and other specified materials for this coating work.
 - 3. **Wet Film Thickness (WFT):** The primer or coating films' actual thickness immediately following application. Wet film thickness is measured in mils or thousandths of an inch (0.001").
 - 4. **Dry Film Thickness (DFT):** The primer or coating films' actual thickness following curing and drying. Dry film thickness is measured in mils or thousandths of an inch (0.001").
 - 5. **Coating System Manufacturer (CSM):** Refers to the approved coating manufacturer.
 - 6. **Manufacturer's Technical:** Refers to the technical representative(s) of the Representative(s) approved CSM.

1.6 Quality Assurance:

- A. The Contractor shall meet the following requirements:
 - 1. The Contractor is ultimately responsible for the workmanship and quality of the epoxy flooring system installation. Inspections by the Owner, the Engineer, or others do not limit the Contractor's responsibility.
 - 2. Do not use or retain contaminated, outdated, or diluted materials for flooring. Do not use materials from previously opened containers.
 - 3. Use only products of the approved CSM. Provide the same products for repairs as for the original coating.
 - 4. If any requirements of this specification are contradicted by a referenced standard or vice-versa, the matter shall be resolved in writing by the Architect or its representative.
 - 5. Make available at all times all locations and phases of the work for access and inspection by the Architect, Owner, or other personnel designated by the Owner. The Contractor shall provide ventilation, egress, and whatever other means are required for the Owner, Architect, or designated personnel to access and exit the work areas safely.
 - 6. Conduct work so that the epoxy flooring system is installed as specified herein. Inspect work continually to ensure that the coating system is installed as specified herein. The Architect shall inspect the work to determine conformance with the contract documents.

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7. The Contractor's Supervisor shall be on site at all times and will be thoroughly familiar with the work in progress. This Supervisor shall have authority to receive and execute all direction provided by the Architect or the Owner.
8. The methods of construction shall be in accordance with all requirements of this specification and the best trade practices. Any changes in the epoxy flooring system installation requirements shall be allowed only with the written approval of the Architect.
9. Installation shall be performed by an applicator having satisfactory experience in the application of these or similar materials or with on-site consultation by a qualified field service representative of the CSM.

1.7 Submittals:

- A. Comply with Section 01300, Submittals.
- B. Submit the following prior to commencing with any phase of the work covered by this Section:
 1. Manufacturer's current printed recommendations and product data sheets for all epoxy flooring system products including performance criteria, surface preparation and applications, volatile organic compound (VOC) data, and safety requirements.
 2. Material Safety Data Sheets (MSDS) for any materials brought on-site including all coating system materials, solvents, and abrasive blast media.
 3. Contractor's written verification that the personnel who will perform this work have the required experience as specified in 1.6.A.9. This document must list the names of all of the Contractor's supervisors and tradespeople who will work on the project covered by this Section.
 4. List of cleaning and thinner solutions allowed by the CSM.
 5. Storage requirements including temperature, humidity, and ventilation for Coating System Materials.
- B. Architect, Owner, Contractor, and CSM's representative shall review and mutually agree upon color, grade, and final texture of coating system before starting installation. The acceptance of a sample will constitute the job standard by which installation will proceed.

1.8 Delivery, Storage, and Handling:

- A. Material shall be delivered to project site in manufacturer's original unopened containers.
- B. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 40° F or above 90° F.
- C. Store all materials only in area or areas designated by the Owner solely for this purpose. Confine mixing, thinning, clean-up and associated operations, and storage of coating materials related debris before authorized disposal, to these areas. All materials are to be stored on pallets or similar storage/handling skids off the ground.
- D. Mix all coating materials in a designated enclosed mixing area. This enclosed area must protect the mixing operation and materials from direct sunlight, inclement weather, freezing, or other means of damage or contamination. Protect all other concrete and metallic surfaces and finishes from any spillage of material(s) within the mixing area.
- E. Do not use drain piping for disposal of coating materials.
- F. The Contractor shall take all precautions and implement all measures necessary to avert potential hazards associated with the epoxy flooring system materials as described on the pertinent Material Safety Data Sheets or container labels.
- G. Deliver all materials to the job site in new, unopened containers. Each container shall bear the CSM's name and label.

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1. Labels on all material containers must show the following information:
 - a. Name or title of product.
 - b. Manufacturer's batch number.
 - c. Manufacturer's name.
 - d. Generic type of material.
 - e. Application and mixing instructions.
 - f. Hazardous material identification label.
 - g. Shelf life date.
2. All containers shall be clearly marked indicating any personnel safety hazards associated with the use of or exposure to the materials.
3. All materials shall be handled and stored to prevent damage or loss of label.
4. Do not use or retain contaminated, outdated, prematurely opened, diluted materials, or materials which have exceeded their shelf life.

1.9 Environmental Conditions:

- A. Surfaces and surrounding air temperatures must exceed 55° F, but must be less than 90° F, with materials at not less than 70° F during application.
- B. Do not apply coating materials when dust is being generated.
- C. If existing facility lighting is not adequate for flooring system application, the Contractor shall provide all temporary lighting during the work equivalent to one 200 watt explosion proof incandescent lamp per 100 square feet of work area.

PART 2 - PRODUCTS

2.1 Manufacturer:

- A. The Basis of Design is Series 242 Ultra-Tread S, by Tnemec Company, Inc.
- B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 Materials:

- A. **Resinous Flooring:** Series **242 Ultra-Tread S** consisting of a two-component, modified polyamine, cured, epoxy liquid slurry-applied flooring topping to provide a minimum 3/16" to 3/8" thickness. Series 242 is self-priming.
- B. **Color:** 00GR, Gray.
- C. **Finish:** Matte.
- D. **Coving:** Series 242 Ultra-Tread S, a two-component, modified polyamine cured epoxy liquid, blended as a mortar with aggregate applied to form a cant or rolled radius cove.
- E. **Flexible Underlayment:** Series 242, 243 or 244, flexible elastomeric epoxy underlayment used for bridging small substrate cracks in concrete and as a protective membrane under aggregate reinforced flooring systems. To be applied at 30 to 40 dry mils. Thickness and number of coats will vary depending on substrate roughness or profile depth.

PART 3 - EXECUTION

3.1 General:

- A. **Protection:** Mask, cover, or otherwise protect all surfaces, equipment, and finishes not to receive the epoxy flooring system specified in this Section.
- B. Strictly follow the approved CSM's written instructions and the requirements of this

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specification regarding all aspects of epoxy flooring work including: mixing, application, recoat times and curing.

- C. **Mock-up:** Prior to commencing the installation, the Contractor shall install with the owner's approval, a mutually agreed upon mock-up test sample to show final color and appearance of the epoxy flooring system.

3.2 Preparation:

- A. Allow new concrete to cure for 28 days. Verify dryness by testing for moisture with a "plastic film tape-down test". (Reference ASTM D4263)
- B. Shot-blast or mechanically abrade to remove laitance, curing compounds, sealers and other contaminants and to provide surface profile. (Reference ASTM D4259, ICRI CSP 4-6).
- C. Vacuum clean concrete to remove all dirt, dust, and other loose materials.
- D. After mechanically abrading, verify that all surfaces are clean, dry and free of any contaminants, which could adversely affect the adhesion of the flooring system.
- E. If between final surface preparation work and epoxy flooring system application, contamination of the prepared and cleaned substrates occurs, re-cleaning shall be required until the requirements of this Section are met.

3.3 Installation:

- A. **For Slurry Broadcast Application:** The primer shall be mechanically mixed, applied and cured in strict accordance with manufacturer's printed instructions. Apply uniformly at a film thickness of 6 to 8 dry mils.
- B. **Cove Base:** Cove bases shall be installed in accordance with the CSM's written instructions and as indicated on the manufacturer's standard flooring details. For this project, provide a **rolled radius cove**.
- C. **Epoxy Flooring:** The material shall be mixed, applied and cured in strict accordance with the manufacturer's printed instructions. Apply by double broadcast (self-priming) or slurry broadcast to a minimum of 1/8" thickness.
- D. **Top Coat:** The high-solids, epoxy glaze coat shall be mechanically mixed, applied and cured in strict accordance with manufacturer's printed instructions. Apply at a film thickness of 6 to 12 dry mils. Skid resistance properties can be adjusted by the film thickness and number of topcoats and should be determined at the time the mock-up is completed.
- E. **Finish Coat:** The high-solids, orange-peel, epoxy finish coat shall be mechanically mixed, applied and cured in strict accordance with manufacturer's printed instructions. Apply at a film thickness of 4 to 6 dry mils.
- F. Fill all cracks and recessed joints, such as control and construction joints with Tnemec Series 201 Epoxoprime and fumed silica. When filled, joint should be flush with the floor surface.

- 3.4 **Cleanup:** Remove waste materials, rubbish, and debris and dispose of them at the owner's direction. Leave work areas in a clean and tidy condition.

3.5 Protection:

- A. Protect the completed work from water, airborne particles or other surface contaminants until cured for a minimum of 24 hours after application.
- B. Protect from traffic, physical abuse, immersion and chemical exposure until the complete system has thoroughly cured for 24 hours at 75° F. For different temperatures, consult the manufacturer's representative about curing times.

3.6 **Field Quality Control Inspection and Testing:**

- A. Inspection by the Architect, Owner or others does not limit the Contractor's responsibilities for quality as specified herein or as required by the CSM's instructions.
- B. The Contractor shall perform the quality control procedures listed below in conjunction with the requirements of this Section. The Architect will inspect the work to determine conformance to the contract documents.
 - 1. **Degree of Cleanliness:** Visually inspect the degree of cleanliness of substrates to meet the requirements of this Section. The pH of the concrete substrates will be measured using pH indicating papers.
 - a. Testing is to be performed once per every 100 square feet of surface area to be coated.
 - b. Acceptable pH values shall be between 8.0 and 11.0 as measured by a full-range (1-12) color-indicating pH paper with readable color calibrations and a scale at whole numbers (minimum). Use Hydrion Insta-Chek Jumbo 0-13 or 1-12 or equal. The paper shall be touched to the surface once using moderate finger pressure. The surface shall not be wiped or moved laterally to disturb the surface during pH testing. Following the one touch, lift the paper vertically to not "wipe" the surface. Compare the color indicated with the scale provided and record the pH.
 - c. If the surface of the concrete is dry, it is not possible to take a pH measurement. However, pH values are still important on dry surfaces. When a dry concrete substrate is encountered for a pH test, the surface where the pH test is to be performed shall be sprayed lightly with distilled, de-ionized water from a commercially available spray bottle that has been properly rinsed to preclude any dissolved solids. The spray shall just wet the surface to a "shiny" appearance. Wait 60 seconds to allow chemical equilibria to be established and then test the pH of the water on the surface. Perform this test in accordance with ASTM D4262.
 - 2. **Concrete Surface Profile:** Using the replicate rubber specimens inspect the concrete surface profile in accordance with ICRI Guide No. 03732. This should be performed once for every 100 square feet of surface area to be coated.
 - 3. Measure and record ambient air temperature once every two hours of each shift using a thermometer and measure and record substrate temperature once every two hours using a surface thermometer.
 - 4. Measure and record relative humidity every two hours of each shift using a sling psychrometer in accordance with ASTM E337.
 - 5. Inspect correct mixing of coating materials in accordance with the CSM's instructions.
 - 6. Inspect and record that the "pot life" of coating materials used are not exceeded during installation.
 - 7. Measure and record the thickness of the coating system using a notched gauge in accordance with ASTM D4414 for Wet Film Thickness at least once every 10 square feet of coating area.
 - 8. Perform moisture tests on concrete as follows:
 - a. Once for every 500 square feet of surface area to be coated, perform the plastic sheet test in accordance with ASTM D4263. If moisture is indicated, proceed to Step b below.
 - b. Perform calcium chloride moisture tests in accordance with ASTM D1869 once for every 1000 square feet of surface area to be coated. The maximum limit for moisture vapor emissions rate should be 3.0 lbs. per 24 hours per 1000 sq. ft. If

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tests indicate rates higher than 3.0, consult with the manufacturer's technical service department for further evaluation.

9. Inspect to verify proper curing of the epoxy flooring system as recommended by the CSM.

END OF SECTION 09671

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SECTION 09900

PAINT

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The work described under this Section consists of all painting and finishing work and related items necessary to complete the work indicated on Drawings, described in the Specifications, and listed in the Paint Schedule included herein. Note that AkzoNobel owns ICI-Dulux, Glidden and Devoe and that paint numbers may be correlated between these products. The present specifications are built around an older county standard and still refers to Glidden and Devoe.
- 1.4 **Definition:** The term "paint" or "painting" as used in this Section in a general sense has a reference to sealers, primers, stains, oil, alkyds, latex, epoxy, and enamel type of paint, and the application of these materials.
- 1.5 **List of items included:** Without restricting the volume or generality of the "Extent", the work performed under this Section shall include, but not be limited to, the following:
 - A. The work, in general, includes all exterior metals, exterior masonry, exterior woodwork, interior metals, interior woodwork, interior wallboard, plaster, concrete, masonry, and other items normally requiring a paint finish, unless otherwise specified.
 - B. Prime coats specified herein will not be required on items delivered with prime coats already applied, except where there is a request for spot priming such as touch-ups. (See other Sections of Specifications for primers specified for shop work).
- 1.6 **Submittals:**
 - A. Comply with Section 01300 for submittals.
 - B. **List of Proposed Materials:** The Contractor shall either verify, in writing, that he intends to apply the materials listed in the Paint Schedule, or submit for approval a list of comparable materials of another listed approved manufacturer. This Submittal shall include full identifying product names and catalog numbers.

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- 1.7 **Storage of Materials:** All materials used on the job shall be stored in a single place designated by the Architect. Such storage place shall be kept neat and clean, and all damage thereto or it's surroundings, shall be made good. Any soiled or used rags, waste and trash, must be removed from the building every night, and every precaution taken to avoid the danger of fire.
- 1.8 **Job, Weather and Temperature Controls:**
- A. Maintain temperature in building at constant 65 degrees F., or above, during drying of plaster and masonry, and provide adequate ventilation for the escape of moisture from buildings, in order to prevent mildew, damage to other work, and improper drying of paint.
 - B. Once painting has commenced, provide constant temperatures of 65 degrees F., or above, and prevent such variations in temperature which might result in condensation on freshly painted surfaces.
 - C. Before painting is started in any area, it shall be broom-cleaned, and excessive dust shall be removed from all areas to be painted.
 - D. After painting operations begin in a given area, broom cleaning will not be allowed. Cleaning shall then be done only with commercial vacuum cleaning equipment.
 - E. Adequate illumination shall be provided by the General Contractor in all areas where painting operations are in progress.
 - F. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently. Remove all hardware, accessories, device plates, lighting fixtures, and similar items, and replace when painting is completed and thoroughly dry.

PART 2 - PRODUCTS

- 2.1 **Manufacturers:**
- A. **Acceptable Manufacturers:** Except as otherwise specified, names used herein refer to products manufactured by AkzoNobel. Wherever the abbreviation "G" appears herein, it shall mean the Glidden Company.
- 2.2 **Materials:**
- A. All materials used in the work shall be exactly as specified in the "Painting Schedule" in brand and quality. No claim by the Contractor as to the unsuitability or unavailability of any material specified, or his unwillingness to use same, or his inability to produce first class work with same, will be entertained, unless such claims are made in writing and submitted to the Architect with substitute proposal prior to commencing work.
 - B. All paints, varnishes, enamels, lacquers, stains, paste fillers and similar materials must be delivered in the original containers, with the seals unbroken and labels intact, and with the manufacturer's instructions printed thereon.
 - C. Secondary materials not specified by name and required for the job, such as oils, thinners, shellac, patching compounds and driers, shall be first grade of a reputable manufacturer.

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- D. Paint shall be well ground, shall not settle badly, cake, or thicken in the container, shall be readily broken with a paddle to a smooth consistency, and shall have easy brushing properties.
- E. Paint shall arrive on the job ready-mixed, except for tinting of undercoaters and possible thinning.
- F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material tinted or thinned.
- G. Fungicidal Agent shall be incorporated into the paint by the manufacturer.

2.2 **Application Equipment:** Select, use, and maintain paint application equipment as necessary to provide the execution quality of painting as specified.

2.3 **Accessory Materials:** This work includes all required ladders, scaffolding, drop cloths, maskings, scrappers, tools, sandpaper, dusters, cleaning solvents, and waste, as required to perform the work and achieve the results herein specified.

2.4 **Colors:**

- A. Color of the final coat shall match the color selections furnished by the Architect. Preceding coats shall vary slightly in shade of color.
- B. Finish one room completely in each building, selected by the Architect, as a sample of the color scheme prior to proceeding with the painting. The approved application shall serve as a standard for the similar work throughout the building.
- C. **No limitation shall be placed on the number of color schemes selected, nor on the number of colors within each scheme.** It is conceivable that the School Administrator will select different color schemes in each building.

PART 3 - EXECUTION

3.1 **Inspection of Surfaces:**

- A. Before starting any work, surfaces to receive paint finishes shall be examined carefully for defects which cannot be corrected by the procedures herein under "Preparation of Surfaces", and which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected.
- B. The commencing of work shall be construed as acceptance of the surfaces, and thereafter, the Contractor shall be fully responsible for satisfactory work as required herein.

3.2 **Cooperation with Other Trades:**

- A. This work shall be scheduled and coordinated with other trades, and shall not proceed until other work and/or job conditions are as required to achieve satisfactory results.
- B. The Contractor shall examine the Specifications of the various other trades and shall thoroughly familiarize himself with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other Sections shall be painted or finished as part of the work covered by this Section.

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3.3 **Workmanship:**

- A. The workmanship shall be the very best. Only skilled mechanics shall be employed. Application may be by brush, roller or spray, at the Contractors option, except as hereinafter specified otherwise.
- B. All materials shall be mixed, thinned, modified, and applied only as specified by the manufacturer's directions on the container.
- C. The Contractor shall have approval of color samples before applying any paint or finish. All priming coats and undercoaters shall be tinted to the approximate shade of the final coat.
- D. The Contractor not only shall protect his work at all times, but shall also protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from the floors, glass, and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others, and shall leave his part of the work in clean, orderly, and acceptable conditions.
- E. All materials shall be evenly applied, free of runs, sags, holidays, brushmarks, air bubbles, excessive roller stipple, and other defects.
- F. Coverage and hide shall be complete. When color, stain, dirt or undercoaters show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.
- G. Each coat shall be thoroughly dry before applying succeeding coat.

3.4 **General Preparation:**

- A. Provide all scaffolding and staging required for work in this section. Coordinate locations to eliminate interference with the work of others.
- B. Remove electrical panel box covers and doors before painting wall. Paint separately and reinstall after all paint is dry.
- C. Finish all walls behind wall-mounted equipment, such as chalkboards and tackboards, etc., prior to the mounting of such equipment.
- D. Exterior painting shall not be done when the temperature is below 50 degrees F., while the surface is damp, or during cold, rainy or frosty weather, or when the temperature is likely to drop to freezing within 24 hours. Avoid painting surfaces while they are exposed to the hot sun.
- E. Exterior doors shall have tops, bottoms, and side edges finished the same as the exterior faces of these doors.

3.5 **Surface Preparation:**

- A. **Concrete and Masonry:** Refer to Section 09910, Special Coatings.
- B. **Ferrous Metal:**
 - 1. Remove rust, mill scale, and defective paint down to bare metal, using scraper, sandpaper, or wire brush as required.
 - 2. Feather edge of sound paint by grinding, if necessary.
 - 3. Touch-up all bare metal and damaged shop coat with Glid-Guard #5207 White Primer as specified.

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4. Touch-up shop coat of all items installed adjacent to concrete masonry prior to caulking.
- C. **Non-Ferrous Metal:**
 1. Prior to painting, pre-treat all metal as directed by the manufacturer of the paint to be used.
- D. **Wood Trim:**
 1. Back-prime painted wood trim before installation with the specified first coat material.
 2. Sand smooth and even surface, then dust off.
 3. Apply pigmented white shellac to all knots, pitch and resinous sapwood before priming coat is applied.
 4. Fill nail holes, cracks, open joints, and other defects with painter's putty after priming coat has dried.
 5. Color putty to match finish color or stain.
 6. Paste wood filler applied on open grain wood, after commencing, to flatten. This shall be wiped across the grain of the wood with a circular motion to secure a smooth, filled, clean surface, with filler remaining in open grain only. After overnight dry, sand surface until smooth before applying the next specified coat.
- E. **Gypsum Wall Board and Plaster:**
 1. Fill narrow, shallow cracks and small holes with vinyl spackling paste such as Glidden 3475 Spred Patch.
 2. Rake deep, wide cracks and deep holes. Dampen with clean water and fill with thin layers of drywall joint compound or patching plaster. Allow to dry, sand smooth, and level surface. Exercise care to avoid raising the nap on the drywall.

3.6 Application of Paint Materials:

- A. Apply paint materials in accordance with the manufacturer's instructions printed on the container and as specified below. Paint materials shall be evenly spread and smoothly flowed on with the proper type and size of brush, roller cover, bucket grid and spray equipment to avoid runs, sags, holidays, brushmarks, air bubbles, and excessive roller stipple. All coats shall thoroughly dry before applying succeeding coats. Sand and dust between each coat to remove defects visible from a distance of five (5) feet. Coverage and hide shall be complete. **When color, stain, dirt, and/or undercoaters show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance, and coverage at no expense to the Owner.**
- B. **Doors:** Top and bottom of wood doors not pre-finished at the factory shall be painted with one coat of primer or sealer within one week after delivery to job site. Shop coat of metal doors and frames shall be touched-up as often as necessary to prevent rust from occurring. After fitting, top, bottom, and side edges of exterior door shall be finished with the same number of coats as the exterior face of the door. Top and bottom edges of exterior doors shall be finished with the minimum of two (2) coats, and side edges shall be finished the same as the faces of the doors.

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Prime-Coated butts and overhead door closers shall be painted to match the adjoining door frames.

3.7 **Fixed Quality Control:** Unless otherwise directed, each completed coat will be inspected by the Architect prior to application of the succeeding coat. Only inspected coats of paint will be considered in determining the number of coats applied.

3.8 **Cleaning:**

- A. Remove spilled or spattered paint from all surfaces.
- B. Touch-up and restore finish where damaged, and leave work in clean, orderly, and acceptable condition.
- C. Broom cleaning will not be permitted once painting has begun. Subsequent cleaning shall be done only by commercial vacuum cleaning equipment.

3.9 **Painting Schedule:**

- A. All surfaces that have been left unfinished by the work of other trades shall be painted as scheduled below. Where factory primed surfaces have been touched-up. Only the following surfaces shall not require painting:
 - 1. Face Brick (with the exception of the specified sealer).
 - 2. Split-face, Architectural Concrete Masonry Units (with the exception of the specified sealer).
 - 2. Items with factory-applied final coat.
 - 3. Concealed ducts, pipes and conduit.
 - 4. Pre-finished wall, ceiling and floor coverings.

PAINING SCHEDULE

EXTERIOR:

- A. **Wood, Painted:**
 - 1 coat Glidden 3651 Spred House Paint Undercoater (Oil Primer)
 - 2 coats Glidden 2900 Series Dura-Satin 100% Acrylic House Paint.
- B. **Wood, Stained:**
 - Semi-Transparent. 2 coats Glidden 9720 Series endurance Semi-Transparent Oil Stain.
- C. **Concrete Masonry Units, Painted:**
 - Exterior: 1 coat Glidden Non-Silicone water repellent sealer.
 - 2 coats Glidden Spred House Masonry and Stucco Paint.
- D. **Ferrous Metal:**
 - 1 coat Glidden 5207 Glid-Guard White Metal Primer.
 - 1 coat Glidden 3651 Spred House Paint Undercoater.
 - 1 coat Glidden 4500 Glid-Guard Alkyd Industrial Enamel.
- E. **Non-Ferrous Metal:**
 - 1 coat Glidden 5229 Glid-Guard White All Purpose Metal Primer.
 - 1 coat Glidden 3651 Spred House Paint Undercoater.
 - 1 coat Glidden 4500 Series Glid-Guard Alkyd Industrial Enamel.
- F. **Brick Sealer:** Non-Silicone Clear Regular Water Repellent 20537 Series - Glidden or "Sure-Krete" clear water repellent by Seal-Krete, Inc.
- G. **PVC Piping:** Use for Downspouts, and other exposed PVC, etc.
 - 1 coat ICI-Dulux 3210, Ultra-Hide Aquacrylic Gripper (latex stain killer/primer/sealer)
 - 2 coats ICI-Dulux 2402, Dulux Professional Exterior 100% Acrylic Satin Finish Paint

INTERIOR:

- A. **Wood, Stained (Satin Finish Transparent Stain):**
 - 1 coat Glidden 1600 Ultra Hide Oil Stain.
 - 1 coat Glidden Ultra-Hide quick drying sanding sealer No. 5035, clear.
 - 1 coat Glidden 81 Gloss Urethane Varnish.
 - 1 coat 82 Satin Sheen, Urethane Varnish (Sand, with 220 grit sandpaper, between each coat applied).
- B. **Ferrous Metal (Doors, Trim, Steel, Iron, Etc.):**
 - 1 coat Glidden 5207 Glid-Guard White Metal Primer.
 - 2 coats Glidden 4600 Series Spred Lustre Semi-Gloss Enamel.

END OF SECTION 09900

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SECTION 09910

SPECIAL COATINGS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The Contractor shall furnish all labor and materials to complete the Special Coating work, including preparation of all surfaces, application of materials, and protection of surfaces until curing is complete, as indicated on the Drawings and/or in these Specifications.
- 1.4 **Submittals:**
- A. Comply with Section 01300, Submittals.
 - B. Submit manufacturer's data and complete line of available colors for selection.
- 1.6 **Preparation of Surfaces:**
- A. **General:**
 - 1. All surfaces shall be dry and clean-free of dirt, grease, or any foreign matter than will adversely affect the adhesion, finished appearance, or protective properties of the Special Coatings.
 - 2. If for any reason the surface cannot be properly prepared, the condition will be reported to the General Contractor who will be responsible for rectifying the unsatisfactory condition.
 - B. **Concrete Masonry Units (Unparged):**
 - 1. Remove all burrs, nibs, mortar spatter, and loose masonry.
 - 2. Remove any efflorescence by muriatic acid wash, and rinse with clear water.
 - 3. Fill all large holes, voids and depressions with cement.
 - 4. Scrape all joints to remove mortar.
 - 5. Brush away all loose dust and residue.
 - C. **Concrete Masonry Units (Parged), Precast and Poured Cement:** Grind Carborundum power tool to remove all marks and defects.
- 1.7 Application shall be by an applicator approved by the manufacturer.

PART 2 - PRODUCTS

2.1 Materials:

- A. **Approved Products:** Except as otherwise noted, proprietary names used herein refer to products as manufactured by ICI-Devoe.
 - 1. Epoxy coatings shall be "Tru-Glaze" wall coating system.
- B. **Concrete Masonry Applications:**
 - 1. **Primer Coat:** One coat or more as required to prepare the substrate to receive finish coats.
 - (a) Wonder-Pruf #11502, Waterproofing Masonry Coating.
 - 2. **Base Coating:**
 - (a) Tru-Glaze-WB 4406 Semi-Gloss
 - (b) Two (2) coats of one (1) solid color.
 - (c) Dry film thickness of each coat to be a minimum of 2 mils.
- C. The Fire Resistance (ASTM E84-61) of the system on concrete block shall have a Class "A" rating with a flame spread rating of 8 or less, contribute no fuel, and have a smoke density rating of 12 or less.
- D. The material used needs Federal Specification TT-C-001226 (GSA-F55) and TT-C-550A.

PART 3 - EXECUTION

- 3.1 Method of application shall be by airless spray in accordance with the manufacturer's directions.
- 3.2 Apply materials only when ambient and surface temperatures are above 65 degrees F.

END OF SECTION 09910

SECTION 10421

CAST-ALUMINUM SIGNAGE LETTERS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** The extent of work is provision of materials and labor for channel-mounted cast aluminum letters. Locations and sizes as indicated on the Drawings.
- 1.4 **Submittals:**
- A. Comply with Section 01300, Submittals.
 - B. **Shop Drawings:** Submit Shop Drawings for fabrication and installation of letters. Include plans, elevations, and large scale details of sign working and lettering layout. Show anchorages and accessory items. Furnish location Template Drawings for items supported or anchored to permanent construction.
 - C. **Product Data:** Submit manufacturer's technical data and installation instructions for each type of sign required.

PART 2 - PRODUCTS

- 2.1 **Manufacturers:**
- A. The following manufacturers are approved:
 - 1. APCO Graphics, Inc.
 - 2. Architectural Graphics, Inc.
 - 3. ASI Sign Systems, Inc.
 - 4. Spanjer Brothers, Inc.
 - 5. A.R.K. Ramos
 - 6. Southwell
- 2.2 **Construction:**
- A. **Letters:** Standard cast-aluminum, font style as selected by the Architect.
 - B. **Fasteners:**
 - 1. Unless otherwise indicated, use concealed fasteners fabricated from metals that are non-corrosive to either the sign material or the mounting surface.

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2. Mount to discrete channel as indicated on the Plans.
- C. **Finish:**
1. Factory-finished, as selected by the Architect.
 2. Mounting Channel (where shown on Drawings) is to match the color of the substrate, **not** the letters.

PART 3 - EXECUTION

- 3.1 **Installation:** Install letters using mounting methods of type described and in compliance with the manufacturer's instructions. Install letters level, plumb, and at the height directed, with sign surfaces free from distortion or other defects in appearance.
- 3.2 **Cleaning and Protection:** At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10421

SECTION 10440

INTERIOR SIGNAGE

PART 1 - GENERAL:

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Provide and install room identification signs with numbers, script, symbols and braille as indicated on the Drawings.
- 1.4 **Quality Assurance:** For each sign form and graphic image process, furnish products of a single manufacturer.
- 1.5 **Submittals:**
 - A. Comply with Section 01300, Submittals.
 - B. **Shop Drawings:** Submit Shop Drawings for fabrication and erection of specialty signs. Include plans, elevations, and large scale details of signs wording and lettering layout. Show anchorages and accessory items. Furnish location template Drawings for items supported or anchored to permanent construction.
 - C. **Product Data:** Submit manufacturer's technical data and installation instructions for each type of sign required.
 - D. **Text:** Sign list, including specific text for each sign, has been provided on a Signage Schedule in the Drawings.

PART 2 - PRODUCTS

- 2.1 **Manufacturers:**
 - A. Subject to compliance with requirements, provide products of one of the following:
 1. ASI
 2. Americraft Corporation, Palmetto, Florida
 3. Duro Decal Co., 1832 Juneway, Chicago, IL 60626.
 4. A.R.K. Ramos, 1321 South Walker, Oklahoma City, OK 73109.
 5. Best
 6. Multi-Graphics, inc.

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2.2 **Construction:**

A. **Construction:**

1. Base: 1/8" acrylic base. Color as selected by Architect.
2. Reverse screen printed message.

B. **Fasteners:** Use concealed fasteners fabricated from metal that are non-corrosive to either the sign material or the mounting surface.

2.3 **Fabrication:**

- #### A.
- Fabricate 1/8" acrylic base. Route edges smooth with 1/2" radius corners. Letter size and color shall be screen applied from standard color range. Sign text shall be tactile (raised). Grade 2 Braille copy of sign text shall also be included on each sign below text in accordance with A.D.A. requirements.

PART 3 - EXECUTION

3.1 **Installation:**

- #### A.
- Locate sign units and accessories as directed by Owner, using mounting methods of type described and in compliance with the manufacturer's instructions. Install sign units level, plumb, and at the height directed, with sign surfaces free from distortion or other defects in appearance.

B.

Signs shall be mounted in accordance with A.D.A. requirements.

1. Refer to the Plans for sign locations.
2. Unless otherwise indicated on the plans, mounting placement shall be on doorknob side of door wherever possible, between 8" and 12" from the door frame.
3. Height of sign shall be 60" from the center of sign to the floor, unless otherwise indicated on Drawings.

3.2 **Cleaning and Protection:**

- #### A.
- At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10440

SECTION 10520

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** Provide and install fire extinguishers and cabinets at locations indicated on the Drawings.
- 1.4 **Submittals:**
 - A. Comply with Section 01300, Submittals.
 - B. Provide cut sheet showing rough opening requirements, finishes and technical data for extinguishers.

PART 2 - PRODUCTS

- 2.1 **Manufacturers:**
 - A. The following manufacturer is approved:
 1. Larsen
 2. J. L. Industries
- 2.2 **Materials:**
 - A. **Cabinet-mounted Extinguishers:** MP-10 series. UL Rating 4A-60 B:C.
 - B. **Cabinet:** Semi-recessed (rolled edge) Larsen 2712-RL or 2409-6R.
 - C. **Finish:** Extruded aluminum.
 - D. **Doors:** Vertical Duo, extruded aluminum.
 - E. **Glass:** All glass is to be **tempered**.

PART 3 - EXECUTION

- 3.1 **Installation:**
 - A. Mounting location and height is indicated on the Drawings.

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- B. Provide necessary rough opening, taking care not to damage block walls or loosen mortar joints. Insure cabinets are plumb and properly anchored.
- C. Install cabinets as per manufacturer's suggested procedure. Test and tag extinguisher prior to installation.
- D. Verify that all extinguishers are correctly sized and located. Provide tagging and full charging of all extinguishers.
- E. Caulk around cabinets with color as selected by Architect.

END OF SECTION 10520

SECTION 10536

HANGER ROD CANOPIES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** It is the intent of this Section to provide for the furnishing, installing, and warranting of hanger rod canopies and all associated work and accessories described herein.
- 1.4 **Work Included:**
- A. Work in this section includes furnishing and installation of extruded aluminum overhead hanger rod style canopies.
 - B. Related Items and Considerations
 - 1. Flashing of various designs may be required. Supplied by the installer.
 - 2. Determine wall construction, make-up and thickness.
 - 3. Ensure adequate wall condition to carry canopy loads where required.
 - 4. Consider water drainage away from canopy where necessary.
 - 5. Any necessary removal or relocation of existing structures, obstructions or materials.
- 1.5 **Quality Assurance:**
- A. **Manufacturer's Qualifications:** Minimum three (3) years experience in the manufacture and fabrication of the canopy components.
 - B. **Erector Qualifications:** Minimum three (3) years experience in erecting, installing and assembling canopies.
 - C. **Single Source Manufacturer:** All canopy materials and components to include, but not be limited to, roof panels and hanger rods, shall be manufactured and produced by and under the control of a single source manufacturer.
- 1.6 **Submittals:**
- A. Submit the following Shop Drawings, Product Data and Engineering Calculations in accordance with Submittals, Section 01300.
 - 1. **Shop Drawings:**

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- a. Show erection techniques and details of canopy assemblies.
 - b. Show all anchorage and accessory items and details.
 - c. Show layout of all columns, identifying those columns where drainage shall occur, on Drawings of not less than 1/8" = 1'-0" scale.
 - d. Provide curved roof panel profiles and plans.
2. **Structural Calculations:** Show that canopies conform to the Florida Building Code, latest edition, to include, but not be limited to, uplift, wind loads and roof live loads. Submit calculations manually signed, dated and impression-sealed by a professional engineer, registered in the State of Florida.
 - a. Design canopies to meet the Florida Building Code loads for education facilities: **110 mph wind speed and 1.15 importance factor.**
 3. **Setting Drawings:** Submit Setting Drawings, templates and written instructions for the installation of anchorage devices built into other work.
 4. **Product Data:** Submit manufacturer's detailed technical data for materials, fabrication and installation.
 - a. Provide catalog cuts of hardware, anchors, fastening and accessories.
- 1.7 **Performance Requirements:**
- A. Canopy must conform to the Florida Building Code and have a Florida Product Approval.
 - B. The canopy must handle a minimum of 30 PSF live load.
- 1.9 **Product Handling:**
- A. **Delivery:** All canopy components shall be delivered in manufacturer's original, unopened standard containers and packing with labels and seals intact.
 - B. **Protection:** Provide all necessary protection to prevent damage to, but not limited to, all components and finishes.
 - C. **Replacements:** Be responsible for and make all repairs and replacements of damaged or defective materials, components and finishes or poor installation at no additional cost to Owner.
- 1.10 **Site Conditions:**
- A. **Weather Conditions:**
 1. Proceed with work only when weather conditions will permit installation of materials and components without harm or damage.
 2. Provide temporary protection of all materials, stored or installed, components and installed work in event of unsuitable weather conditions which may cause damage.
 3. Be responsible for repairing and replacing all materials, stored or installed, damaged by unsuitable weather conditions.
 - B. **Existing Work to Remain:**
 1. Provide protection for all existing work to remain or to be re-installed, whether stored or installed or in-place, from damage, to include, but not be limited to, weather conditions, abuse or defacing by work operations and lack of protection.

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2. Provide protection for all existing work not included in work but subject to damage by work operations or weather conditions.
 3. Be responsible for repairing and replacing existing work, whether a part of the work or not, damaged due to work operations or weather conditions.
- C. **Field Measurements:**
1. Be responsible for all field measurements prior to fabrication.
 2. Distances and measurements shown on Drawings are for illustration or approximate extent of work and are not exact.

PART 2 - PRODUCTS

2.1 Manufacturers:

- A. Mapes Canopies. Lincoln, Nebraska. Phone: 1-888-273-1132.
- B. ***No "approved equal" material or equipment will be considered unless written request has been submitted to the Architect for approval at the latest ten (10) days prior to date for receipt of bids.***

2.2 Roof Deck:

A. Flat Roof Decking:

1. **Material:** 3" x 6" interlocking flat soffit "Super Lumideck" panels, 6063-T6 extruded aluminum
2. **Deck Gauge:** 0.078
3. **Finish:** Dark Bronze

2.3 Fascia/Gutter:

A. **Material:** 8" extruded "C" channel style, 6063-T6 extruded aluminum

1. **Shape:** Profile as shown on Drawings.
 - a. Serve as a built-in gutter for roof drainage
 - (1) **Gutter Width:** 2-3/4" minimum
 - (2) **Gutter-Fascia Height:** 8"
 - b. Serve as a structural frame member
 - (1) **Live Load:** 30 PSF
2. **Gauge:** Minimum 0.125"
3. **Finish:** Dark Bronze

2.4 Hanger Rods:

A. **Material:**

1. **Rod:** 1" x Schedule 40 hanger pipe assembly
2. **Clips:** Extruded Aluminum
3. Provide threaded adjustment rods
4. Provide all nuts, washers, clevis, and bolts are required for a complete assembly

2.5 Fabrication:

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- A. **Connections:** All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
- B. **Decking:** Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.
- C. **Concealed drainage:** Water shall drain from covered surfaces into integral fascia gutter and directed to either the front for front drainage or to the rear for ground level discharge via one or more designated downspouts.

2.6 Anchorage:

- 1. Anchorage is through the brick veneer and CMU wall system.
- 2. Provide 1/2" diam x 16" min ASTM A193 grade B8 Class 2 stainless steel through-eyebolt with 3" diam x 0.25" plated steel washers exterior and 4" square x 0.25" interior steel backing plate
- 3. Embed all wall anchor washers in sealant to provide watertight seal at the wall.

2.7 Component Accessories:

Provide clip angles, support I-beams and other necessary components of similar materials and finishes to match prime components.

2.8 Finish:

- A. Two-coat Kynar: **Extra Dark Bronze**
- B. Apply finish in accordance with the "Quality Standards" specified by the Aluminum Association.

PART 3 - EXECUTION:

3.1 Inspection:

- A. Examine all surfaces for any deviations beyond allowable tolerances for installation of work.
- B. Installer shall confirm dimensions and elevations to be as shown on the Drawings provided.
- C. Correct any conditions deemed as unacceptable and which would adversely affect workmanship of new work installation.
- D. Starting of work constitutes acceptance of surfaces as satisfactory and suitable for installation of new work, and the installer/erector shall be held responsible for good workmanship, to include, but not be limited to, proper fitting of new and existing components, installation of accessories, watertight installation, and other defects.

3.2 Preparation:

Ensure proper anchorage to structure behind brick veneer. *Anchorage in brick veneer alone is not acceptable.*

3.3 Installation and Erection:

- A. Anchor beams and supports securely by bolting or welding. Perform all cutting, drilling and fitting required for installation. Fit exposed connections accurately together to form tight hairline joints.

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- B. Install and secure roof panels in accordance with manufacturer's instructions and approved Shop Drawings.
- C. Space fastenings and brackets as required and secure to back-up structure or additional support where necessary to prevent metal distortion.
 - 1. Conceal all fasteners from exterior view.
 - 2. Separate dissimilar metals with approved coating.
- D. Install sealants where shown or recommended in accordance with manufacturer's instructions for watertight installations.

3.4 **Adjusting and Cleaning:**

- A. Touch-up marred finishes.
- B. Remove and replace damaged components or surfaces deemed as unacceptable by Architect.
- C. Perform all cleaning as directed in Section 01710 to include, but not be limited to, removing stains, scrapes and cutting, and cleaning all surfaces, new and existing.

3.5 **Disposal:** Dispose of all debris material in appropriate containers.

END OF SECTION 10536

SECTION 10800

TOILET ACCESSORIES

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Scope:** It is the intent of this Section to provide for the furnishing, installing, and warranting of all toilet accessories as described herein.
- 1.4 **Work Included:**
 - A. Work included is a convenient listing of the significant items described within this Section and shall not be construed as the only work applicable or related to this Section.
 - B. Work includes, but is not limited to:
 1. Toilet Accessories.
 2. Fasteners.
- 1.5 **Submittals:**
 - A. Comply with Section 01300, Submittals.
 - B. **Product Data:** Submit manufacturer's catalog, cuts, and data sheets, complete parts list and installation requirements for each accessory item specified.
 - C. Submit maintenance data, operating instructions and keys required for each type of equipment and lock.
- 1.6 **Product Handling:**
 - A. Deliver items in manufacturer's original unopened protective packaging. Store materials in original protective packaging to prevent soiling, physical damage, wetting or abuse.
 - B. Handle so as to prevent damage to finished surfaces. Maintain protective covers on all units until installation is complete. Remove protective covers at final clean-up of installation.
- 1.7 **Guarantee:** Guarantee all mirrors for ten (10) years against silver spoilage.

PART 2 - PRODUCTS

2.1 Manufacturers:

- A. **Basis of Specification:** Products listed are by Bobrick, unless noted otherwise.
- B. **Acceptable Manufacturers:**
 - 1. Bobrick
 - 2. Bradley Corp.

2.2 Products: *(where noted on the plans)*

- A. **Paper Towel Dispensers:**
 - 1. B-262, surface-mounted, C-fold or multi-fold towels.
- B. **Soap Dispensers:**
 - 1. B-2112, surface-mounted.
- C. **Toilet Tissue Dispensers:**
 - 1. **Surface-mounted:** B-2888
 - 2. **Dual Toilet Partition:** B-386
- D. **Paper Waste Receptacles:**
 - 1. B-279, surface-mounted, include vinyl liner.
- E. **Sanitary Napkin Disposal (Feminine Napkin Disposal):**
 - 1. **Surface-mounted:** B-254
 - 2. **Dual Toilet Partition:** B-354
- F. **Grab Bars:**
 - 1. **Type 1:** B-5806.99 x 36", 1-1/4" diameter, peened grip, snap flange.
 - 2. **Type 2:** B-5806.99 x 42", 1-1/4" diameter, peened grip, snap flange.
 - 3. **Type 3:** B-5806.99 x 30", 1-1/4" diameter, peened grip, snap flange.
- G. **Mirrors:**
 - 1. 24" W x 36" H, B-293-2436-8, tilt mirror, tempered.
 - 2. 48" W x 36" H, B-290-4836-8, standard mirror, tempered.

2.2 Fabrication:

- A. **Locked Dispensing Units:** Key alike for all accessories.
- B. Weld corners leaving no open miters.

PART 3 - EXECUTION

3.1 Execution:

- A. Check areas to receive surface-mounted units for conditions that would affect quality and execution of work.
- B. Verify plumbing fixtures and toilet partitions that affect installation of accessories.
- C. Do not begin installation of toilet accessories until surfaces are acceptable.

3.2 Installation:

- A. Drill holes to correct size for applications that are concealed. Mount surface-mounted accessories to back-up with toggle bolts. Plumb and align.
- B. Lock grab bars to conceal mounting plate installed in wall.
- C. No adhesives shall be used to attach accessories to walls.

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3.3 **Clean-Up:**

- A. Adjust accessories for proper operation.
- B. After completion of installation, clean and polish all exposed surfaces.
- C. Deliver keys and instruction sheets to Owner.

END OF SECTION 10800

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SECTION 11400

FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

- 1.1 **Related Documents:** The General Provisions of the Contract, including the General Conditions, Supplementary Conditions and Special Conditions, (if any), along with the General Requirements, apply to the work specified in this Section.
- 1.2 **Direct Purchasing:** This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Construction Purchase Orders (CPO) by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.
- 1.3 **Coordination:**
- A. In case of discrepancies and/or conflicts between specifications and drawings, precedence of various documents shall be as follows, in order:
 - 1. The itemized equipment specifications and drawings whichever shows the greater quantity;
 - 2. The figured dimensions on the Drawings;
 - 3. The General Provisions of the Contract
 - B. Discrepancies and/or conflicts shall be submitted in writing to the Architect for clarification before the General Contractor's bid is submitted. This must be submitted at least ten (10) days before bids are to be opened so that an addendum may be issued if necessary. Should discrepancies and/or conflicts be discovered after the work has been started, the General Contractor shall report same to the Architect immediately, and no work connected with the discrepancies and/or conflicts shall be undertaken; or if underway, such work shall be stopped immediately until the General Contractor and the Architect agree on the clarification thereof.
 - C. If there is any conflict within or between any of the Contract Documents involving the quality or quantity of the work required, it is the intention of the Contract that the work of highest quality or greatest quantity shown or specified shall be furnished. Whether or not the word "all" is used in the specification, coverage is intended to be complete, except where partial coverage is specifically and expressly noted. In all cases where an item is referred to in the singular number, it is intended that the reference shall apply to as many such items as are required to complete the work, or as shown on the drawings.
- 1.4 **Scope:**
- A. Food Service Equipment Subcontractor shall furnish complete all food service equipment, labor, materials, tools and equipment necessary for the complete installation of kitchen equipment in a first class manner, including all work incidental

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- thereto in accordance with the drawings and these specifications.
- B. The term "Complete Installation" shall mean the delivery of the kitchen equipment, with transportation and trucking charges prepaid to the building site, un-crated, assembled, set in place, leveled, calibrated, and ready for final connection to be performed by other trades unless noted to be performed by the Food Service Equipment Subcontractor. The Food Service Equipment Subcontractor shall clean all equipment using cleaners approved by the manufacturers. Equipment is to be cleaned just prior to Owner's acceptance.
 - C. Food Service Equipment Subcontractor is responsible for leaving equipment with the threaded outlets for type of connections as standardized by food service equipment manufacturers for other Subcontractors to make final steam, plumbing, electrical, and ventilating connections.
 - D. If items marked "Existing," "Relocate," or "By Owner" are to be used and Food Service Equipment Subcontractor shall disconnect them from existing service, move them in accordance with construction schedule and warehouse them when necessary while site is being prepared by other subcontractors for final setting in place. Existing equipment shall be cleaned and refinished and/or repaired as noted in the Itemized List of Food Service Equipment. Any damage during moving or warehousing shall be repaired at no cost to the Owner.
 - E. This portion of the Contract shall be performed by a competent Food Service Equipment Subcontractor who is to provide a competent foreman for erection and placing of equipment and to counsel with other subcontractors in regard to connections at time of installation.
 - F. Food Service Equipment Subcontractor is to deliver to other subcontractors all plumbing, steam fitting and electrical parts that are furnished loose and as a part of the equipment and if requested, counsel with other trades for proper installation.
 - G. Food Service Equipment Subcontractor shall erect the equipment at the site in full compliance with local rules and regulations.
 - H. Food Service Equipment Subcontractor shall maintain a full time service department and be a factory-appointed dealer in distribution for all equipment to be furnished.
 - I. If all partitions will be erected prior to delivery of food service equipment, bidders are cautioned that all equipment must be fabricated to clear through finished door openings.
 - J. Food Service Equipment Subcontractor shall clean up all debris made by his workmen immediately upon completion of installation and remove same from premises.
 - K. Food Service Equipment Subcontractor shall supervise the placement of pipes, sleeves, drains and power prior to pouring of the floor slab.

1.5 **Qualifications of Bidders:**

- A. It is required that all fabricated equipment such as food serving units, tables, sinks, countertops, etc. described in the following specifications, other than by name and catalog numbers, be manufactured by an equipment fabricator who has the plant, personnel, and engineering facilities to properly design, detail, and manufacture high quality food service equipment. All work in the above category to be by one (1) manufacturer and of standard unit assembly and uniform design and finish.
- B. The prospective bidder for the equipment hereinafter specified shall be a recognized

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distributor for these items of equipment, including those of other manufacturers than his own.

- C. In consideration of the scope and size of performance of this section, the General Contractor shall provide the name of the Food Service Equipment Subcontractor that shall be performing this work at the time of bid opening. Upon demand, the Food Service Equipment Subcontractor, being considered for possible negotiation, shall submit to the Architect and Owner evidence of having executed contracts of a size comparable to this contract. If requested, he shall also submit evidence of sufficient financial resources for completion of the contract.

1.6 **Manufacturer's Name and Substitution:**

- A. It is the intent of the Itemized List of Food Service Equipment to establish a quality and performance standard for the equipment to be purchased under this section. The standard established by these specifications has been carefully set by the Architect and Owner. The prime specified brand is identified as first named and in detail to establish this standard and alternate brands identified in these specifications must comply with the standard established by the prime specified product. It is, as well, the intent of this Contract to purchase equipment of the standard specified as competitively as possible without reduction of quality. To ensure this, the base bid shall be for items of equipment as specified with no substitutions. Bidders wishing to supply approved substituted items are encouraged to do so, identifying cost savings for each prior approved item. Owner reserves the right to accept the lowest base bid without regard to proposed substitutions.
- B. Any bidder wishing to supply alternate equipment other than that specified shall submit a request for substitution to the Architect at least ten (10) days prior to Bid Date for approval or disapproval. If a substitution is approved, an addendum will be issued.
- C. Bidders requesting such substitutions are cautioned to examine mechanical and electrical plans and building conditions to determine if such substitution will require changes in mechanical or electrical connections or require rearrangement. If any of the above changes would be involved, a layout of such changes and any additional cost (itemized) must be submitted with the request for substitution. If proposed substitutions entail additional cost which was not submitted with the request for substitution and approval is granted, bidders shall be responsible for such costs.
- D. In addition, a request for substitution must be accompanied by the manufacturer's specification and a *Substitution Request Form* which provides the Architect with a detailed description of the manner in which the proposed substitution conforms and/or varies from the item specified. No request for substitution will be considered without an accompanying *Substitution Request Form*.
- E. It is understood by the Architect and Owner that no agent, dealer, broker or agency may bind a manufacturer beyond the manufacturer's own printed literature. Therefore, any party submitting a *Substitution Request Form* stating compliance with a feature specified for the prime specified item by a manufacturer in a manner not identified as a standard of projection or as an option for that item in the manufacturer's literature must be accompanied by a letter on the manufacturer's own letterhead stating that the manufacturer shall comply with the specified feature and such compliance shall not adversely affect the manufacturer's product

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- performance, reliability, durability, appearance or effect the warranty.
- F. If the substituted item is approved and subsequently installed and upon final inspection found to deviate from the specifications in a manner not detailed in the *Substitution Request Form*, the Food Service Equipment Subcontractor shall at the discretion of the Architect or Owner bring the equipment into compliance or remove the equipment and replace it with one in compliance with the specifications at his own cost. In consideration of the job stage at the final inspection, the Food Service Equipment Subcontractor shall take no more than five (5) working days to make this replacement. Bidders are encouraged to review the *Substitution Request Form* (provided upon request) prior to using such items in their bid. Awarded Contractor shall be responsible for deviations not detailed in the *Substitution Request Form* submitted **FROM ANY SOURCE**. Approval of submittals by the Architect does not relieve the General Contractor or Food Service Equipment Subcontractor of this condition. The *Substitution Request Form* can be found in this document before the Itemized List of Food Service Equipment.
 - G. Related equipment, such as dishwasher assembly, steam equipment, refrigerators, and cafeteria line equipment shall be from one (1) and only one (1) manufacturer.
 - H. No request for substitution will be considered after ten (10) days prior to date bid except in instances where the item is no longer available.

1.7 Drawings and Field Measurements:

- A. Upon Contract award, submit the following shop drawings and product data:
 - 1. Specification sheets on all equipment containing illustrations, line drawings and rough-in information.
 - 2. Complete and detailed shop drawings on all fabricated equipment, drawn at a minimum scale of 3/4" to the foot, plus necessary cross sections at a minimum scale of 3/4" to the foot, showing complete detail of each item of specially fabricated equipment.
 - 3. Separate plumbing and electrical rough-in dimensioned drawings showing rough-in for each piece of equipment with each outlet when giving size, height and an explanation with each outlet cross-referenced to the specification sheets or shop drawings. It is the responsibility of the Food Service Equipment Subcontractor to verify that all plumbing and electrical rough-ins are correct with item being furnished under this section. Items marked "Future," N.I.C., or "by Owner" or planned for purchase at a later date, the Food Service Equipment Subcontractor shall include these items as well as existing items to be reused on the rough -in dimensioned drawings.
- D. All drawings shall be based upon the floor plans and Itemized List of Food Service Equipment. Drawings shall include accurately dimensioned layouts and locations for all masonry bases, if required or called for, and shall include accurately dimensioned details and locations for equipment extending through walls.
- E. The Food Service Equipment Subcontractor shall also furnish with the submittals a list showing exact electrical characteristics required for each item in a check list format for approval of the Architect before purchasing of these items.
- F. The Food Service Equipment Subcontractor shall verify all measurements at the building and be responsible for same before proceeding with the manufacture of the

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- equipment. Measurements shown on drawings accompanying these specifications are approximate and are for estimating purposes only. The Food Service Equipment Subcontractor is to make two (2) mid-job inspections after submitting an approved 1/4" scale drawing of all mechanical, electrical, and plumbing placements. These two (2) inspections are to be made upon notification by the General Contractor in order to assure effective coordination between itself and trades. The Food Service Equipment Subcontractor is to verify all plumbing and electrical stub-ups prior to the floor being poured and to verify hood placement. As it is an integral part of this section that all equipment be located properly, it shall be the Food Service Equipment Subcontractor's responsibility to verify completion of stub-ups and hood placement to insure proper placements of floor drains and mechanical outlet stubs to insure that all of the equipment provided under this section shall be properly located. Where necessary, he shall confer with the General Contractor and flooring subcontractor to coordinate and establish such finished dimensions wherever necessary. Flooring subcontractor shall be responsible for maintaining these dimensions in erection of his work, and will assume cost of any change necessary due to errors in his work. At time of checking measurements, Food Service Equipment Subcontractor shall carefully examine spaces and existing conditions, and report to the Architect any work performed by others or planned by others which prevents him from execution of his work as required under the contract and obtain the Architect's final decision and instructions before proceeding.
- G. Should a contract for food service equipment be awarded after mechanical services have been roughed in, the Food Service Equipment Subcontractor shall carefully measure locations of all floor and wall penetrations and existing conditions, and indicate them and provide for them on his shop drawings and final mechanical plan. If his inspection reveals that any of these existing conditions seriously interfere with execution of this work as required under his contract, he is to report these conditions to the Architect and await his decision and instructions before proceeding with that portion of his detailed drawings.

1.8 **Material and Workmanship:**

- A. Unless otherwise specified or shown on drawings, all material is to be new, of best quality, perfect and without flaws, and delivered upon completion in an undamaged condition.
- B. All workmanship to be best of its respective kind. All labor to be performed in a thorough workman like manner by qualified, efficient and skilled mechanics.
- C. Food service equipment will be inspected after delivery and any equipment found not to be in accordance with specifications and/or approved shop drawings will be rejected and replaced with the approved equipment at the expense of the Food Service Equipment Subcontractor. Any defects found during inspection must be remedied to the satisfaction of the Owner.

1.9 **Standards:**

- A. All equipment shall be constructed in strict compliance with the standards of the National Sanitation Foundation (NSF) and in full compliance with the public health regulations of Florida. Each piece of equipment to have "Seal of Approval" label of

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the NSF.

- B. All equipment must conform to NFPA 96.
- C. All electrical equipment must be UL listed.
- D. All steam equipment shall be ASME code approved and National Board registered.

1.10 **Compliance with Laws and Code Regulations:**

- A. Nothing in the Contract Documents shall be construed to conflict with any local or state laws or regulations governing the installation or any part of the work to be performed under this contract, and all requirements shall be in accordance therewith, without any additional cost to the Owner.
- B. All work and materials shall be in full accordance with the latest rules of the U.S. Public Health Service, Florida public health department, National Board of Fire Underwriters, Florida Building Codes, any local or state ordinances, and regulations of the Florida state fire marshal.

1.11 **Work by Other Subcontractors:**

- A. All plumbing, steam, electrical and ventilation work required in connection with this section shall be done by other subcontractors, unless specifically called for in the Itemized List of Food Service Equipment, to include but not limited to exhaust fans and duct work associated with the ventilation hood. The work to be done by these other subcontractors shall include roughing-in to points indicated on the mechanical, plumbing, and electrical plans, final connections from rough-in points to various pieces of equipment requiring such connections and the supplying of all necessary materials and labor for this work except as hereinafter noted. Tile bases, if supplied below various items of kitchen equipment, are to be provided by other trades.
- B. Refrigeration work to be performed under this section as listed in the Itemized List of Food Service Equipment except for electrical and plumbing connections to compressors, blower coils, controls, etc. These final connections shall be made by other trades.
- C. All line and disconnect switches, safety cut-outs, control panels, fuse boxes, or other electrical controls, fittings, and connections shall be furnished and installed by other trades. Those starting switches furnished loose as standardized by food service equipment manufacturers (other than fabricated items) shall be mounted and wired complete under the electrical division.
- D. Any sleeves or conduit required for refrigeration and tubing lines shall be furnished and installed under the other trades. This is also applicable to the alarm system.
- E. Plumbing and steam fitting trades are to see that all lines are flushed free of foreign matter before connecting fixtures.
- F. The electrical subcontractor shall make all final connections to equipment as shown on plans or specified herein; and it shall be the responsibility of the electrical subcontractor to check all items to see where starters, contactors, switches, etc., are required.
- G. The plumbing subcontractor shall rough-in and connect water and waste to the items which will be furnished and installed by the Food Service Equipment Subcontractor. The Food Service Equipment Subcontractor shall furnish faucets and all lever waste drains, hose reels with mixing valves to the plumbing subcontractor for connections

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- and installation. The plumbing subcontractor will provide traps, tail pieces and fittings, water piping, floor drains, shut-off valves, and all other necessary fittings.
- H. The mechanical subcontractor shall furnish and install necessary ventilation facilities of sufficient capacity to operate the equipment. Mechanical work done by the Food Service Equipment Subcontractor is listed in the Itemized List of Food Service Equipment.
 - I. The General Contractor shall furnish openings and passage ways of sufficient strength to sustain the weight of the food service equipment. He shall furnish openings and passage ways of sufficient size to permit the delivery and erection of the equipment in their respective locations without dismantling, providing the sizes are the same as shown on the shop drawings. The General Contractor shall furnish depressed floor for drain grates, and walk-in cooler/freezer when noted.

1.12 Warehousing:

- A. The School District does not pay for materials not delivered to the job site. However, because of the responsibility of damage to the food service equipment, other arrangements may be made by special permission of the School District Project Manager. The Food Service Equipment Subcontractor is advised to ensure items stored in his warehouse prior to shipment to the site.

1.13 General Construction Notes:

- A. It is the intention of these specifications to produce equipment to meet the individual needs of the Owner. The primary requirements in the manufacture of this equipment are the proper use of materials and construction as specified. In addition, features of sanitation, ready accessibility for cleaning, low cost in maintenance in operation, strength and ruggedness shall be maintained in the manufacture or fabrication of this equipment.
- B. It is the intention of these specifications that all exposed surfaces of equipment be free from bolts, screws, and rivet heads. Wherever bolts shall be required, they shall be concealed type wherever possible and shall be of similar composition to the metal to which they are applied.
- C. Water inlets shall be located above positive water level to prevent siphoning of liquids into the water system. Wherever conditions shall require a water inlet placed below the water level suitable type of vacuum breaker shall be placed on the fixture to form part of same to prevent siphoning.
- D. Suitable pipe slots shall be provided through all undershelves to accommodate necessary service lines. These slots shall be of proper size and shall be neatly made with turned up edges on all four (4) sides to eliminate cutting or defacing of equipment on job. Cabinet bases shall be provided with an inner panel duct at ends or rear of cabinet to allow vertical pipe space to conceal the vertical piping.
- E. All hardware, including that used for refrigerators, shall be of heavy-duty cast type and arranged for locking device. Hardware shall be specifically selected for the particular use to which each piece is intended.

1.14 Quality and Guarantee:

- A. It is the purpose and intention of these specifications to obtain equipment of the

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highest quality commercially manufactured.

- B. All equipment is to be guaranteed free from defects in workmanship and/or material for a period of one (1) year from the date of acceptance of same by the Architect and Owner unless noted otherwise in the Itemized List of Food Service Equipment. All refrigeration units are to have a five (5) year manufacturer's warranty on the compressor. Extended guarantees will be specified in the Itemized List of Food Service Equipment.

1.15 **Testing and Operating Instructions:**

- A. After all utility connections to equipment have been made by other Contractors, Food Service Equipment Subcontractor shall conduct final test of equipment in presence of Architect and Owner or other duly Authorized Representative.
- B. The Food Service Equipment Subcontractor, upon completion of work, shall deliver to the school's food service director two (2) sets of instruction manuals, two (2) sets of parts and maintenance manuals including care of finished surfaces, and two (2) sets of a listing of names and addresses of the various manufacturers supplying the equipment. Food Service Equipment Subcontractor, upon completion of work, shall deliver to General Contractor three (3) sets of instruction manuals, three (3) sets of parts and maintenance manuals, including care of finished surfaces, and three (3) sets of a listing of names and addresses of the various manufacturers supplying the equipment. Information is to be assembled in a hardback loose-leaf binder suitably labeled for a permanent record. A separate record of written guarantees with records of factory registration, where required, shall be handled the same as the above manuals.

1.16 **Special conditions:**

- A. The Food Service Equipment Subcontractor shall furnish a qualified representative to instruct and demonstrate to the Owner's personnel the proper operation, care and maintenance of all equipment involved. The date and time shall be designated by the Architect.
- B. In addition, the Food Service Equipment Subcontractor shall provide a qualified representative to be on hand for the first day of operation. Representative shall spend full time at the site for this day. Additional training in the proper use and maintenance of all equipment, as well as checks on equipment for correct operation, will take place during this time.
- C. It shall be the responsibility of the Food Service Equipment Subcontractor to thoroughly familiarize building maintenance personnel during first day of operation on all supplied or relocated equipment in the manner of its care and maintenance. Particular note to be given to proper de-liming of steam generator, tightening of convection oven door chain, sharpening of slicer blade, proper lubrication of mixer, slicer, and other equipment requiring periodic lubrication, procedure in freeing jammed disposer and dishmachine pumps and spray heads and all other incidental preventative maintenance procedures that the instruction thereof would prevent unnecessary service calls and expense. Where gas fired equipment is specified, maintenance is to be instructed in the proper method of lighting all pilot lights. Maintenance and food service personnel are to be instructed in the prompt

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prevention thereof. A check list of these points and the accomplishment thereof to be presented to the Owner.

ITEMIZED LIST OF FOOD SERVICE EQUIPMENT

Note that manufacturer's and model numbers have been given as the Basis of Design. Equal products must follow the submittal process detailed in this section, Section 01150, Substitution Requests and Section 01300, Submittals, to be considered. All substitution submittals must be submitted no later than 10 days prior to Bid Opening, unless specified elsewhere under bidding procedures.

ITEM 1 - CASHIER STAND UNIT

Provide Atlas Metal Industries model BLM-BU with left and right slide cashier stands. Furnish with all standard accessories plus the following options:

- A. Furnish with TS stainless steel solid, ribbed, fold-down slides.
- B. Provide laminate from standard color range.

ITEM 2 - MILK COOLER

Provide Traulsen model RMC49S6 single-access, 12-crate milk coolers. Furnish with all standard accessories plus the following options:

- A. Furnish with 6" casters.
- B. Furnish MCACC-BUMPER corner guards.
- C. Unit to operate on 115/60/1 power.

ITEM 3 - TRAY & SILVER CART [OWNER-SUPPLIED]

The owner has elected to re-use their existing carts, Atlas Metal Industries model TC-2-S.

ITEM 4 - HOT FOOD SERVING UNIT

Provide Atlas Metal Industries model BLH-5 hot food serving unit with 5 pan wells. Furnish with all standard accessories plus the following options:

- A. Provide 1000 W model.
- B. Provide SLT, 11.25" wide, stainless steel, 3-rail, fold-down tray slide.
- C. Provide BLSF, stainless steel front panel.
- D. Provide OSC-5 buffet-style overshef.
- E. Unit to operate on 208/60/1 power.

ITEM 5 - COLD FOOD SERVING UNIT

Provide Atlas Metal Industries model BLC-5-RM cold food serving unit with 3" deep refrigerated cold pan. Furnish with all standard accessories plus the following options:

- A. Provide SLT, 11.25" wide, stainless steel, 3-rail, fold-down tray slide.
- B. Provide BLSF, stainless steel front panel.
- C. Provide OSC-5 buffet-style overshef.
- D. Provide a 10-foot power cord.
- E. Unit to operate on 120/60/1 power.

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ITEM 6 - PASS-THRU HEATED CABINET

Provide Traulsen model RHF232WP-FHS, stainless exterior and interior self-contained pass-thru heated cabinet with full-height doors front and rear. Hinging to be as shown on the plans. Furnish with all standard accessories plus the following options:

- A. Furnish with 4-5/8" high casters in lieu of legs.
- B. Furnish with 28 stainless steel shelves, with 1" adjustable stainless steel pilaster strips.
- C. Furnish with 28 universal tray slides (2 sides).
- D. Unit to operate on 208/60/1 power.

ITEM 7 - PASS-THRU REFRIGERATED CABINET

Provide Traulsen model RHT232WPUT-FHS, stainless exterior and interior self-contained pass-thru refrigerated cabinet with full-height doors front and rear. Hinging to be as shown on the plans. Furnish with all standard accessories plus the following options:

- A. Furnish with 4-5/8" high casters in lieu of legs.
- B. Furnish with 28 stainless steel shelves, with 1" adjustable stainless steel pilaster strips.
- C. Furnish with 28 universal tray slides (2 sides).
- D. Unit to operate on 115/60/1 power.

ITEM 8 - ICE MAKER

Provide Ice-o-Matic Pearl Ice Series model GEM0450 modular air-cooled ice machine. Furnish with all standard accessories plus the following options:

- A. Furnish Ice-o-Matic ice storage bin, model B55PS (slope-front), stainless steel bin with stainless steel feet.
- B. Furnish top kit, model KBT19.
- C. Unit to operate on 115/60/1 power.

ITEM 9 - WATER FILTER FOR ICE MAKER

Provide CuZn model UC-200 modular air-cooled ice machine. Furnish with all standard accessories plus the following options:

- A. Provide any hardware required for wall mounting to CMU wall or ice maker, at owner's direction.

ITEM 10 - BAKER'S WORK TABLE, (8-FOOT, NO DRAWERS)

Provide Eagle Group, UT3096STB, Deluxe Series work table with rear upturn and stainless steel tubular base. Furnish with all standard accessories.

ITEM 11 - INGREDIENT BIN [OWNER-SUPPLIED]

The owner has elected to re-use their existing bins, Cambro model IB44, one-piece polyethylene ingredient bins with polycarbonate covers and casters.

ITEM 12 - FLOOR MIXER (60-QT)

Provide Hobart model HL-600, Legacy Series 2.7-HP all-purpose mixer.

- A. Furnish with Deluxe Accessory Package: stainless steel bowl, "B" beater, "D" wire whip, "ED" dough hook, bowl scraper, bowl truck and ingredient chute.
- B. Unit to operate on 208/60/3 power.

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ITEM 13 - HOT FOOD/PROOFING CABINET (REACH-IN)

Provide Alto-Shaam model 1200-UP, full-height, reach-in heated holding and proofing cabinet. Hinging to be as shown on the plans. Cabinet to have deluxe control module (holding and proofing). Furnish with all standard accessories plus the following options:

- A. Furnish with 5" casters, locking on the front side.
- B. Unit to operate on 120/60/1 power.

ITEM 14 - REACH-IN REFRIGERATOR

Provide Traulsen model RHT232WUT-FHS, stainless exterior and interior self-contained pass-thru refrigerated cabinet with full-height doors front. Hinging to be as shown on the plans.

Furnish with all standard accessories plus the following options:

- A. Furnish with 4-5/8" high casters in lieu of legs.
- B. Furnish with 28 stainless steel shelves, with 1" adjustable stainless steel pilaster strips.
- C. Furnish with 28 universal tray slides (2 sides).
- D. Unit to operate on 115/60/1 power.

ITEM 15 - VEGETABLE SINK (THREE-COMPARTMENT)

Provide Amtekco model C-3-2424-24D, 3-compartment stainless steel sink with integral drain boards. All stainless steel to be Type 300 Series, polished to a No. 5 finish. All metal edges and corners to be filed smooth and exposed welds to be covered with aluminum paint. Top is to be 16 ga. stainless steel all-welded construction with integral 10" back splash. All horizontal and vertical corners to be covered to a 1/2" radius. Provide 3" high, 1-3/4" diameter, rolled splash on front and sides with radiused corners. Sinks to be welded integral to top. All interior sink corners to be covered to a 3/4" radius with spherical intersections and bottom to be creased to the opening for a crumb cup waste. Legs are to be 1-5/8" outside diameter, 16 ga. stainless steel tubing held in stainless steel leg holders which are fully welded to reinforcing plates on the underside of the sink bowls. Provide adjustable stainless steel bullet-type feet. Furnish with all standard accessories plus the following options:

- A. One (1) T&S Brass, model B-0133-01, pre-soak faucet.
- B. Three (3) T&S Brass, model B-3952-01, rotary waste valves with overflow strainers (one per compartment).
- C. See Item 16 for Garbage Disposal.

ITEM 16 - DISPOSAL

Provide Hobart Corporation, model FD4/300-B-6 (208/60/3), 3-HP disposal. Furnish with all standard accessories plus the following options:

- A. Provide 15" cone.
- B. Accessory Group D: Nitrile Rubber Silver-Saver Splash Guard Ring, 7" I.D. Stainless Steel Weld-in Adapter for Sink, Fixed Direction Water Inlet for Sink, Vacuum Breaker.
- C. Electrical Group 6 controls: Magnetic contactors, pushbutton start and stop, automatic reversing, low water pressure cut-off, time delay for water after shut-off, line disconnect, solenoid valve, and NEMA 4 enclosure.
- D. Provide Hobart ring D-300 for fabricator to use in soiled dish table (Item 30) fabrication and connection.
- E. Unit to operate on 208/60/3 power.
- F. If water pressure exceeds 60 psi, install a pressure-reducing valve.

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ITEM 17 - FOOD PROCESSOR

Provide Berkel model M3000, continuous feed food processor. Furnish with all standard accessories plus the following options:

- A. Furnish with slicing plates S2, S3, S5, S14, SH3, SH7; and dicing grids D14, D22.
- B. Furnish with 8-section storage rack.
- C. Unit to operate on 115/60/1 power.

ITEM 18 - TILTING STEAM-JACKETED KETTLE (SLAVED TO ITEM 19)

Provide Market Forge model MT-40, 40-gallon, tilting, steam-jacketed kettle with modular base. *Steam supplied from Item 19.* Furnish with all standard accessories plus the following options:

- A. 48" long kettle paddle
- B. Tilting kettle accessory kit: draw-off brush, 36" clean-up brush, 8.5" clean-up brush, whip and solid strainer.
- C. Furnish with solid disk to cover draw off.
- D. Unit to operate on 208/60/3 power.

ITEM 19 - TILTING STEAM-JACKETED KETTLE (SELF-CONTAINED)

Provide Market Forge model MT-40EO, 40-gallon, tilting, electric kettle with self-contained electric boiler and modular base. Furnish with all standard accessories plus the following options:

- A. 48" long kettle paddle
- B. Tilting kettle accessory kit: draw-off brush, 36" clean-up brush, 8.5" clean-up brush, whip and solid strainer.
- C. Furnish with solid disk to cover draw off.
- D. Unit to operate on 208/60/3 power.

ITEM 20 - COMBI OVEN/STEAMER

Provide Alt-Shaam Combitherm model CTP10-20E electric, boiler-free steam/convection oven with ECO standard. Furnish with all standard accessories plus the following options:

- A. Stainless steel left side, right side and back panel.
- B. Stainless steel, French-type, 180-degree swinging doors with minimum 1" insulation.
- C. Furnish with mobile stand 5015711, pan slides and shelf.
- D. Unit to operate on 208/60/1 power.

ITEM 21 - HOT PLATE (2-BURNER)

Provide Market Forge Premier Series model M18HPE electric 2-burner range mounted on a 28" high polished stainless steel cabinet base. Heating elements shall be 8.7" diameter cast iron surfaces, located front and rear on raised cabinet top. Furnish with all standard accessories plus the following options:

- A. Furnish with 6" high stainless steel legs.
- B. Unit to operate on 208/60/3 power.

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ITEM 22 - CONVECTION OVEN

Provide Alto-Shaam Platinum Series model ASC-4E electric convection oven. Furnish with all standard accessories plus the following options:

- A. Provide interior stainless steel panels.
- B. Provide stainless steel rear closure panel.
- C. Furnish with six (6) shelves with 2 removable side racks.
- D. Furnish stationary stainless steel 28" high open stand with cooling racks and bullet feet.
- E. Unit to operate on 208/60/3 power.

ITEM 23 - EXHAUST HOOD & FIRE SYSTEM

Provide CaptiveAire UL listed, NSF approved, models 6630ND-2WI-PSP-FB (2 sections) and 6630VHB-G-PSP-FB (1 section) canopy exhaust hood, sized as shown on plans. Furnish with 18 ga minimum stainless steel closure panels to the ceiling.

A. Ventilator/Canopy:

- 1. Ventilator shall be compensating with the addition of a dual air stream perforated supply plenum (PSP).
- 2. Supply air shall discharge through perforated panels at the bottom of plenum capable of providing both make-up air and air-conditioned air.
- 3. The make-up air plenum shall be located nearest the hood and the air-conditioned plenum away from the hood. The air-conditioned portion of the plenum shall be insulated to prevent condensation.
- 4. The hood components shall be fabricated of Type 304 stainless steel, #3 or #4 polish, on all exposed surfaces.
- 5. Construction shall be in accordance with NFPA 96.
- 6. The hood shall be provided with hanging angles on each end of the hood. An additional set of hanging angles will be provided for hoods greater than 12' in length.
- 7. The hood shall be fitted with UL classified aluminum baffle filters with handles. Each filter shall be easily removable for cleaning. The filters will drain the grease into a sloped grease drain system with removable 1/2 pint cup for easy cleaning.
- 8. Hood lights shall be UL listed and NSF listed for use in commercial cooking hoods. Each fixture shall be a L55 Series E26 canopy light fixture, High temp assembly, to include clear thermal and shock resistant globe.
- 9. Hood dimensions shall be as shown on drawings.

B. Fire Suppression System:

- 1. Provide an Ansul R-102 wet chemical suppression system in accordance with all local, state and national codes. System shall be installed by CaptiveAire and fully tested.
- C. The associated exhaust fans, tempered make-up air unit and fan control package are to be supplied with the hood system.

ITEM 24 - WORK TABLE (7-FOOT, WITH DRAWERS)

Provide Eagle Group, T3084SEB, work table with rear upturn, stainless steel base and adjustable undershelf. Table to be Deluxe model (16 ga. Type 304 stainless steel) with adjustable, heavy gauge Type 430 stainless steel undershelf. Furnish with all standard accessories plus the following options:

- A. Furnish with two (2) model 502946 20" x 20" x 5" drawers with pull.

ITEM 25 - HAND SINK

Provide Eagle Group, model HSA-10-FDP, hand sink furnished with splash-mounted gooseneck faucet, tailpiece, trap, clean-out, temperature-adjusting valve and mounting bracket. Furnish with all standard accessories plus the following options:

- A. Furnish with C-fold paper towel dispenser, soap dispenser, and basket drain.
- B. Provide P-trap and tail piece.

ITEM 26 - HOSE REEL

Provide T&S Brass model B-1433-01 hose reel assembly with 8" wall-mounted mixing faucet with polished chrome-plated brass body, compression cartridges with spring checks, lever handles, 1/2" NPT female inlets, 16" riser, control valve, 40" riser, wall brackets, continuous pressure vacuum breaker, 36" flexible water hose connector with stainless steel quick disconnect, open coated hose reel with 3/8" x 35' heavy-duty non-marking hose, ratcheting system, high flow spray valve with swivel, multi-fit bracket and adjustable hose bumper..

Furnish with all standard accessories plus the following options:

- A. Furnish with stainless steel open hose reel #B-7142-C01 (50' hose with #EB-0107 spray valve), 8" wall-mount mixing faucet #002832-40, shut-off valve #0RK3, vacuum breaker #B-0966 and flexible water supply connecting hose.
- B. Base of hose reel to be mounted at least 6'-8" A.F.F. with mixing valves to be mounted no higher than 4'-6" A.F.F.
- C. Furnish to GC at the time of wall construction.

ITEM 27 - OVERHEAD CORD REEL

This item is not required.

ITEM 28 - POT SINK (THREE-COMPARTMENT)

Provide Amtekco, model C-3-2430-30D, 3-compartment stainless steel sink with integral drain boards. All stainless steel to be Type 300 Series, polished to a No. 5 finish. All metal edges and corners to be filed smooth and exposed welds to be covered with aluminum paint. Top is to be 16 ga. stainless steel all-welded construction with integral 10" back splash. All horizontal and vertical corners to be covered to a 1/2" radius. Provide 3" high, 1-3/4" diameter, rolled splash on front and sides with radiused corners. Sinks to be welded integral to top. All interior sink corners to be covered to a 3/4" radius with spherical intersections and bottom to be creased to the opening for a crumb cup waste. Legs are to be 1-5/8" outside diameter, 16 ga. stainless steel tubing held in stainless steel leg holders which are fully welded to reinforcing plates on the underside of the sink bowls. Provide adjustable stainless steel bullet-type feet. Furnish with all standard accessories plus the following options:

- A. One (1) T&S Brass, model B-0133-01, pre-soak faucet.
- B. Three (3) T&S Brass, model B-3952-01, rotary waste valves with overflow strainers (one per compartment).

ITEM 29 - MOBILE POT/PAN STORAGE

Provide InterMetro "MetroMax i" X556EGX3 mobile 4-tier bulk drying and steam pan rack unit.

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ITEM 30 - SOILED DISH TABLE

Provide Low Temp Industries soiled dish table of the size and shape indicated on the drawings. Construct as described in general construction details, and as follows:

- A. Furnish with miter corner turns, as shown on plans.
- B. Provide pass-thru window sills, as shown on plans.
- B. Furnish with cut-out in top for Item 31, Pre-rinse Sink. Weld unit into top of dish table.
- C. Furnish "B" type legs and crossrails and "C" type undershelves.

ITEM 31 - PRE-RINSE SINK

Provide Low Temp Industries 20" x 20" x 5" deep pre-rinse sink. Furnish with the following options:

- A. 1-1/2" basket drain.
- B. 20 ga removable scrap basket formed of the same material as the sink. Basket is to be perforated and stand free of the sink bottom on legs. The top of the basket is to have 1" stainless steel tubular handles which also act as rack supports.
- C. Pre-rinse spray assembly to be T&S B-0113-B. Hot and cold water mixing faucet with vertical tubing, flexible goose-neck hose and squeeze-type valve and spray head.

ITEM 32 - PANT LEG DUCT

Provide LowTemp Industries model PT, duct for dishwasher (Item 33). Furnish with the following characteristics:

- A. Duct to fit inside dishwasher damper connectors.
- B. Verify ceiling height.
- C. Duct to be fabricated of 16 ga stainless steel, all joints welded and watertight.
- D. Furnish ceiling trim panel.

ITEM 33 - DISHWASHER (ELECTRIC)

Provide Hobart Corporation model CLPS66eN-BAS-BUILDUP, electric, high-temperature, rack-type conveyor dishwashing machine. Furnish with all standard accessories plus the following options:

- A. Operation is to be as indicated on the plans (left-to-right, or right-to-left).
- B. Furnish with 30 KW internal booster heater.
- C. Furnish with two (2) stainless steel vent hoods containing locking dampers, at the load and unload ends.
- D. Furnish with the following heavy-duty all-plastic Hobart racks: (3) bun pan, (3) combination, (4) tray, (4) bowl, (4) silverware.
- E. Furnish with conveyor dwell.
- F. Furnish with lower pre-wash arm.
- G. Unit to operate on 208/60/3 power. Provide a one-point electrical service and exhaust fan interlock.
- H. Furnish unit with Table Limit Switch to protect and extend life of conveyor drive system.
- J. Coordinate with Item 34, Booster Heater, and Item 35, Kitchenware Dryer.

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ITEM 34 - BOOSTER HEATER (ELECTRIC)

Provide Hatco Corporation "Imperial" model S-54, electric 16-gallon booster heater for use with Item 33, Dishwasher. **Verify sizing with dishwasher manufacturer.** Unit is floor-mounted. Furnish with all standard accessories plus the following options:

- A. Furnish with all stainless steel body and base.
- B. Furnish with adjustable stainless steel legs 6" to 7".
- C. Unit to operate on 208/60/3 power.
- D. Provide shock absorber as required.

ITEM 35 - KITCHENWARE DRYER (ELECTRIC)

Provide Hobart Corporation F4025 all-electric blower-dryer accessory for CLen Series. Furnish with all standard accessories plus the following options:

- A. Coordinate installation with Item 33, Dishwasher, and Item 32, Pant Leg Duct.
- B. Operation is to be as indicated on the plans (left-to-right, or right-to-left).
- C. Unit to operate on 208/60/3 power.

ITEM 36 - CLEAN DISH TABLE

Provide Low Temp Industries clean dish table of the size and shape indicated on the drawings. Construct as described in general construction details, and as follows:

- A. Furnish with miter corner turns, as shown on plans.
- B. Furnish "B" type legs and cross rails.
- C. Furnish drain trough with removable 18 ga stainless steel grate.

ITEM 37 - WALK-IN COOLER

Provide Mid-South Industries "Thermo-Kool" walk-in cooler, in the dimensions and configuration as shown on the Drawings. Construct as described in general construction details, and as follows:

- A. **Walk-In Units:** Construct walk-in unit to be 9'-0" high (interior) in the dimensions shown on the Drawings. Finish is to be 0.040" embossed aluminum interior and exterior. Interior ceiling finish is to be #4008 mill embossed aluminum "enamel white". Factory or site painted are unacceptable.
 - 1. Provide vertical and wall trim with finish to match mating panels.
 - 2. Floor shall be a recessed installation in a depressed pad, as identified on the plans. The walk-in prefabricated floor is to be 1/8" treadbrite aluminum. Provide a wear surface of 3/16" NSF approved polyurethane applied to all floor surfaces and continuing up the wall surfaces for 9" above the interior floor.
 - 3. Panels shall consist of precision roll-formed inner and outer pans separated by foamed-in-place (not cut slab) rigid polyurethane insulation molded to form compressible tongue and groove joints at mating edges.
 - a. All panel edges, including ceiling and floor panels, shall have double reverse flanges.
 - b. Panel gaskets shall be acid-resistant, NSF approved, and foamed-in-place with interior gasket sleeving the double reverse flange.
 - c. Panel thickness to be a full 4" with the following characteristics:
 - (1) K factor (cured) = 0.121
 - (2) U factor = 0.030

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- (3) R factor = 33.3
 - (4) Compressive strength = 30 psi
 - (5) Meeting ASTM E84
 - (6) UL labeled
 - d. Panels shall be drawn together and held in place by wrench-activated eccentric cam locks. Panel fasteners to be secured and foamed-in-place of a "fan" metal type. Foam density around panel edges and fasteners not to exceed that of the interior panel for the maximum insulation quality. No wood members are to be part of panel fasteners or door sections. No foam of a compressive strength in excess of 30 psi shall be acceptable. Ceiling panels shall be supported by hanger rods and angle iron.
4. Provide 34" x 78" net opening door.
- a. Door finish to be as specified for panels with the same insulation and thickness as specified for panels.
 - b. Door jamb perimeter to be internally supported with heavy gauge, welded, steel channel support.
 - c. Door hinging to be as shown on the Drawings.
 - d. Doors to be inset with three (3) self-closing lift hinges, mounted on heavy pre-threaded back-up plates.
 - e. Door units to have the following mounted hardware:
 - (1) Built-in dial thermometers
 - (2) Combination pilot light and 3-way interior and exterior toggle switch for interior vapor-proof lights
 - (3) Interior light safety pilot
 - (4) Anti-condensate heaters around the door perimeter
 - (5) Stainless steel buck strip for magnetic gasket
 - (5) Safety release
 - (6) Adjust doors for pad depression and provide with adjustable sweeper gasket.
 - (7) Mechanical door closure #1097
 - (8) Exterior 34" x 48" x 3/16" aluminum tread kick plate
 - (9) Clearview solid hinged air curtain and foot treads.
5. Provide heated pressure relief vent mounted in freezer section.
6. Provide the following lighting:
- a. Mount a vapor-proof lighting on the door section, centered above the door.
 - b. Provide two (2) additional vapor-proof 4' long 2-tube fluorescent fixtures designed for medium temperature operation mounted on the cooler ceiling, and two (2) low temperature fixtures likewise for the freezer ceiling.
 - c. Fluorescent fixtures are a part of this section and are to be mounted on the ceilings.

B. Refrigeration Equipment:

1. Refrigeration equipment shall consist of, but not be limited to, compressor, condenser, receiver, pre-wired control panel, fused electrical service, one-point electrical connection with disconnect, all refrigerant piping extended to service point, necessary controls and evaporator coils for the required duty. **Note that there is**

minimal headroom and condensing units will be ground-mounted outside the building.

2. Outside systems shall be as follows:
 - a. Designed for 100 degree ambient temperature
 - b. Housed in a single stainless steel enclosed housing with all major components of the condensing unit module assembled on a mill galvanized steel sheet metal base plate (minimum 10 gauge, with 3" welded channel base).
 - c. The outdoor enclosure to be constructed of 20 gauge material with a rust-proof enamel finish.
 - d. the air louver is to be a one-piece, top discharge construction with removable side panels for major maintenance.
 - e. Each refrigeration system shall have a pre-wired main power and control panel, containing (but not limited to) the main power terminal block for single point connection, main power master circuit breaker, branch circuit breaker and motor contactor for each compressor.
 - f. Refrigerant piping within the housing shall be of ACR (Air Conditioning & Refrigeration) Type, ASTM B-280, Grade L, hard-drawn copper pipe (annealed or "soft" copper is unacceptable) assembled with forged or wrought copper fittings. All brazed joints, copper to copper, shall be made with an approved brazing alloy with a minimum of 5% silver content (BCuP). Copper to brass or copper to steel joints shall be made with an alloy having a minimum of 45% silver content (BAg). All piping is to terminate at the service point of the condensing module. Refrigerant piping and controls shall be completely factory piped and tested before shipment. Minimum test pressures shall be 390 PSIG high side, and 150 PSIG low side. *Note: The maximum high pressure setting of the high pressure safety is 90% of the test pressures. High pressure control that do not have a maximum set point of this value are unacceptable.*
 - g. **Cooler refrigeration system to include:**
 - (1) 2-HP medium temperature, reciprocating type, hermetic R-22 compressor, model #MOH-02073C condensing unit
 - (2) Model TKM-1560 matching 10-degree TD coil
 - (3) Room thermostat
 - (4) Dual pressure control
 - (5) Dehydrator
 - (6) Sight glass
 - (7) Vibration eliminator
 - (8) Contact starter
 - (9) Electrical common disconnect
 - (10) Expansion valve
 - (11) Pump down solenoid
 - (12) Crankcase heater
 - (13) Anti-acid line filter on suction line and line filter on liquid line
 - (14) Liquid refrigerant receiver
 - h. Control panel shall be pre-wired and contain all electrical, refrigeration and instrumentation controls necessary for a complete and operable system. All controls shall be factory-mounted and shall be UL listed.

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- j. Minimum energy ratings:
 - (1) Cooler = 8.68 EER

C. Installation:

1. Refrigerant piping between outside condensing modules and evaporators shall be ACR (Air Conditioning & Refrigeration) Type, ASTM B-280, Grade L, hard-drawn copper pipe (annealed or "soft" copper is unacceptable) assembled with forged or wrought copper fittings. All brazed joints, copper to copper, shall be made with an approved brazing alloy with a minimum of 5% silver content (BCuP). Copper to brass or copper to steel joints shall be made with an alloy having a minimum of 45% silver content (BAg). Quick disconnect coupling and pre-charged lines are unacceptable.
2. Hard-drawn copper line sets are to be installed in accordance with acceptable refrigeration practices, including utilization of any and all necessary line traps and line grading to maximize the flow of oil and refrigerant throughout the systems.
3. Refrigeration lines to be cleaned with nitrogen and vacuum tested prior to charging.
4. Cooler suction lines are to be insulated with 1/2" wall Armorflex.
5. Condensate drain lines are to be of ACR (Air Conditioning & Refrigeration) Type, ASTM B-280, Grade L, hard-drawn copper pipe (annealed or "soft" copper is unacceptable) with freezer lines wrapped with heater tape and insulated with 1/2" wall Armorflex. Condensate to be drained into drain provided on Plans.
6. All floor panels are to be installed level and wall panels plumb.
7. Doors and sweeper gaskets to be adjusted and light tested for air-tight seal.
8. All walk-in panel penetrations are to be field drilled and wall sleeves used. All building wall penetrations are to be sleeved by the appropriate diameter PVC conduit and the perimeter of the sleeve sealed with silicone at the interior and exterior penetration points and the interior of the sleeve foamed. **Coordinate all penetrations with the Architect prior to drilling.**
9. Food service equipment subcontractor is responsible for installation, start-up and checking of all pressures, setting of the time clocks, and pull-down of the unit to an operating temperature of -10 degrees F in the freezer and 35 degrees F in the cooler. The food service equipment subcontractor is to maintain an on-site temperature check for 2 hours after the start-up with a pressure gauge check at the end of this time and is to visually inspect and pressure gauge check the following day.
10. Unless more fully described elsewhere in the specifications, the General Contractor is to provide the following for the food service equipment subcontractor:
 - a. Electrical and control wiring and final electrical connections.
 - b. Electrical conduit of a Lock-tite type or field formed-in-place.
 - c. Wall and roof penetrations and pitch pockets the size and location specified by the walk-in installation supervisor and coordinated with the Architect.
 - d. Pads for the ground-mounted condensing units in the location indicated on the Drawings and of a size coordinated with the condensing equipment manufacturer. Pads shall be a minimum of 4" thick with 3,000 psi concrete containing reinforcing wire.
 - e. A sand leveling bed in the depressed slab area, level and at the correct depth for the 4" walk-in floor panels so that the floor is level with the kitchen finished

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floor. If the walk-in floor is higher than the kitchen floor, the General Contractor will provide ramping in the tile work to provide rolling access into the walk-ins.

- f. Soffit enclosure of the space between the walk-in and ceiling.

ITEM 39 - DUNNAGE RACK

Provide New Age Industrial Corporation 2000 series model 2015, heavy-duty, all-welded, aluminum racks. Construction to be high tensile extruded aluminum tube, 1-1/2" x 1-3/4" x 0.070 wall thickness, uniform throughout, primary aluminum, Type 6063-T5 alloy. All joints heli-arc welded. All seams welded, feet capped and welded. Include the following features:

- A. Provide lateral bars on the bed, and NSF approved.
- B. Provide sizes as shown on the plans.
- C. Verify fit with field dimensions prior to ordering.
- D. Leg height to be 8".

ITEM 40 - DRY STORAGE SHELVING

Provide InterMetro Industries Corp (Metro) "MetroSeal 3 Super Adjustable Super Erecta" series model 2448NK3 corrosion-resistant, anti-microbial shelving system. Furnish with all standard accessories plus the following options:

- A. Furnish with 74PK3 (74" high) posts.
- B. Furnish with four (4) shelves.
- C. Furnish with all required hardware for complete installation, including floor and/or wall anchoring.
- D. Sizes as indicated on the Drawings.

END OF SECTION 11230

SECTION 15000

GENERAL REQUIREMENTS FOR MECHANICAL WORK

PART 1 - GENERAL

1.01 INSTRUCTIONS

The General Conditions, Special Conditions, and Instructions to Bidders are hereby made a part of these specifications and the contractor is to consult them for instructions pertaining to the work of this Section. Scope of work shall include all materials, equipment and labor necessary for a complete and properly functioning installation in accordance with local and state codes, and contract drawings and specifications. Work shall be understood to include all work specified in Sections 15000 through 15999, inclusive, of these specifications.

1.02 PRECONSTRUCTION CONFERENCE

Prior to commencing any work, the mechanical Contractor shall meet with the Architect and Mechanical Engineer to determine that no questions remain concerning the intent of the drawings and specifications. Contractor shall outline his method of procedure and bring up for discussion and decision any questions concerning the project. No work shall be performed prior to this meeting. The Architect shall set date, time and place of conference.

1.03 LOCAL CONDITIONS

Contractor shall visit the site and observe all existing local conditions which would affect work under this contract. Contractor shall examine all plans and specifications for this project and consult them for instructions pertaining to work of this Section.

1.04 PERMITS, FEES AND CODES

- A. Contractor shall obtain all necessary permits and inspections required for pertaining to work under this contract and pay all charges incidental thereto. Deliver to Architect all certificates of inspection issued by authorities having jurisdiction.
- B. Requirements of Regulatory Agencies:
 - 1. 2017 Florida Building Code – Mechanical, 6th Edition
 - 2. 2017 Florida Building Code – Plumbing, 6th Edition
 - 3. 2017 Florida Fire Prevention Code, 6th Edition
 - 4. Code requirements and local ordinances of City and/or County having supervisory jurisdiction.

1.05 SUBMITTALS

- A. Material List: Within twenty (20) days of award of contract, Contractor shall submit to Architect a complete list of materials to be provided for the HVAC work. The list shall include suppliers' names and manufacturers' names and number or series for each item on list.

- B. Shop Drawings: Submit to the Architect for approval, before commencing work, shop drawings for all materials and equipment to be provided under this contract. The following applies to the shop drawings:
1. Contractor shall submit within 30-days after Award of Contract, drawings and/or cut sheets of all materials and equipment, and 1/4" scale equipment room drawings for approval by Architect-Engineer. Such submittals must contain outline dimensions, operating clearances, installation, operating and maintenance information and sufficient engineering data to indicate substantial compliance with specifications. All shop drawings for one section of work or one mechanical system shall be submitted at one time in loose-leaf 3-ring binders; no approval will be given if submitted piecemeal.
 2. Where Contractor considers additional detail or shop drawings essential to proper fabrication or installation of equipment, ductwork, and piping he shall prepare such drawings and submit for approval.
 3. Approval granted on shop drawings is rendered as a service only and shall not be considered as guarantee of measurements or building conditions; nor shall it be construed as relieving the Mechanical Contractor of basic responsibilities of coordination with other trades under this contract.
 4. Design is based on manufacturers named on drawings or in specifications. Shop drawings shall indicate all exceptions to or deviations from basis of design.
 5. Changes in structural support frames, foundations, equipment hangers, duct or piping connections, controls, starters, electrical equipment, wiring and conduit, roof, wall or ceiling openings, or vibration isolators in order to accommodate equipment other than that scheduled or specified shall be made at no additional cost to the owner.
 6. Indicate on each shop drawing that Contractor has checked that the equipment and materials comply with the drawings and specifications by affixing a stamp indicating the following: Date, specification page and section, drawing note indicating that manufacturer is as specified or that manufacturer is to be approved as "or equal", and signature of person reviewing shop drawing. Leave sufficient area adjacent to Contractor's stamp for Architect's approval and date of approval.
 7. Contractor shall submit shop drawings and receive Engineer's approval before installing materials or equipment. Any equipment or materials installed prior to receipt of approved shop drawings from Engineer shall be subject to removal and/or alteration at the discretion of the Mechanical Engineer at no additional cost.
 8. Approval of any submitted data or shop drawings for materials, equipment, apparatus, devices, arrangements and/or layouts will not relieve Contractor from responsibility of furnishing same of proper dimensions, capacities, sizes, quantities and installation details to efficiently perform requirements and intent of contract. Such approval shall not relieve Contractor from responsibility for errors of any sort on submittal data or shop drawings.
 9. All fan shop drawings, including those for air handling unit fans, exhaust fans and supply (make-up) fans, shall include fan performance curves as part of the shop drawing submittal. The operational fan curve shall indicate the operation point with indication of RPM, CFM, static pressure, brake horse power and efficiency. No fan submittals will be considered for review without this basic performance information. The operation point shall not fall on a level or positive slope portion of the fan curve.

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- C. Samples: Submit to Architect for approval samples of materials as indicated elsewhere herein. Samples shall duplicate materials, workmanship and finish of products intended for installation.
- D. Any electrical deviations between the contract documents and the furnished equipment must be separately acknowledged by a substitution request and additionally noted on the submittal. Such deviations are the responsibility of the contractor. The contractor shall be wholly responsible for all necessary electrical adjustments to include wiring, conduit, starters, disconnects, fusing, thermal overload protection, circuit breakers, etc.

1.06 SUPERVISION OF WORK

Contractor shall have a full time Superintendent in charge of work at the site at all times. Superintendent shall be qualified and have suitable experience in the type of work to be installed under this contract.

1.07 WORKMANSHIP

Materials and equipment shall be installed in a neat and first class workmanlike manner consistent with current industry methods and standards. Engineer reserves the right to direct removal and replacement of any items which, in his opinion, do not present an orderly and reasonably neat and workmanlike appearance, provided such an orderly installation can be made using customary trade methods. Removal and replacement shall be done when directed in writing by Engineer at the contractor's expense and without additional expense to Owner.

1.08 CONNECTING TO WORK OF OTHERS

- A. Before starting his work, and from time to time as work progresses, mechanical contractor shall examine work and materials installed by others insofar as they apply to his work and shall notify Engineer immediately in writing if conditions exist which will prevent satisfactory results in installation of system.
- B. Should Contractor start his work without such notification, it shall be construed as an acceptance by him of all claims or questions as to suitability or work of others to receive his work. He shall remove and replace, at his own expense, all work under this contract which may have to be removed on account of such defects.

1.09 CONTRACT DRAWINGS

- A. It is the intent of drawings and specifications to obtain a complete and fully operational, and satisfactory installation. An attempt has been made to separate and completely define work under this contract. However, such separate divisional drawings and specifications shall not relieve contractor from full responsibility of compliance with work of his trade which may be indicated on any drawing or in any section of the specifications.
- B. Contractor shall carefully examine architectural, structural, electrical, and mechanical drawings prior to submitting bid. Contractor will be required to furnish, install and connect with appropriate services all items shown on any drawings without additional expense to Owner. Architect shall be notified prior to bid date of any discrepancies,

omissions, conflicts or interferences which occur between drawings or between drawings and specifications. In the event that there are conflicts between the plans and specifications, the specifications shall have precedence. If such notification is received in adequate time, additional data or changes will be issued by addendum to all bidders. Submittal of bid by contractor shall indicate the contractor's acknowledgment and acceptance to provide all necessary equipment, materials and labor to meet the intent of the drawings and specifications in accordance with all code requirements.

- C. Architectural drawings shall take precedence over mechanical drawings with reference to building construction. Mechanical drawings are diagrammatic but shall be followed as closely as actual construction of building and work of other trades will permit. Where locations of equipment, devices or fixtures are controlled by architectural features, establish such locations by referring to dimensions on architectural drawings and not by scaling drawings. Changes from drawings necessary to make work of contractor conform with building as constructed and to fit work of other trades or rules of bodies having jurisdiction shall be made by contractor at his own expense. Some drawings may have been prepared from existing drawings with intent of providing the contractor with information concerning the existing conditions. Data shown has not been completely verified by Architect/Engineer and no guarantee of accuracy of this information is given or intended. It shall be the responsibility of contractor to verify all existing conditions. Data which is shown but proves to be incorrect shall in no way relieve the contractor from installing his work within the intent of plans and specifications, nor shall it constitute basis for a change order unless, in the opinion of the Architect/Engineer it is determined to be an extra cost over and above the basic intent of these plans and specifications.
- D. If potential conflicts involving ductwork, equipment, piping or any other system components are discovered during construction, the mechanical contractor shall inform the Architect/Engineer of said conflicts immediately and prior to proceeding with his work. If the contractor proceeds with his work prior to receiving additional instructions or corrective action from the Architect/Engineer, that portion of the work may be required to be removed and replaced at the discretion of the Architect/Engineer and at no additional cost to the project.

1.10 DAMAGE TO OTHER WORK AND PERSONNEL

Contractor shall be responsible for proper protective measures when working overhead or in finished areas. He shall repair, replace or touch-up all finished surfaces which may be damaged as a result of his operations.

1.11 STORAGE AND WORK AREAS

All equipment other than piping shall be stored either in water-tight trailers on-site or in a warehouse off-site. All materials shall be protected from the weather, damage, moisture, dirt, debris, etc. Use of cardboard, visqueen, or other similar materials while stored outside is not acceptable. Do not install damaged equipment.

1.12 APPROVAL OF MATERIAL

- A. Equipment other than specified in the contract documents requires approval from Engineer 10 days prior to bid date.

- B. Written request for prior approval must be received in Engineer's office by close of business no later than 10 days prior to scheduled bid date. Request shall contain detailed information on the proposed item. This shall include:
 - 1. Catalog cuts sheets
 - 2. Detailed specifications
 - 3. Description of deviation from specified item

- C. An addenda shall be issued listing all prospective contractors listing all prior approved manufacturers and products.

PART 2 – PRODUCTS

2.01 SYSTEMS IDENTIFICATION

- A. Pipe Marking:
 - 1. All piping shall be identified with semi-rigid plastic (pressure- sensitive not acceptable) identification markers as manufactured by Seton or prior approved equal. Direction of flow arrows are to be included on each marker.
 - 2. In conformance with "Scheme for the Identification of Piping Systems" ANSI A13.1-1975 each marker must show (1) approved color-coded background, (2) proper color of legend in relation to background color, (3) approved legend letter size, and (4) approved marker length.
 - a. Type SNA markers to be used on diameters 3/4-in. thru 5-in.
 - b. Type STR markers to be used on diameters 6-in or larger.
 - c. For pipes under 3/4-in. O.D. brass identification tags 1-1/2-in. in diameter with depressed 1/4-in. high black-filled letters above 1/2-in. black filled numbers shall be fastened securely at specified locations.
 - 3. Locations for pipe markers to be as follows:
 - a. Adjacent to each valve and fitting.
 - b. At each branch and riser take-off.
 - c. At each pipe passage through wall, floor and ceiling construction.
 - d. At each pipe passage to underground.
 - e. On all horizontal pipe runs - marked every 15 feet.
 - 4. Pipe line identification shall be in accordance with the legends as shown on the drawings.

- B. Valve Tagging
 - 1. All valves shall be designated by distinguishing numbers and/or letters, corresponding to those on the drawings, or as directed by the Engineer, engraved on anodized aluminum tags. Tags shall be not less than 2-in diameter with engraved natural aluminum numbers not less than 1/2-in high and engraved natural aluminum lettering not less than 1/4-in. high. Lettering size may be reduced if required to accommodate additional wording. Background color of the tags shall be coded in colors and/or color combinations as directed by the Engineer. Tags shall be securely fastened to valves with approved brass "S" hooks, or brass jack chain, in a manner to permit easy reading. Color-coded tags shall be Style 2070.
 - 2. Identifying letters for various systems shall be in accordance with legends on drawings. A chart of all valves shall be furnished by the Contractor. Said chart to include the following items:

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- a. Valve Identification Number
 - b. Location
 - c. Purpose
 3. Chart of the complete system shall be mounted and secured on a wall in a location as directed by the Engineer. Chart shall be provided with an approved transparent plastic closure for permanent protection. Front and back plastic sheets, which form closure, are to be no less than .015 thickness. Two (2) holes to be furnished at top of plastic closure to allow for affixing approximately an 8-in. length of nickel plated bead chain. Each hole to be reinforced by means of a small brass or nickel grommet. Frames and plastic closures as manufactured by Seton.
- C. Equipment Identification: All items of mechanical equipment such as air handling units, fans, pumps, chillers, tanks, heat pumps or condensing units, etc. shall be identified by approved name plates to be provided. Name plates shall be securely affixed to each individual piece of equipment. Name plates shall bear notations corresponding to the same notations on the framed wiring diagrams and/or operating instructions. Name plates to be aluminum, 2-1/2-in. x 3/4-in., with a black enamel background, with etched or engraved natural aluminum lettering. Aluminum name plates as manufactured by Seton Name Plate Corporation.
- D. Pipe Painting: Finish of all piping and equipment (heat exchangers, tanks, etc.) shall be color coded in accordance with ANSI A13.1-1975. Piping without aluminum jacket located "Outside Equipment Rooms", shall be provided with a painted band around the pipe centered between the color coded pipe marker. The painted band shall be 12-in. in width.
- E. Schedule: The Contractor shall prepare a schedule of proposed colors with samples for each system and a complete list of abbreviations as a shop drawing.

2.02 CONCRETE

Concrete shall be of normal aggregate type and shall have a compressive strength of 3000 psi at 28 days or shall be as specified in Division 3 - Concrete.

2.03 PAINT

- A. Touch-up paint shall match items requiring touch-up.
- B. The interior of all exposed/visible ductwork shall be painted flat black; this includes the inside surface of ductwork visible through diffusers and grilles.

2.04 FLOOR, WALL AND CEILING ESCUTCHEONS IN VISIBLE AREAS

Provide escutcheons, fabricated plates or collars at each location where pipe or duct passes through a finished surface. Escutcheons for flush sleeves shall be equal to Benton & Caldwell No. 3A chromium plated brass; sleeves extending above floor shall be equal to Benton & Caldwell No. 36 chrome plated brass. Collars or plates for ducts and large diameter insulated pipe shall be fabricated of 18 gauge galvanized copper bearing sheet steel and shall be secured to structure and neatly fitted around duct or pipe.

2.05 ACCESS DOORS

Provide as necessary for access to concealed valves, cleanouts, unions, expansion joints, dampers, coils, junction boxes, etc., where no other means of access is shown or specified. Doors shall be manufactured by the Milcor Division of Inland-Ryerson, or an acceptable equal, type as follows:

Door Location	Door Type
Drywall	Style "DW"
Masonry or tile	Style "M-Stainless"
Acoustical tile	Style "AT"
Plaster	Style "K"
Fire-rated walls	Style "Fire Rated"

Each door shall be equipped with two flush, screwdriver operated cam latches and, other than Style "M", shall be finished to match adjacent surface. Door sizes shall be applicable to the access required for normal service.

2.06 ELECTRICAL

- A. General: Unless specified otherwise, motors shall be furnished under the section of specifications that covers driven equipment. All electrical power wiring, conduits, starters, and connections not specified as an integral part of the mechanical equipment specified in the Mechanical Division shall be provided under the Electrical Division. Contractor furnishing driven equipment shall coordinate wiring diagrams with contract requirements and shall furnish coordinated wiring diagrams for installation. Power wiring shall be defined as all wiring conveying 50 volts or more; control wiring shall be defined as wiring conveying less than 50 volts.
- B. All control wiring shall be furnished and supplied by the mechanical contractor. Control wiring shall be routed separately from power wiring of Division 16. All wiring shall be in accordance with Division 16.
- C. Motors: Unless specified otherwise in the Section covering the driven equipment (or the equipment drives), motors shall comply with the following:
1. Three Phase: NEMA design B, three-phase, squirrel cage induction type designed for 1800 rpm synchronous speed for operation in 40 degrees C ambient at 1.15 service factor at constant speed on the scheduled voltage. Motors shall be insulated with Class B insulation material and shall be cast iron, drip proof, horizontal foot mounted type with ball bearings. Two speed motors shall be provided as scheduled and shall be two winding type.
 2. Single Phase: Squirrel cage induction type designed for 1800 rpm synchronous speed for operation in 40 degree C ambient at 1.15 service factor at constant speed on the scheduled voltage. Motors shall be insulated with Class B insulation materials and shall be two winding capacitor start type with steel enclosure, drip proof, horizontal foot mount and ball bearings.
 3. Scheduled Horsepowers: The horsepowers scheduled or specified are those nominal sizes estimated to be required by the equipment when operating at specified duties and efficiencies. In the case of pumps, these horsepowers are non-overloading and may also include provisions for future planned impeller changes. If the actual horsepower for the equipment furnished differs from that specified or shown on the drawings, it shall be the contractor's responsibility to

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insure that proper size feeders, breakers, wiring, conduit, starters, etc. are provided at no change in contract price.

2.07 BELT DRIVE

- A. Each piece of motor-driven machine, other than those specified to have direct drive, shall be equipped with a V-belt drive assembly. Belts shall be of correct cross section to fit properly in sheave grooves and shall be carefully matched for each drive. Sheaves shall be cast iron or steel, bored to fit properly on shafts and secured with keys of proper size. The rating of each drive shall be as recommended by manufacturer for service but shall be at least 150 percent of nameplate horsepower rating of drive motor.
- B. Fan Belt Drives: Variable and adjustable pitch sheaves shall be selected so that required fan rpm will be obtained with sheave set approximately in mid- position. Fans shall have drives in accordance with the following table:

<u>Motor Output (Horsepower)</u>	<u>Fan Speed (RPM)</u>	<u>Sheave Type</u>
0 to 10	Up to 1800	Variable Pitch
15 and up	Up to 1800	Fixed Pitch
0 to 3	1801 and up	Variable Pitch
5 and up	1801 and up	Fixed Pitch

- C. Speed Adjustment: Adjust fan speed as necessary to obtain proper design air flow with fan in its installed location. Fans which are to have fixed pitch drives may be first fitted with variable pitch drives until proper speed adjustment is made and then may be fitted with proper fixed pitch drive size, or alternate sizes of fixed pitch drives may be used until proper fan speed is obtained. Provide all drives necessary to obtain proper fan speed needed to deliver necessary air quantity.

2.08 BELT AND COUPLING GUARDS

- A. Each belt drive shall be equipped with a guard. Guards shall be constructed of #12 U. S. standard gauge 3/4-inch diamond mesh wire screen, or equivalent, welded to one inch steel angle frames, and shall enclose all belts and sheaves. Tops and bottoms of guards shall be of substantial sheet metal or not less than #18 U. S. standard gauge. Braces or supports must not "bridge" sound and vibration isolators. Guards shall be designed with adequate provision for movement of motor required to adjust belt tension. Means shall also be provided to permit oiling, use of speed counters, and other maintenance and testing operations with guard in place. All direct drive equipment shall have coupling guards in accordance with OSHA.

PART 3 - EXECUTION

3.01 OPENINGS, CUTTING AND PATCHING

- A. General: Contractor shall set in position all sleeves and inserts required in walls, partitions, ceilings, or floors, and shall have a representative on-site during pouring of concrete to maintain position of sleeves and inserts until concrete is set. Close coordination is required to insure that all sleeves are properly set. Correctness of size and location of openings shall be verified by contractor after framing is in place.

Contractor shall do all cutting and patching of existing and/or new building materials required for installation of work herein specified. No structural members shall be cut without approval of Structural Engineer and all such cutting shall be done in a neat and workmanlike manner, meeting with approval of Structural Engineer to match adjoining surfaces and finishes, by mechanics of particular trade involved. Sleeves and openings not used during construction shall be sealed with grout by contractor. Openings between pipes and sleeves through fire and smoke walls or floors shall be sealed to prevent passage of smoke or heat using an Underwriters' Laboratories approved method rated at least equal to the barrier being penetrated. Method of sealing shall be submitted with proof of U.L. approval with other submittals. All openings required in concrete which were omitted when concrete was poured shall be carefully made by use of core boring operation with 5-in. maximum hole size unless larger size is approved by Structural Engineer. Cut no openings in prestressed or precast members without approval of Structural Engineer.

B. Sleeves:

1. Walls and Partitions:
 - a. Pipe sleeves 8-inch diameter and smaller (Above Grade): Sleeves shall be mild steel pipe or plastic sleeves built into wall, partition or beam, sized to pass pipe and covering, leaving a clear space of 1/4-inch minimum between covering and sleeve. Penetrations of fire rated barriers shall have mild steel sleeves.
 - b. Pipe sleeves installed in Exterior Walls Below Grade: Schedule 40 steel hot dipped galvanized after fabrication or cast iron sleeve with 1/4-inch x 3-inch center flange (water stop) around the outside.
2. Pipe Sleeves in Floors (Above Grade): Sleeves shall be 14 gauge galvanized sheet steel or plastic, set before floor is poured, sized to pass pipe and covering, leaving a clear space of 1/4-inch between covering and sleeve, and shall extend 1/2-inch above finished floor.
3. Duct Sleeves: Sleeves or openings sized to pass mechanical ducts and covering shall be of framed construction in roof, wall, or partitions.

C. Sealing of Sleeves:

1. Sleeves Below Grade: Caulk annular space between pipe and sleeve using oakum and poured lead both sides minimum one inch deep to make wall penetration water tight.
2. Sleeves Above Grade: Openings around pipes, duct, etc., passing through sleeves shall be made draft free and vermin-proof by packing solidly with mineral wool or fiberglass.
3. Sealing of Sleeves Through Fire Rated Barriers: Openings around pipes, etc., through fire rated barriers shall be sealed using an U.L. approved method rated at least equal to the wall being penetrated.

3.02 REMOVAL OF RUBBISH

Contractor shall at all times keep premises free from accumulations of waste material or rubbish generated by work under this contract. At completion of the work, he shall remove all tools, scaffolding, materials and rubbish in accordance with Special Conditions section of these specifications. Contractor shall leave the premises in a clean, orderly and acceptable condition.

3.03 CONCRETE PADS

Subcontractor will furnish concrete bases for equipment located in equipment room, on grade outside and elsewhere as noted on the mechanical drawings. Subcontractor shall furnish all foundation bolts, and sleeves to be installed. Concrete shall be placed in accordance with Concrete Section of these specifications.

3.04 EXCAVATION, BACKFILLING AND COMPACTION

All excavation, backfilling, compaction, testing, etc. required for the installation of underground piping in this division of the specifications shall be done by the mechanical contractor. This work shall be done in strict accordance with Excavation and Backfilling Section of Division 2.

3.05 PAINTING

- A. Finish Painting: All finish painting, except for items specified to be factory finished, shall be provided under Section "PAINTING".
- B. Protective Painting:
 - 1. Protective painting only shall be provided under work of this section. All HVAC equipment shall be carefully cleaned, oiled, and rubbed down before final acceptance. Equipment which has rusted or been chipped or scratched shall be painted to provide a new appearance.
 - 2. As soon as practical after installation, maximum time of 7-days, all ferrous piping including fittings, unions and flanges, iron valve, pipe hangers and supports, uncoated cast iron, steel supports, vibration eliminator rails, springs, etc. shall be given a heavy coat of rust-inhibitive primer. All materials shall be properly cleaned of rust and scale before painting. Minor surface rust shall be wire brushed, heavy rust shall be sanded. System identification painting shall be provided by the mechanical contractor in accordance with "SYSTEMS IDENTIFICATION".

3.06 CLEANING AND ADJUSTMENTS

Upon completion of work, Contractor shall clean, oil and grease all fans, motors and other running equipment and apparatus which he installs and make certain all such apparatus and mechanisms are in proper working order and ready for test. Refer to Section 15950 "SYSTEM COMPLETION".

3.07 OPERATING INSTRUCTIONS

At the time of substantial completion of work, contractor shall furnish to the mechanical engineer, Operation and Maintenance portfolios containing shop drawings and operation and maintenance instructions on all equipment furnished under this contract. Provide a "Certificate of Completion" letter to the Owner stating the date in which the instruction was given, all personnel present and a summary of the topics discussed. Refer to Section 15950 "SYSTEM COMPLETION" for additional requirements.

3.08 AS-BUILT DRAWINGS

Upon completion of installation, the contractor shall furnish to the Architect a set of reproducible drawings, marked to scale, indicating the size and location of equipment, piping, controls, and ducts, and noting all major changes made during construction. The contractor shall bear all costs in obtaining and providing the As-Built drawings. The Contractor shall deliver a reproducible set of As-Built prints to the Architect. Each sheet in each set shall be signed by a principal representative of the contractor, dated and have "AS-BUILT" stamped near the signature. Drawings shall give accurate dimensions measured from columns, walls, beams and other fixed parts of the building to the concealed materials. The Contractor shall maintain a set of drawings at the site and each day shall record installation of pipe, ducts, etc. to insure accurate "As-Built" drawings.

3.09 GUARANTEE AND SERVICE

- A. In addition to the guarantee of equipment by the manufacturer of each piece of equipment specified herein, the mechanical contractor shall also guarantee such equipment and shall be held responsible for a period of one year from final acceptance for necessary adjustments and/or replacements of all defective equipment, materials and workmanship without expense to the Owner. Provide a letter to the Owner stating the contractor's guarantee and dates of guarantee coverage.
- B. Cleaning of permanent type filters; lubrication, and cleaning of strainers shall be limited to 30-days after the final acceptance.
- C. The contractor shall provide for a representative of his firm, the control system contractor, and the Owner's representative to return to the job at the change of seasons, (summer to winter or winter to summer) for the first year only, to adjust the air conditioning systems and recheck or recalibrate controls as may be required of the season change from cooling to heating or vice versa.

3.10 ACCEPTANCE

- A. As a prerequisite to requesting final inspection, Contractor shall:
 - 1. Complete all work in Sections 15000 through 15999 inclusive of these specifications.
 - 2. Each system shall be tested and balanced to assure design performance and Architect-Engineer shall be provided with preliminary test results.
 - 3. Furnish letter from authorized representative of control manufacturer that all controls have been checked for operation and calibration and that all systems are operating as intended.
 - 4. Furnish required operating instructions, wiring diagrams, and pneumatic or electric control diagrams and mount one copy of each in the equipment rooms framed under glass where directed.
 - 5. Complete all work required under Section 15950 "SYSTEM COMPLETION".
- B. Acceptance will be made by the Architect-Engineer or his representative on the basis of tests and inspection of the job. Contractor shall furnish the necessary mechanics to operate systems, make any necessary adjustments and assist with the final inspection.

(END OF SECTION 15000)

SECTION 15100

PLUMBING SYSTEMS

PART 1 - GENERAL

1.01 WORK DESCRIPTION

- A. The work includes providing new and/or modifying existing plumbing systems and related work. The work also includes providing roughing-in and making final plumbing connections to equipment furnished under other sections of these specification. Provide each system complete and ready for operation. Plumbing systems including fixtures, equipment, materials, installation, and workmanship shall be in accordance with the contract documents, all referenced standards, local ordinances and applicable codes.
- B. Plumbing required for this work is indicated on the drawings and includes but is not necessarily limited to:
 - 1. Domestic cold water distribution
 - 2. Domestic water heating and distribution
 - 3. Sanitary waste and vent piping systems
 - 4. Roof drainage piping systems
 - 5. Plumbing fixtures and trim
 - 6. Plumbing accessory items

1.02 RELATED DOCUMENTS

The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this section.

1.03 QUALITY ASSURANCE

- A. General: The work of this section shall comply with all applicable standards, codes and ordinances.
- B. Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. D1785 & D1784, Poly Vinyl Chloride (PVC) Pipe, Schedules 40, 80, and 120.
 - b. D2466 & D2467, Poly Vinyl Chloride (PVC) Pipe Fittings, Schedule 40 & 80.
 - c. D2665, Poly Vinyl Chloride (PVC) Drain, waste, and vent pipe and fittings.
 - d. D2564, Solvent Cements for Poly Vinyl Chloride (PVC) Pipe and Fittings.
 - e. D2855, Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings.
 - f. F402, Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.
 - g. B88, Copper Pipe Fittings.
 - h. A74-75, A888, C564, Cast Iron Soil Pipe and Fittings.

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- i. A53, Steel Pipe, Schedule 40, Hot Dip Galvanized.
 - j. D2846, Chlorinated Polyvinyl Chloride (CPVC) Plastic Hot and Cold Water Distribution Systems (Copper tube sizes)
 - k. F441, Chlorinated Polyvinyl Chloride (CPVC) Plastic Pipe, Schedules 40 and 80.
 - l. F439, Socket-Type Chlorinated Polyvinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80.
 - m. F1412, Polypropylene chemical resistant plastic pipe.
 - n. F493, Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Pipe and Fittings.
 - o. ASTM A240, 300 series stainless steel
 2. Cast Iron Soil Pipe Institute (CISPI): 301-72 Hubless Cast Iron Sanitary System.
 3. Plumbing and Draining Institute (PDI): WH201, Water Hammer Arrestors.
 4. ANSI, LC-1 Fuel Gas Piping Systems using corrugated stainless steel tubing (CSST)
 - C. Requirements of Regulatory Agencies:
 1. 2017 Florida Building Code – Mechanical, 6th Edition;
 2. 2017 Florida Building Code – Plumbing, 6th Edition;
 3. Code requirements and local ordinances of City and/or County having supervisory jurisdiction.
 - D. Permits and Fees:
 1. The Contractor shall arrange for all permits, pay all fees, charges and expenses necessary for a complete and operating system.
- ### 1.04 MANUFACTURERS
- A. Manufacturers' model numbers are listed to establish a standard of quality and level of performance.
 - B. Equivalent items of the following manufactures are acceptable:
 1. Fixtures:
 - a. American-Standard
 - b. Eljer
 - c. Kohler
 - d. Crane
 - e. Elkay
 - f. Just
 - g. Briggs
 2. Fixture Trim:
 - a. American-Standard
 - b. Kohler
 - c. Speakman
 - d. Moen
 - e. Delta
 - f. T&S Brass
 - g. Chicago Faucet
 - h. Symmons

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- i. Briggs
3. Drain and Fixture Specialties:
 - a. J.R. Smith
 - b. Josam
 - c. Zurn
 - d. Wade
 - e. Watts
4. Water Coolers:
 - a. Oasis
 - b. Elkay
 - c. Halsey Taylor
5. Water Heaters:
 - a. Rheem
 - b. A.O. Smith
 - c. State
 - d. Lochinvar
6. Pre-fabricated fiberglass/Acrylic shower:
 - a. Lasco
 - b. Hydro Systems
 - c. Aqualine
 - d. Aquabath
 - e. Kohler

1.05 SUBMITTALS

- A. Material and Equipment Schedule:
 1. Submit complete list of materials and equipment to be incorporated in work, partial lists are not acceptable. All deviations and/or substitutions must be submitted in writing 10 days prior to the day bids are due for consideration. Review of this submittal, regardless of action code indicated, shall not relieve the contractor from providing specified items or materials in the event a deviation from the specified items has submitted and inadvertently approved. Deviations must be clearly identified as such on the submittal.
 2. Manufacturers' Data:
 - a. Plumbing Fixtures
 - b. Water Heaters
 - c. Cleanouts
 - d. Drains
 - e. Water Hammer Arrestors
 - f. Backflow Preventers
 - g. Piping Materials
 - h. Pipe Insulation
 - i. Valves
 3. Certificates of Compliance:
 - a. Water Flushing Volume of Flush Valve and Water Closet Combination.
 - b. Water Flushing Volume of Flush Valve and Urinal Combination
 - c. Backflow Preventers
 4. Certified Data:
 - a. Water Heaters
 - b. Pump Test Curves
 - c. Backflow Preventers

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5. Operation and Maintenance Manuals
 - a. Water Heaters
 - b. Pumps
6. Posted Operating Instructions:
 - a. Water Heaters
 - b. Pumps

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Deliver materials with manufacturer's tags and labels intact.
- C. Store materials and equipment in dry, clean location.
- D. Handle and store so as to avoid damage.
- E. Remove items delivered in broken, damaged, rusted or unlabeled conditions from project site immediately.

PART 2 - PRODUCTS

2.01 PIPE

- A. General:
 1. Free from defects impairing strength and durability and best commercial quality for purposes specified.
 2. Structural properties sufficient to safely sustain or withstand strains to which it is normally subjected.
- B. Pipe Materials:
 1. DWV (Drain, Waste, and Vent) Piping: Fittings shall be long radius fittings, except fittings in vent piping may be short radius fittings. Minimum size piping shall be 2 inches for buried piping and 1-1/4 inches for aboveground piping.
Contractor's option:
 - a. Below Grade: Cast iron, ASTM A74, standard, single hub, coated.
 - b. Above Grade: Cast iron, No Hub, CISPI Standard 301/ASTM A888.
 - c. Above and Below Grade: PVC, Schedule 40, meeting ASTM D1785.
 2. Roof Drainage Piping: Same as DWV above.
 3. Domestic Water Piping (Contractor's Option):
 - a. Copper, meeting ASTM B88.
 1. Below Grade: Type K, coated with coal tar shellac.
 2. Above Grade: Type L.
 - b. Chlorinated Polyvinyl Chloride (CPVC):
 1. Piping up to 1-1/4" shall meet ASTM D2846.
 2. Piping 1-1/2" and larger shall be Schedule 80 and meet ASTM F441 and ASTM F439.
 4. Exterior Water Piping: PVC, Schedule 40, meeting ASTM D1785.
 - 1.) Below Grade: Certified corrugated stainless steel tubing (CSST). Tested to 125 PSI with pre-sleeved Trac Pipe PS sleeve and vent.

- C. Fittings and Joints:
1. DWV Pipe:
 - a. Joints Below Grade: Hub and spigot compression gasket meeting ASTM C564.
 - b. Joints Above Grade: Cast iron coupling with neoprene gasket and stainless steel bands meeting CISPI 310 and ASTM C564.
 - c. Fittings: Cast iron, same as pipe.
 - d. Joints Above and Below Grade: Solvent weld meeting ASTM D2564.
 - e. Fittings: PVC, same as pipe.
 2. Copper: (Contractor's Option)
 - a. Joints: Solder, 95% tin, 5% antimony.
 - b. Fittings: Wrought copper.
 - c. Joints: Propress system by Viega or prior approved equal.
 - d. Fittings: Propress system by Viega or prior approved equal.
 3. CPVC:
 - a. Joints: Solvent weld.
 - b. Fittings: CPVC, same as pipe.
 4. Steel: 150# malleable iron fittings.
 - a. 2" diameter and smaller: threaded joints.
 - b. Larger than 2" diameter: welded joints.
 5. CSST
 - a. Autoflare mechanical attachment fittings
 - b. Trac Pipe or equal fittings to include:
 1. Galvanized steel box with manifold bracket
 2. Iron poly coated manifold
 3. Pressure regulator
 4. Stainless steel ball valve
 5. Carbon steel stricker plate
 6. Galvanized steel conduit
 7. Excess safety flow device equal to gas breaker
 6. Dielectric Unions: Shall be used at all joints of dissimilar pipe materials.

2.02 INSULATION

- A. Piping to be insulated as follows:
1. Electric Water Cooler Waste:
 - a. 3/4-lb., 1-1/2 inch blanket.
 - b. FSK jacket.
 2. Domestic Cold Mains and Risers; Hot Water Mains, Risers and Branch lines:
 - a. 1-inch standard fiberglass.
 - b. Factory jacket and fitting covers.
 3. Horizontal Roof Drain Piping:
 - a. 1-inch standard fiberglass.
 - b. Factory jacket and fitting covers.
 4. Domestic Water Piping Exposed to Exterior: Nitrile rubber based elastomeric sheet insulation; Armstrong "Armaflex 2". Minimum insulation thickness shall be 3/4-inch.
 5. CPVC Water Piping and PVC Waste, Vent and Roof Drain Piping Run in

Return Air Plenums: Wrap with a fire protective jacket with a maximum flame spread rating of 25 and a maximum smoke development rating of 50 in accordance with NFPA-90A, paragraphs 4-3.3.1 and 4-3.10.1.

- B. Piping to be uninsulated: Piping run-outs to fixtures (except as noted for handicap-accessible fixtures).

2.03 DRAINAGE SPECIALTIES

A. Drainage, Waste and Vent System:

- 1. Cleanouts:
 - a. Unfinished Areas, Exterior: Josam 58900 or Zurn Z-1440 coated cast iron cleanout ferrule and bronze countersunk plug with access cover.
 - b. Floors, Unfinished Areas: Josam 58850 or Zurn Z-1400 coated cast iron cleanout ferrule and recessed ABS plug.
 - c. Floors, Finished Areas: Josam 56000 or Zurn Z-1400 threaded bronze plug, nickel bronze top. Furnish recess top for areas with vinyl or asbestos tile. Furnish carpet marker for carpeted areas.
 - d. Walls: Josam 58710 or Zurn Z-1441 round cast Nikaloy access frame, anchor lugs, smooth secured cover, coated cast iron cleanout ferrule with bronze plug.
 - e. All floor cleanouts installed in floors and waterproof membrane shall be furnished with clamp ring and flange.
- 2. Floor Drains:
 - a. Toilet Rooms, Finished Areas: Zurn Z-415 cast iron body with bottom outlet, adjustable collar with "Type B" nickel bronze strainer, 3-inch outlet with 5-inch top, 4-inch outlet with 7-inch top.
 - b. Lab Areas: Zurn Z-415 cast iron body with acid-resisting enamel interior and "Type B" nickel bronze top.
 - c. Unfinished Areas, Equipment Room: Zurn Z-415 cast iron body and "Type B" nickel bronze top with sediment bucket
 - d. Showers: Zurn Z-415 cast iron body with bottom outlet, adjustable collar with "Type BL" nickel bronze strainer
- 3. Vent Flashing: Provide high boot 4 pound per square foot density lead sheet.

B. Roof Drainage System:

- 1. Roof Drains:
 - a. Coated cast iron adjustable with aluminum dome.
 - b. Acceptable: Josam 21000 or Zurn Z-100.
- 2. Roof Drain Flashing: Provide 4-lb. sheet lead flashing extending 24 inches on all sides of drain.

2.04 WATER SYSTEM SPECIALTIES

- A. Water Hammer Arrestors: All arrestors shall conform to PDI Standard WH201 and ASSE 1010, Acceptable: Zurn Shoktrols Z-1700
- B. Hose Valves (Bibbs): See Plumbing schedule
- C. Backflow Preventers: Where indicated and/or required by code provide a reduced pressure type backflow preventer meeting the requirements of the local authorities

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having jurisdiction. Backflow preventers shall be installed at all domestic water/mechanical equipment connections. Minimum size shall be line size.

2.05 WATER HEATERS

A. Electric Water Heaters:

1. Tank: UL listed water heater with a 150 psi working pressure and be equipped with extruded high density anode rod. All internal surfaces of the heater exposed to water shall be glass-lined with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1600°F. The outer jacket shall be of baked enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panels and shall enclose the tank with foam insulation exceeding the latest requirements of ASHRAE 90.1 and the 2017 Florida Building Code – Plumbing, 6th Edition.
2. Heater elements: Shall be medium watt density with zinc plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch.
3. Terminal Block: Factory installed electrical terminal box for single point connection for all 208/240 models.
4. Provide factory drain and ASME rated Pressure and temperature relief valve.
5. Provide factory three year limited warranty.
6. Provide and install water heater in accordance with the manufacturer's installation instructions.

2.06 PLUMBING FIXTURES

- A. As scheduled on the drawings.
- B. Provide control-stop valves in each supply to each fixture.
- C. The finish of fittings, accessories and supplies exposed to view shall be chromium plated.
- D. Provide special roughing-in for wheelchair fixtures.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas to receive piping for:
 1. Defects that adversely affect execution and quality of work.
 2. Deviations beyond allowable tolerances for piping clearances.
- B. Check location of rough-in work to assure match with fixtures.

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- C. Verify that electrical facilities are compatible with equipment.
- D. Start work only when conditions are satisfactory and all sections of this specification have been read and understood.

3.02 INSTALLATION

- A. Piping Layout:
 - 1. Complete installation to present a neat, orderly appearance.
 - 2. Run piping parallel to walls of building unless otherwise indicated.
 - 3. Keep piping free from contact with building structure and all other equipment.
- B. Pipe Supports and Fasteners:
 - 1. Hang and support as required with approved structural fasteners.
 - 1. Support metallic pipe with hangers and fasteners of the same material.
 - 2. Maximum spacing of pipe hangers shall be in accordance with Table 308.5 of the 2004 Florida Building Code – Plumbing.
- C. Piping Within Walls:
 - 1. Anchor as required to prevent vibration or movement of any kind.
 - 2. Secure piping to flush valves with support system designed specifically for this purpose.
- D. Penetrations:
 - 1. Coordinate penetrations for vents and roof drains with roof system.
 - 2. Do not penetrate structural members without written approval from Structural Engineer.
 - 3. Provide chromium plated cast brass adjustable escutcheon plates at exposed pipe penetrations through walls, partitions, ceilings or floor.
- E. Water Hammer Arrestors (Domestic Water System):
 - 1. Install where shown or required for elimination of water hammer.
 - 2. Air chambers are not acceptable.
- F. ProPress Installation:

Copper press fittings shall be made in accordance with the manufacturer's installation instruction. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.03 TESTING AND DISINFECTING

- A. Testing:
 - 1. Test prior to covering or concealing piping.
 - 2. Perform all tests in presence of Building Official. Provide 24-hour advance notice.
 - 3. Soil, Waste, Vent and Roof Drain System:
 - a. Temporarily plug all outlets.
 - b. Fill lines with water to the roof level.

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- c. Allow to remain full for 24 hours.
 4. Water System:
 - a. Test at 150 percent of design pressure but not less than 100 psig.
 - b. Allow pressure to remain on line for 24 hours.
 5. Repair all detectible leaks in piping systems.
- B. Disinfection of Domestic Water System:
 1. Disinfect domestic water system after approval of test results and piping installation by Building Official.
 2. Prior to substantial completion sterilize piping system in accordance with local plumbing code requirements.
 3. Deliver certification to Building Official.

(END OF SECTION 15100)

SECTION 15500

THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 - GENERAL

1.01 REQUIREMENTS

Provide labor and materials to insulate equipment, piping, ductwork and miscellaneous items in the piping and duct systems as indicated on the drawings and specified herein. Refer to requirements of Section 15000 - "General Requirements for Mechanical Work."

1.02 INSTALLATION

No insulation shall be installed until the Engineer has approved the systems to which insulation is to be installed. All materials, insulation, adhesives, coatings and sealers located in supply or return air passages shall have a flame spread of 25 or less and a smoke development of 50 or less as tested by ASTM E- 84 and shall comply with latest edition of NFPA-90A. Protect all surfaces, equipment and premises from all drippings of coatings, adhesives, finishes, etc. Clean all drippings and leave spaces in an acceptable condition. Insulation shall be installed with all joints fitted to eliminate voids. Voids shall not be fitted with joint sealant, but shall be eliminated by refitting or replacing insulation.

1.03 SUBMITTALS

Refer to the requirements of Section 15000 - "General Requirements for Mechanical Work". Shop drawings shall contain complete descriptive and engineering data, including flame spread and smoke developed ratings (ASTM E-84 test method), on all materials and adhesives. Where finishes, covers, or jackets are specified, provide complete data on same. Shop drawings shall contain specific information on: densities, conductivities, conductances, or resistances as required to establish conformance with the specified values and materials. If requested by the Architect, the Contractor shall supply a sample of each type of insulation with specified finish.

1.04 QUALIFICATION

Insulation Contractor shall be an independent Contractor regularly engaged in the installation of insulation. Contractor shall have adequate experience with insulating systems required by this Contract.

1.05 MANUFACTURERS

- A. Insulation products shall be equal in all respects to the products used as a basis of design and shall be products of Armstrong, Manville, Owens-Corning, Certain Teed, Pittsburgh- Corning, Knauf or Rubatex.
- B. Adhesives, mastic, sealants, and bore coats shall be products of Armstrong, Pittsburgh-Corning, Benjamin Foster, or Childers.
- C. Aluminum jacketing shall be a product of Childers or prior approved equal.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Condensate Drain Pipe Insulation Preformed nitrile rubber based elastomeric pipe insulation; Acceptable: Armstrong "Armaflex 2."
- B. Ductwork:
 - 1. Interior Concealed: Two inch (2") thick fiberglass duct insulation with reinforced foil scrim kraft vapor barrier; Acceptable: Manville "R-Series".
 - 2. Interior Exposed: One inch (1") thick, one and one-half (1-1/2) pound per cubic foot density fiberglass duct liner insulation with black pigmented neoprene coating on face of insulation in contact with airstream. Acceptable: Manville "Linacoustic"
 - 3. Exterior: Two inch (2") thick cellular glass block insulation; Acceptable: Pittsburgh-Corning "Foamglas."

2.02 ADHESIVES, MASTIC, SEALANTS, AND BORE COATS

- A. Glass Fiber Insulation: Foster's 85-20 adhesive. Foster's 35-00 mastic finish with Mast-A-Fab white cloth.
- B. Nitrile Rubber Based Elastomeric Insulation: Armstrong "520 Adhesive". Do not store this adhesive within the building.

2.03 FINISHES

- A. Glass Fiber Pipe Insulation:
 - 1. Exposed: Aluminum jacketing and fitting covers. Aluminum jacketing, 0.016 inches thick, type 3003 alloy, H-14 temper, circumferentially corrugated, with a continuously laminated moisture barrier of one mil polyethylene film and a protective layer of 40 pound virgin kraft paper; Childers Products Company "Corrolon". Aluminum fitting covers, 0.020 inches minimum thickness, type 3003 alloy H-14 temper prefabricated fitting covers with baked epoxy moisture barrier for pipe sizes through 24 inches using 0.020 inches thick aluminum roll jacketing with laminated polyethylene/kraft moisture barrier; Childers Products "Ell-Jacs", "Gore Ell-Jacs", "Tee Jacks", "End-Caps", "Beveled Collars", "Valve Fitting Covers", and "Flange Jacks".
 - 2. Concealed: All-purpose jacket on pipe insulation. Cover joints with mastic and white cloth.
- B. Nitrile Rubber Based Elastomeric Insulation: Armstrong "Armaflex Finish - White". Do not store this finish within the building.

PART 3 - EXECUTION

3.01 CONDENSATE DRAIN PIPING

Insulate with preformed nitrile rubber based elastomeric pipe insulation secured with adhesive and finished with white finish coating. Insulation thickness shall be minimum three-quarter inch (3/4").

3.02 DUCTWORK

- A. Internal Insulation (Lining): See Section 15700 - "Ductwork, Air Distribution Equipment, and Accessories".
- B. Interior Concealed: Insulate all supply, return, and outside air ducts. All supply, return and outside air ductwork that is internally lined shall also be externally wrapped, unless otherwise shown on drawings. Extend internal lining a minimum of one foot past the end of the external insulation and vapor seal raw end as specified herein for joints. Adhere duct insulation using a full coverage coat of adhesive as required by insulation manufacturer and applied in accordance with the manufacturer's recommendations. Where duct width exceeds twenty-four inches (24") the insulation shall be additionally secured to the bottom of the duct using mechanical fasteners spaced one foot (1') on center. Insulation shall be applied with edges tightly butted and all joints and breaks in the vapor barrier sealed using glass fabric and mastic applied in conformance with the manufacturer's recommendations.
- C. Interior Exposed: Adhere duct insulation using a full coverage coat of adhesive tape as required by insulation manufacturer and applied in accordance with the manufacturer's recommendations. Where duct width exceeds twenty-four inches (24") the insulation shall be additionally secured to the bottom of the duct using mechanical fasteners spaced one foot (1') on center. Insulation shall be applied with edges tightly butted together.

(END OF SECTION 15500)

SECTION 15600

HVAC EQUIPMENT

PART 1 - GENERAL

1.01 INSTRUCTIONS

Contractor shall consult Section 15000 - "General Requirements for Mechanical Work", General Conditions and Special Conditions of the Specifications. Contractor shall refer to the mechanical drawings for dimensions, capacities, locations of HVAC equipment and accessories to be furnished and installed under this contract.

1.02 SCOPE

Furnish all labor, materials, tools, equipment, transportation, scaffolding, services, supervision, and perform all operations required to properly complete mechanical work in accordance with this section of specifications, and as indicated on applicable drawings, subject to terms and conditions of contract. Contractor shall pay for all applicable service charges, fees, permits, royalties, taxes and insurance or other similar costs as required by work performed under this section.

1.03 APPROVAL OF EQUIPMENT

When a manufacturer's name is used on the plans or in the specifications, that manufacturer's product or equipment shall be a standard of quality and level of performance. Other manufacturer's products that the Contractor may anticipate furnishing as equal shall be approved by the Engineer 10-days prior to the scheduled bid date. If the approval is not obtained before submission of bids, the specified products and manufacturers listed must be used. All approved equals shall be acknowledged by the issuance of an addendum to all prospective contractors prior to the bid date. Request for prior approval, shall contain all engineering data required by Section 15000.

1.04 SHOP DRAWINGS

Shop drawings shall be submitted in accordance with Section 15000 - "General Requirements for Mechanical Work.". Equipment rooms which contain significant amount of equipment and/or ductwork may be required to be drawn at a scale of 1/4" = 1'-0" and submitted as a shop drawing at the discretion of the Engineer.

PART 2 – PRODUCTS

2.01 PACKAGED ROOFTOP AIR CONDITIONERS (25-50 TONS)

- A. General: Units shall be specifically designed for outdoor rooftop installation on a roof curb and be completely factory assembled and tested, piped, internally wired, fully charged with R410a, compressor oil and shipped in one piece. Units shall be available for direct expansion cooling with electric heating. Filters, outside air system, exhaust air system, non-fused disconnect switches and all operating and safety controls shall be furnished factory installed. All units shall be rated in accordance with ARI Standard 360. All units shall have decals and tags to aid in service and indicate caution areas. Electrical diagrams shall be printed on long life water resistant material and shall ship attached to control panel doors.

- B. Casing: Exterior panels shall have minimum of 1.25-ounce zinc coating per square foot of steel, phosphatized and painted with a slate grey finish which meets a 672 hour salt spray test based on the ASTM B117 standard for salt spray resistance. Screws shall be coated with zinc-plus-zinc chromate. Eighteen gauge steel hinged access panels with tiebacks to secure door in open position shall provide access to filters and heating sections. Refrigeration components, supply air fan and compressor shall be accessible through removable panels as standard. Unit control panel shall be accessible through hinged access panel with quick release latches. Double Wall Construction hinged access doors shall provide access to filters, return/exhaust air, heating and supply fan section. All access doors and panels shall have neoprene gaskets. Interior surfaces or exterior casing members shall have 1/2-inch Tuf-Skin fiberglass insulation. Unit base shall be watertight with 14-gauge formed load bearing members, formed recess and curb overhang. Unit lifting lugs shall accept chains or cables for rigging. Lifting lugs shall also serve as unit tie down points. Condensate pan shall be stainless steel.
- C. Compressors: Scroll compressors shall have a simple mechanical design with only three major moving parts and no suction or discharge valves. Scroll type compression shall provide a completely enclosed compression chamber with no leakage paths and the ability for scroll plates to separate, allowing liquid refrigerant to pass through without damage to the compressor. Scroll compressor shall include a direct-drive, 3600 rpm, suction gas cooled hermetic motor, centrifugal oil pump, oil sight glass and oil charging valve. Control of compressor shall allow lead/lag of multiple compressors/circuits for even run time to increase life of compressors.
- D. Evaporator Coil: Internally enhanced seamless copper tubing of 1/2-inch O.D. shall be mechanically bonded to heavy-duty aluminum fins of configured design. All coils shall be equipped with thermal expansion valves and factory pressure and leak tested at 300psi.
- E. Condenser Coil: Configured aluminum fin or configured copper fin secondary surface shall be mechanically bonded to primary surface of 3/8-inch O.D. seamless copper tubing for extra corrosion resistance. Subcooling circuit(s) shall be provided as standard. All coils shall be factory tested at 450 psig air pressure and vacuum dehydrated.
- F. Condenser Fans and Motors: All condenser fans shall be vertical discharge, direct drive fans, statically balanced, with steel blades and zinc plated steel hubs. Condenser fan motors shall be three-phase motors with permanently lubricated ball bearings, built-in current and thermal overload protection and weather tight slingers over motor bearings.
- G. Supply Fan: All supply fans shall have two double inlet, forward-curved fans mounted on common shaft with fixed sheave drive and shall be dynamically balanced and tested in factory. Supply fan shall be test run in unit as part of unit test and unit shall reach rated rpm before the fan shaft passes through first critical speed. Fan shaft shall be mounted on two grease lubricated ball bearings designed for 200,000 hours average life. Extended grease lines shall allow greasing of bearings from unit filter section. Fan motor and fan assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. Entire assembly shall be completely isolated from unit and fan board by double deflection rubber-in-shear isolators or by two-inch deflection spring isolation on motor sizes larger than five hp.

- H. Controls: Unit shall be completely factory wired with necessary control and contractor pressure lugs or terminal block for power wiring. Units shall provide an internal location for a non-fused disconnect with external handle for safety. Unit mounted microprocessor controls shall provide anti-short cycle timing for compressors to provide a high level of machine protection.
- I. Unit Controller: DDC microprocessor controls shall be provided to control all unit functions.
The control system shall be suitable to control CV or VAV applications. The controls shall be factory-installed and mounted in the main control panel. All factory-installed controls shall be fully commissioned (run tested) at the factory. The unit shall have a Human Interface Panel with a 16 key keypad, a 2 line x 40 character clear English display as standard to provide the operator with full adjustment and display of control data functions. The unit controls shall be used as a stand-alone controller, or as part of a building management system involving multiple units.
The unit shall be equipped with a complete microprocessor control system. This system shall consist of temperature and pressure (thermistor and transducer) sensors, printed circuit boards (modules), and a unit mounted Human Interface Panel. Modules (boards) shall be individually replaceable for ease of service. All microprocessors, boards and sensors shall be factory mounted, wired and tested.
The microprocessor boards shall be stand-alone DDC controls not dependent on communications with an on-site PC or a Building Management Network. The microprocessors shall be equipped with on-board diagnostics, indicating that all hardware, software and interconnecting wiring are in proper operating condition.
- J. Zone sensors shall be available in several combinations with selectable features depending on sensor.
- K. The Human Interface Panel's Keypad display character format shall be 40 characters x 2 lines.
The character font shall be 5x7 dot matrix plus cursor. The display shall be Supertwist Liquid Crystal Display (LCD). The display format shall be in clear English. The Keypad shall be equipped with 16 individual touch-sensitive membrane key switches. The switches shall be divided into four separate sections and be password protected from change by unauthorized personnel. The six main menus shall be STATUS, SETPOINTS, DIAGNOSTICS, SETUP, CONFIGURATION and SERVICE MODE.
- L. Filters: Pre-filters shall be two inch (2") thick pleated filters of non-woven cotton fabric which shall filter both return and outside air handled by unit; pre-filters shall have a minimum MERV rating of 6 when tested in accordance with ASHRAE Standard 52.2. Filter face velocity shall not exceed 500 feet per minute. Primary filters shall be two-inch (2") high-efficiency media filters with minimum MERV rating of 11 when tested in accordance with ASHRAE 52.2.
- M. 0-100 Percent Modulating Economizer: Operated through the primary temperature controls to automatically utilize OA for "free" cooling. Automatically modulated return and OA dampers shall maintain proper temperature in the conditioned space. Economizer shall

be equipped with an automatic lockout when the outdoor enthalpy temperature is too high for proper cooling. Minimum position control shall be standard and adjustable at the Human Interface Panel or with a remote potentiometer or through the building management system. A spring return motor shall ensure closure of OA dampers during unit shutdown or power interruption. Mechanical cooling shall be available to aid the economizer mode at any ambient. Low leak economizer dampers shall be standard with a leakage rate of 2.5 percent of nominal airflow (400 CFM/ton) at 1 inch wg. static pressure.

- N. Heating System: All electric heat models shall be completely assembled and have wired electric heating system integral within the rooftop unit. Heavy-duty nickel chromium elements internally wired with a maximum density of 40 watts per square inch shall be provided. Heater circuits shall be 48 amps or less, each individually fused. Automatic reset high limit control shall operate through heater backup contractors.
- O. Roof Mounting Curb: Roof mounting curb shall be fourteen gauge zinc coated steel with nominal two-inch by four-inch nailer setup. Supply/return air opening gasketing shall be provided. Curb shall ship knocked down for easy assembly. Channel shall be provided to allow for adjustment of return air opening location. Curb shall be manufactured to Association guidelines.
- P. Zone Sensors: Shall provide two temperature setpoint levers, Heat, Auto, Off, or Cool system switch, Fan Auto or Fan On switch, Optional status indication LED lights, System On, Heat, Cool, and Service shall be available. These sensors shall be used with CV units.
- Q. Programmable Night Setback Sensors: Shall be electronic programmable sensors with auto or manual changeover with 7 day programming. Keyboard shall provide selection of Heat, Cool, Fan Auto or On All programmable sensors shall have System On, Heat, Cool, Service LED/indicators as standard. Night setback sensors shall have (1) Occupied, (1) Unoccupied and (2) Override programs per day. Sensors shall be available for CV zone temperature control and VAV Supply Air temperature control.
- R. Through-The Base Electrical Provision: An electrical service entrance shall be provided which allows access to route all high and low voltage electrical wiring inside the curb, through the bottom of the outdoor section of the unit and into the control box area.
- S. Non-Fused Disconnect Switch: Factory installed non-fused disconnect switch with external handle shall be provided and shall satisfy NEC requirements for a service disconnect. The non-fused disconnect shall be mounted inside the unit control box.
- T. GFI Powered Convenience Outlet: Factory installed and powered 15A, 115V Ground Fault Interrupter convenience outlet shall be factory installed. It shall be wired and powered from the factory mounted transformer.
- U. Integral Heat wheel module:

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1. **Cassette Components**
The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.
2. **Coatings and Dessicants.**
The total energy recovery wheel shall be coated with a silica gel dessicant permanently bonded by a patented and proprietary process without the use of binders or adhesives, which may degrade dessicant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Dessicant shall not dissolve nor deliquesce in the presence of water or high humidity.
3. **Sensible Wheel Characteristics.**
Sensible energy recovery wheels shall be constructed of lightweight polymer and shall be provided without dessicant coating. Sensible-only wheels shall be constructed in the same fashion as the total energy recovery wheel.
4. **Wheel Layers.**
The wheel shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.
5. **Removable Segment Wheels.**
Wheels greater than 30 inches in diameter shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.
6. **Seals and Belts.**
All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.
7. **Standards Compliance.**
The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratories Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84-1991, Method of Testing Air-to-Air Heat Exchangers and ARI Standard 1060-2000, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the ARI Certified Products Directory and bear the ARI Certified Product Seal.

V. Acceptable: Trane IntelliPak Series; or equal products of York.

2.02 PACKAGED ROOFTOP AIR CONDITIONERS (Up to 10 tons)

- A. Furnish and install a roof mounted packaged air conditioners of the capacity, operating characteristics, and electrical characteristics indicated on the drawings and specified

herein. Units shall utilize R410A or other CFC- and HCFC-free refrigerant.

- B. Manufacturer: Product of Trane or York may be submitted for review provided they conform to all requirements of these specifications.
- C. Warranty: Contractor shall include in his price the cost of one year's warranty on the entire system plus an additional four years warranty on the compressor(s). The first year's warranty shall comply with Section 15000 - "General Requirements for Mechanical Work". The additional four year warranty shall include parts, refrigerant, and oil, exclusive of labor.
- D. Frame and Casing: Unit shall be completely factory assembled with all components mounted on a one piece unitized frame. Frame shall be constructed of extruded aluminum or welded steel. Frame shall incorporate lifting lugs for purposes of rigging and setting the unit in place. The unit casing shall be not less than 16 gauge zinc coated steel, phosphatized, epoxy primed, and finished with enamel. Casing shall utilize one piece construction with all seams filled with sealant. Access shall be provided by means of access panels furnished in sufficient number and size to enable ready access to all controls, fans, coils, filters, compressors, refrigerant system accessories, and service valves. Access panels shall be gasketed neoprene seals.
- E. Refrigerant Coils: Refrigerant coils shall be constructed of seamless copper tubes with mechanically bonded aluminum heat transfer fins. Condenser coils shall be tested at not less than 400 psig and proved tight. Evaporator coils shall be tested at not less than 300 psig and proved tight.
- F. Electric Heater: Provide factory mounted and wired electric resistance heating coils of the capacities scheduled. Heating coils shall be of heavy duty nickel chromium wire and incorporate manual and auto reset high limit protection devices and air flow interlock devices. Heaters shall be U.L. labeled.
- G. Fans:
 - 1. Supply Air Fans: Supply air fans shall be double-width, double-inlet forward curved blade type and shall be both statically and dynamically balanced. Fans shall be of the belt drive type and drives shall conform to Section 15000 - "General Requirements for Mechanical Work".
 - 2. Condenser Fans: Shall be propeller type, direct drive, statically and dynamically balanced and protected with metal guards on discharge side.
- H. Filters: Two inch (2") thick pleated filters of non-woven cotton fabric which shall filter both return and outside air handled by unit. Filter shall have a minimum MERV rating of 11 when tested in accordance with ASHRAE Standard 52.2. Filter face velocity shall not exceed 500 feet per minute.
- I. Compressors: Unit compressor(s) may be of the hermetic or serviceable, semi-hermetic type. Compressor overload sensors shall be embedded in the starter windings.
- J. Refrigerant Circuit Accessories: The following refrigerant accessories shall be included: suction accumulator; back-seating compressor suction and discharge valves with gauge ports on serviceable hermetics; high and low pressure service gauge ports and valves; filter drier; sight glass and moisture indicator; thermostatic expansion valves; crankcase heater. Where units have multiple compressors, the above shall apply to each compressor refrigerant circuit.

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- K. Insulation: All casing panels and all interior surfaces of exterior casing members in contact with air stream shall be insulated with not less than one inch (1") expanded foam or glass fiber insulation. All unit insulation and adhesives shall comply with the requirements of NFPA 90A as to flame spread and smoke developed ratings.
- L. Roof Curb: Unit shall be furnished complete with National Roofing Contractors' Association approved roof curb constructed of 18 gauge zinc coated steel with full perimeter gasketing. Curb height shall be a minimum of fourteen inches (14").
- M. Utility Connection Openings: Utility connection openings may be provided within the roof curb enclosure, or on the exterior of the unit provided a good water seal is provided to prevent leakage within the unit.
- N. Controls: Units shall be furnished and installed complete with all system operating and safety controls specified herein and as otherwise required for a complete and operable system. Controls shall be of the electric and electronic type. Unit controls shall operate at 115V AC and all remote controls shall be low voltage (less than 50 VAC).
 - 1. Refrigerant Controls: Refrigerant controls shall include short cycle protection; high pressure cutout; low pressure cutout; and oil pressure failure protection switch (on serviceable hermetics). Also provide complete defrost controls (e.g.; timers and thermostats).
 - 2. Room Controls: Each unit shall be provided with an individual space control capable of matching system heat input or heat removal to space heat loss or heat gain sufficiently close to maintain a space temperature within plus or minus two (2) degrees of thermostat setpoint. Thermostat shall have COOL-OFF-AUTO-HEAT system selector and ON-AUTO fan selector switch.
- O. Through-The Base Electrical Provision: An electrical service entrance shall be provided which allows access to route all high and low voltage electrical wiring inside the curb, through the bottom of the outdoor section of the unit and into the control box area.
- P. Non-Fused Disconnect Switch: Factory installed non-fused disconnect switch with external handle shall be provided and shall satisfy NEC requirements for a service disconnect. The non-fused disconnect shall be mounted inside the unit control box.
- Q. GFI Powered Convenience Outlet: Factory installed and powered 15A, 115V Ground Fault Interrupter convenience outlet shall be factory installed. It shall be wired and powered from the factory mounted transformer.

2.03 KITCHEN VENTILATION SYSTEM

- A. General: Provide a kitchen ventilation system of the type, operating characteristics, and electrical characteristics indicated on the drawings. The system shall be U.L. listed and meet all the requirements of NFPA 96.
- B. Manufacturer: Products of CaptiveAire or Grease Master may be submitted for review provided they meet the requirements of these specifications and fits within the allotted space.
- C. Start up and Balance: A representative of the system manufacturer shall be responsible for the start-up, check out, and balance of the system. A start-up, check out, and balance report shall be submitted to the Engineer. Final balance shall be per the manufacturer's recommendations and as indicated on the drawings.

D. Hood:

1. The ND Series with PSP Accessory is a compensating wall canopy ventilator rated for all types of cooking equipment. Shall be capable of providing up to 80% make-up air through a front perforated stainless steel plenum. The hood shall have size, shape and performance specified on drawings.
2. Construction shall be type 430 stainless steel with a #3 or #4 polish, where exposed. Individual component construction shall be determined by manufacturer, ETL, and NSF. Construction shall be dependent on the structural application to minimize distortion and other defects. All seams, joints and penetrations of the hood enclosure to its lower outermost perimeter that directs and captures grease-laden vapor and exhaust gases shall have a liquid-tight continuous external weld in accordance with NFPA 96. Hood shall be wall type with a minimum of four connections for hanger rods. Connectors shall have 9/16" holes pre-punched in 1 ½" x 1 ½" angle iron at the factory to allow for hanger rod connection by others.
3. Ventilator shall be furnished with U.L. classified aluminum baffle filters, supplied in size and quantity as required by ventilator. The filters shall extend the full length of the hood and the filler panels shall not be more than 6".
4. The hood manufacturer shall supply complete computer generated submittal drawings including hood sections view(s) and hood plan view(s). These drawings must be available to the engineer, architect and owner for their use in construction, operation and maintenance.
5. Exhaust duct collar to be 4" high with 1" flange. Duct sizes, CFM and static pressure requirements shall be as shown on drawings. Static pressure requirements shall be precise and accurate; air velocity and volume information shall be accurate within 1-ft increments along the length of the ventilator.
6. U.L. incandescent light fixtures and globes shall be installed and pre-wired to a junction box. The light fixtures shall be installed with a maximum of 4'0" spacing on center and allow up to a 100 watt standard light bulb.
7. The hood shall have:
 - a. A double wall insulated front to eliminate condensation and increase rigidity. The insulation shall have a flexural modulus of 475 EI, meet UL 181 requirements and be in accordance with NFPA 90A and 90B.
 - b. An integral front baffle to direct grease laden vapors toward the exhaust filter bank.
 - c. The grease drain system shall be an integral part of the hood back and have a minimum 1/8" per foot slope with an exposed, removable ½ pint grease cup to facilitate cleaning.
8. The front plenum shall provide make-up air through perforated stainless steel panels.
9. All seams shall be welded and have stainless steel on exposed surfaces. Unexposed surfaces shall be constructed of aluminized steel. Perforated diffuser plates shall be included in the design, to provide even air distribution and the plenum shall be insulated to prevent condensation.
10. The hood shall be ETL Listed as "Exhaust Hood Without Exhaust Damper", NSF Listed and built in accordance with NFPA 96. The hood shall be listed for 450° F cooking surfaces at 150 CFM/ft, 600° F cooking surfaces at 200 CFM/ft, and 700° F cooking surfaces at 250 CFM/ft. Hood shall be ETL Listed as "Exhaust Hood Without Exhaust Damper". A built-in wiring chase shall be provided for outlets and electrical controls on the hood face and shall not penetrate the capture area or require an external chaseway.

- E. Rooftop Make-up Air Unit: Unit shall be epoxy coated, wired in accordance with the NEC and include the following:
1. Blower Section: Forward curved centrifugal fan, dynamically balanced wheel, double inlet-mounted on vibration isolators adjustable belt-driven motor and adjustable motor mount.
 2. Electric Pre-Heater: Electric heating unit shall be furnished as an integral part of the roof-top air handling unit completely pre-wired to the master control panel. The open coils shall be formed of high grade nickel chromium alloy wire and insulated by ceramic insulators. Furnish a two- stage heating thermostat mounted at control panel on front of hood. The complete heater shall be UL listed. Sufficient 24 volt wiring harness shall be provided to connect roof module and thermostat.
 3. Filter Section: Consisting of cleanable filters, side access and with intake hood and removable bird screen.
 4. Master Electrical Panel: 18 gauge aluminized steel casing, weatherproof, epoxy coated, mounted on blower section consisting of the following pre-wired controls: Fuses, overload relays, connectors, fan interlock relays, control transformers, wiring harness, receptacles, toggle switches, magnetic contractors, control circuit fuses, and pressure switch (prove air flow). All components shall be UL listed.
 5. Master or Main Disconnect Switch: Wired to master control panel.
 6. Galvanized welded support curb with wood nailer.
 7. UL listed fire damper.
- F. Roof-Top Supply and Exhaust Plenum: Furnish and install 18 gauge galvanized epoxy coated plenum and prefab 16 gauge galvanized roof curb 10 inches high. Plenum shall include the following:
1. Welded 16 gauge exhaust duct with expansion type joint to meet NFPA Code 96.
 2. Top curb adaptor removable for cleaning and sized to fit exhaust fan curb.
 3. Inverted supply duct collar.
 4. Access panel to electrical junction box consisting of 24 volt terminal strip to facilitate the wiring from head control panel and master control panel. The twist-lock receptacle shall be of proper voltage for the exhaust fan pig tail. Wiring harness from receptacle to master panel.
 5. Supply opening adaptable to receive the make-up air unit with matching weatherproof flanges.
- G. Exhaust Fan: Furnish and install on top of supply and exhaust plenum a vertical discharge commercial kitchen ventilator for Grease-Laden Air listed under Underwriters Classification 762 rated according to schedule on plans.
- H. Supply and Exhaust Duct: Furnish and install side-by-side supply and exhaust duct to meet NFPA Code 96-21-A-1, Item 6, and with expansion joints to meet NFPA Code 96-8, Footnote 1. Exhaust duct shall be 16 gauge, welded with 1 inch mineral wool bats reinforced wire mesh and 2 gauge galvanized steel jacket. Supply duct shall be 18 gauge galvanized riveted with expansion joints at hood collar. 24 volt conduit and greenfield of sufficient length to take coiled wire from hood to junction box in supply and exhaust plenum.
- I. Controls: In addition to the controls specified hereinbefore, provide all necessary controls to simultaneously shut down the supply and exhaust fans upon activation of the fire protection system serving the cooking area.

PART 3 - EXECUTION

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3.01 GENERAL

- A. All equipment shall be installed in strict accordance with the manufacturer's instructions.
- B. Equipment locations shall be essentially as shown on the drawings; however, actual placement of the equipment shall be verified using field measurements and data relating to the equipment approved for actual installation on this project.
- C. Contractor shall protect equipment from damage from the time of its receipt until final acceptance and shall thoroughly clean the equipment of all dirt and debris prior to requesting final inspection. Items which become damaged during the course of construction shall be repaired to "as new" condition or shall be replaced with new material or equipment components.

(END OF SECTION 15600)

SECTION 15700

AIR DISTRIBUTION SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

Provide complete duct systems as indicated. Systems shall include but not be limited to the following: outside air, exhaust air, and air conditioning supply and return ducts as shown on the drawings. Drawing scale prohibits the indication of all offsets, fittings and like items, however, these items shall be installed as required for the actual project conditions at no change in contract price. Provide all air distribution devices and terminal units as indicated on the drawings and as specified herein for a complete and operable system free from drafts and excessive noise.

1.02 APPROVAL OF MATERIALS

Refer to requirements of Section 15000 - "General Requirements for Mechanical Work".

1.03 SUBMITTALS

Refer to requirements of Section 15000 - "General Requirements for Mechanical Work". Provide data for each specified item.

1.04 DEFINITIONS

- A. Low Pressure Ductwork: Any and all ductwork conveying air or other gases at velocities less than 2,000 FPM and static pressure less than 2.0 inches w.g. This ductwork may also be referred to as "Low Velocity Ductwork".
- B. Medium Pressure Ductwork: Any and all ductwork conveying air or other gases at velocities equal to or greater than 2,000 FPM or static pressure equal to or greater than 2.0 inches w.g. This ductwork may also be referred to as "High Velocity Ductwork" or "Medium Pressure Ductwork".
- C. Indicated Ductwork Dimensions: All ductwork dimensions indicated are nominal free clearance internal dimensions which do not include insulation or internal liner thickness. It shall be the contractor's responsibility to make proper allowances in sheet metal dimensions to account for internal duct liner where applicable.

PART 2 - PRODUCTS

2.01 LOW PRESSURE SHEET METAL DUCTWORK

Low pressure sheet metal ductwork shall be constructed of galvanized sheet steel. Construction of joint connections, cross-breaking, and bracing shall conform to the latest edition of the SMACNA "Low Pressure Duct Construction Standards".

2.02 ACOUSTICAL DUCT LINER

Line all supply and return ductwork a minimum of fifteen feet from all air handling equipment unless indicated otherwise. Refer to drawings for additional lining required. Liner shall be one inch thick, one and one-half pound per cubic foot (1.5 pcf) density fiberglass duct liner with moving air stream stabilized with black pigmented neoprene. Duct liner shall comply with requirements of NFPA 90A as to flame spread and smoke development ratings. Acceptable: Manville Linacoustic or equivalent products of PPG Industries, Certain-Teed, Knauf or Owens-Corning.

2.03 PHENOLIC FOAM PRE-INSULATED DUCTWORK (alternate duct system)

- A. Material: Ductwork system materials, including the panel, adhesive, tape, sealant, flanges, and gasket to be supplied as a matched system by Knauf insulation, with the entire system listed by UL-181 standard as a Class 1 air duct. The panel shall be manufactured of CFC-free phenolic foam thermos-bonded on both sides to a factory applied .001" aluminum foil facing reinforced with a fiberglass scrim. The thermal conductivity shall be no greater than 0.13 and the density of the phenolic foam shall not be less than 3.5 pcf.
- B. Fabrication: Ductwork fabrication and installation shall be in accordance with SMACNA and current manufacturer's literature on approved fabrication methods.
- C. Closure Systems: Closure systems shall be as specified by manufacturer of the ductwork to maintain the UL Class I duct label. Provide closure of all joints using silicone and an aluminum grip profile or Tiger Connectors with 3" wide UL 181 aluminum tape in accordance with Knauf KooDuct System Design Guide. Use appropriate UL and SMACNA approved tapes.
- D. Acceptable: Knauf Koolduct system.

2.04 LOW AND MEDIUM PRESSURE SELF-SEALING SPIRAL DUCT SYSTEM

- A. All round supply, return and exhaust ductwork shall be SPIROsafe as manufactured by Lindab, Inc. or prior-approved equal products of other manufacturers. The duct system shall consist of fittings that are factory fitted with a sealing gasket and spiral duct which, when installed according to the manufacturer's instructions, will seal the duct joints without the use of duct sealer.
- B. The contractor may, at his option, convert any of all rectangular ductwork to round provided that the project space limitations are properly addressed, coordination with all other trades is successful and that the overall system design static pressure is not exceeded.
- C. Unless otherwise noted, all duct and fittings shall be G-90 galvanized steel in accordance with ASTM A-653 and A-924. When specified on contract documents, stainless steel type 304 or type 316 in accordance with ASTM A-240 shall be provided.
- D. Unless otherwise noted, all duct and fittings shall be constructed per SMACNA Duct Construction Standards (+10" w.g.) shown in the following table:

<u>Duct diameter (inches)</u>	<u>Spiral duct gage</u>	<u>Fittings (gage)</u>
3 - 14	26	24
16 - 26	24	22

28 – 36	22	20
38 – 50	20	20
52 – 60	18	18

- E. All fitting ends shall come factory-equipped with a double-lipped, U-profile, EPDM rubber gasket. Gasket shall be manufactured to gauge and flexibility so as to insure that the system will meet all of the performance criteria set forth in the manufacturer’s literature. Gasket shall be classified by UL to conform to ASTM E84-91a and NFPA-90A flame spread and smoke developed ratings of 25/50. All fitting ends shall be calibrated to manufacturer’s published dimensional tolerance standard and associated spiral duct. All fitting ends shall have rolled-over edges for added strength and rigidity. All elbows from 3”-12” diameter shall be 2-piece die stamped and continuously stitch welded. All elbows 14” diameter and larger shall be standing seam gorelock construction and internally sealed. The radius of all 90-degree and 45-degree elbows shall be 1.5 times the elbow diameter; the radius of all 15-degree, 30-degree and 60-degree elbows shall be 1.0 times the elbow diameter. All fittings that are spot welded or button punched construction shall be internally sealed. When the construction documents require divided flow fittings, only full body fittings will be accepted. The use of duct taps is unacceptable except for retrofit applications. All volume dampers shall be SPIROsafe type DRU, DSU or DTU or approved equal. Damper shall be fitting sized to slip into spiral duct. Damper shall have locking quadrant with blade position indicator, 2” sheet metal insulation stand-off, integral shaft/blade assembly, shaft-mounted load bearing bushings and gasketed shaft penetrations to minimize leakage.
- F. Spiral duct shall be calibrated to manufacturer’s published dimensional tolerance standard. All spiral duct 14” diameter and larger shall be corrugated for added strength and rigidity. Spiral seam slippage shall be prevented by means of a flat seam and a mechanically formed indentation evenly spaced along the spiral seam.
- G. Duct system performance shall meet SMACNA Leakage Class 3 requirements at system static pressures not to exceed -20” w.g. or +12” w.g.

2.05 LOW PRESSURE FLEXIBLE DUCTS

- A. Flexible duct shall consist of a zinc coated spring steel helix permanently bonded to a full interior liner to form the duct core with positive interior air seal. Core shall be covered with factory-applied one pound per cubic foot (1 pcf) density fiberglass insulation having a minimum R-value of 6.0 (tested in accordance with ASTM C-518) and sheathed in a seamless exterior Class 1 foil vapor barrier jacket with a vapor cuff on both ends.
- B. Flexible duct shall be made for use with quadrant dampered fittings suitable for sheet metal or glass fiber ductwork. Acceptable: CROWN PRODUCTS Model 3200-DS (for applications where the height of the rectangular sheet metal trunk duct to which the connection is to be made is at least 4” larger than the size of the round tap); CROWN PRODUCTS Model 3300-DS (for applications where the height of the rectangular sheet metal trunk duct to which the connection is to be made is less than 4” larger than the size of the round tap); CROWN PRODUCTS Model 624 (for 1” glass fiber ductwork) or 624-FL (for 1-1/2” glass fiber ductboard); each type shall have integral volume damper at connection to rectangular main duct branch or equivalent products. Flexible duct shall be UL 181, Class 1 air duct meeting all requirements of NFPA 90A. Flexible ductwork shall withstand a maximum positive pressure up to 6” w.g. thru 12”

diameter; 4" w.g. from 12"-20" diameter. Provide factory finished lengths not in excess of lengths required to make suitable connections with minimum pressure drop.
Acceptable: Atco Model UPC #036 or equal.

2.06 RANGE HOOD EXHAUST DUCTS

Furnish and install range hood system ducts as indicated on drawings and conforming to the following requirements. Ducts shall be fabricated from not less than 16 US gauge galvanized steel (ASTM 526). Fabricate duct in shapes, fittings, and sizes indicated and weld all seam and joints. Construct all changes in shape or direction in such a manner as to prevent the formation of any traps or pockets which might collect grease. Provide an opening in each exhaust duct at each change in direction of duct for the purposes of inspection and cleaning. Openings shall be at the sides and large enough to permit cleaning. In horizontal sections the lower edge of the opening shall be not less than one and one-half inches from bottom of the duct. Covers shall be constructed of the same material and thickness as the duct and shall be grease tight when in place.

2.07 DUCT SYSTEM ACCESSORIES

- A. General: Provide all necessary duct system accessories to assure proper balance, quiet and draftless distribution and conveyance, and minimization of turbulence, noise and pressure drop for all supply, return, exhaust and ventilation air quantities indicated. Accessories shall be recommended by their manufacturer for each specific application.
- B. Flexible Duct Connections: Provide where air handlers, fans and blowers connect to their ductwork. Shall be at least 4-inches (4") long connected on each side to metal (either metal ductwork, air handling apparatus, or heavy gauge steel sleeves), and be suitable for use in medium and/or low pressure duct systems. Provide braided copper bridge strap equal to Thompson Lightning Protection, Inc. No. 588 across each connection. Acceptable: Ventfabrics, Inc. "Ventglas Metal- edge" or prior approved equal.
- C. Low Pressure Metal Turning Vanes: Provide in all elbows, bends and tees of all low velocity supply air ducts whether or not shown in detail; provide in all elbows, bends and tees of all other low velocity ducts where portions of such ducts convey air at greater than 700 FPM average velocity. Unit to be of the permanent fixed type, having adequate rigidity and strength to be completely flutter-proof. Aluminum, or steel with corrosion resistant coating, or galvanized steel. Airfoil type in all mitered elbows, mitered bends and mitered tees. Air foil type products equal to CROWN PRODUCTS.
- D. Extractors: Provide where shown on drawings. Use in low pressure duct systems only. Shall be properly designed to deflect, proportion and direct the indicated air quantities to the branch duct and/or to the registers, grilles or other outlets without causing objectionable noise or pressure drop. Shall be multi-vented and adjustable and constructed of aluminum, or steel with corrosion resistant coating, or galvanized steel. Provide with devices for adjusting and securing the position of these deflectors.
- E. Manual Volume Dampers: (other than those specified as being integral with each register, diffuser and other air outlet or inlet): Provided in the complete air distribution system(s) (including ductwork, return air plenums, etc.) to allow complete balancing of

the air supply, return, ventilation and exhaust system(s). Dampers shall be single-blade type up to 12" height and opposed-blade type for dampers larger than 12" height. Dampers shall be made of galvanized steel, or steel with a sprayed or dipped aluminum rust resistant finish and be flutter-proof. Provide operators so that all damper adjustment can be made from outside the completed ductwork without necessity for puncturing or otherwise penetrating the ductwork and/or its vapor barrier and which are fully adjustable and with locking device provided at a point in the ductwork which is a sufficient distance upstream from an outlet (or downstream from an inlet) to attenuate objectionable noise due to damper throttling and to preclude adverse effects on the distribution characteristics (throw, drop, pattern, etc.) of the air distribution device; use in low pressure duct systems only. Based upon location of the duct in which the damper is to be installed, provide the following types of operators: Dampers in ducts which are exposed or located above lay-in or accessible ceilings shall be equipped with balancing dampers have operators located at the damper neck; dampers in ducts that are concealed above plaster/gypsum ceilings or behind other inaccessible construction shall be equipped with remote damper operators equal to Bowden Model #270-301. Remote damper operators shall be located in the ceiling/wall as close to the damper as practical or possible and shall be accessible from the space. Dampers shall be equal to Ruskin MD25 or MD35.

F. Fire Dampers: Provide dynamic fire dampers where indicated on drawings and/or where otherwise necessary. Fire dampers shall be UL labeled clustered blade type, dynamic, spring actuated, for horizontal or vertical mounting as required. Damper blades shall be held in position by a 165 degree F fusible link. Damper sleeves shall be 24-gauge minimum and all other details of installation shall comply with the UL installation data sheets furnished with the dampers. Openings between the fire damper sleeves and the wall or floor openings shall be filled with fiberglass batting to prevent sound flanking. Cluster blades shall completely outside air stream for all duct systems (Style B). Acceptable: Ruskin Models DIBD2 (square and rectangular) or FDR25 (round); equal products of other manufacturers may be submitted for review.

G. Low Pressure Duct Access Doors: Provided for each manual and motorized damper; fire damper; electric duct heater; and where access is otherwise necessary. Factory prefabricated double wall insulated type of 24-gauge galvanized steel (of same or thicker gauge than ductwork panel in which installed, whichever is greater. Minimum size shall be as large as is compatible with duct size but in no case less than the following (provide larger sizes if necessary to permit proper access operation):

Maximum Duct Dimensions	Access Door Size
11" and less	Maximum duct dimension x 12"
12" through 16"	12 x 16"
17" and over	16 x 24"

Doors shall be provided with hand operated adjustable tension catches and shall be completely gasketed around their perimeters. Doors shall be equal to Ruskin ADC24 or equal SMACNA approved access door.

H. Test Openings: Furnish and install gasketed capped test openings for test equipment (pitot tubes, etc.) on the entering and leaving sides of air handling units and other air handling equipment and heating coils. Test openings shall be Young Regulator No. 1110 or equivalent product by Ventlok.

2.08 AIR DISTRIBUTION SYSTEM

A. General:

1. Scope: Provide all air distribution devices as indicated on the drawings and as specified herein for a complete and operable system free from drafts and excessive noise.
2. Relation to Other Work: Coordinate with work of the ceiling, drywall and plastering trades as required to insure an orderly progression of work and first class finished system with respect to placement, alignment, finish and general fit.
3. Design Conditions:
 - a. Acoustical: Noise produced at each diffuser, register, grille, or other air distribution device shall not exceed a noise criteria level of NC 32 based on sound pressure levels in db re 0.0002 microbars unless otherwise indicated. Coordinate air distribution devices, sound attenuation measures, and equipment actually provided to insure that these design goals are not exceeded by the system installed.
 - b. Pressure drop across any air distribution device shall not exceed 0.15 in w.g. static pressure unless otherwise indicated.
 - c. Guaranty: Air distribution equipment shall be guaranteed by the manufacturer to operate without excessive noise and with velocities in the five foot occupancy zone, when handling air with temperature differentials as high as 25 degrees, not to exceed 30 fpm at a 2 degree difference, 50 fpm at 1-1/2 degree difference, or 75 fpm at a 1 degree difference when operating with an average 75 degree room temperature and measured no closer than 6 inches from a wall surface.
4. Shop Drawings: Refer to the requirements of Section 15000 - "General Requirements for Mechanical Work". Include complete data on proposed sizes, noise levels, pressure drops, air flow quantities, throw, finishes, and accessory devices including mounting frames completely dimensioned. The data shall be in the form of catalog engineering data sheets and a complete schedule worked up by room numbers.
5. Manufacturer: Titus, MetalAire, Carnes, Krueger, Anemostat or Tuttle & Bailey. Manufacturers model numbers indicated are examples of products to be provided.
6. Manufacturers must be members of the Air Distribution Council unless otherwise indicated.
7. All air distribution devices shall be constructed of extruded aluminum unless otherwise indicated.
8. Where continuous linear supply and return devices are shown as abutting one another in a single direction, then the total unbroken visible length of the linear supply/return device shall equal the sum of the nominal lengths of the abutting devices.
9. Each air distribution device which has a portion thereof (frame, core, etc.) exposed to view in the finished area shall have a factory applied finish which matches and is compatible with the color of the surrounding surface on which the device is installed. Colors must be approved by Architect prior to device fabrication.
10. All dampers, blank-off baffles and other companion devices which form an integral part of an air distribution device shall be factory made items produced by the manufacturer of the air distribution device.
11. Air diffusion pattern shall be as indicated on the drawings.

12. Manufacturers, model numbers and sizes used as the basis for design are indicated on the mechanical drawings.

PART 3 - EXECUTION

3.01 DUCTWORK

- A. General: Construct all ductwork and accessories in accordance with latest editions of applicable SMACNA Manuals. Streamline all ductwork to the full extent practical and equip with proper and adequate devices to assure proper balance and quiet draftless distribution of indicated air quantities. Protect all ductwork and system accessories from damage during construction until Architect's final acceptance of project. Prior to ductwork fabrication, verify if all ductwork as dimensioned and generally shown will satisfactorily fit allocated spaces. Take precautions to avoid space interference with beams, columns, joists, pipes, lights, conduit, other ducts, equipment, etc. Notify Architect if any spatial conflicts exist, and then obtain Architect's approval of necessary routing. Make any such necessary revisions which are minor at no additional cost. Carefully correlate all duct connections to air handling units and fans to provide proper connections, elbows and bends which minimize noise and pressure drop. Provide all curved elbows with radius ratios of not less than 1.5 unless otherwise shown or approved by Architect. Provide all mitered elbows with turning vanes. Coordinate any and all dimensions at interfaces of dissimilar type of ductwork and at interfaces of ductwork with equipment so that proper overlaps, interfaces, etc., of insulation and continuity of vapor barriers are maintained. If necessary, where interfacing different types of insulation provide transitions so that internal free area of duct remains unchanged. Install horizontal rigid ductwork as high as practical above suspended ceilings so that movable light fixtures may be relocated without interference to meet any future partition relocation requirements.
- B. Hangers and Supports:
 1. Hangers:
 - a. Sheet metal duct hangers: Support ducts from the building structure with galvanized steel hangers to each side of the duct. Hangers for duct to 60-in. shall be 1" x 1/8" galvanized steel band. Space hangers approximately 8- ft. (8') along the length of duct. Hangers shall extend down the side of duct and turn under. Shall be secured to duct by two or more #14 sheet metal screws. Where sprayed fire-proofing occurs, install hangers before application of such treatment and withhold installation of ducts until after application.
 - b. Fiberglass Duct Hangers: Support glass fiber duct from the building structure with 3/4-in. perforated 24 gauge steel straps or #12 wire, securely anchored to structure above and to a 2" x 1" x 1" 24 gauge steel angle, or equivalent, cross support under the duct. Space hangers at all turns and transitions, at not more than eight foot (8') centers on straight runs, and elsewhere as necessary to maintain true alignment.
 - c. Phenolic foam Duct Hangers: Support Phenolic foam duct from the building structure with 1-in. perforated 22 gauge steel straps or #12 wire, securely anchored to structure above and to a 2" x 1" x 1" 22 gauge steel angle, or equivalent, cross support under the duct. Space hangers at all turns and transitions, at not more than eight foot (8') centers on straight runs, and elsewhere as necessary to maintain true alignment in

accordance with Knauf KoolDuct design guide.

2. Supports: Vertical risers and other duct runs where the method of support specified above is not applicable shall be supported by substantial angle brackets designed to meet field conditions and installed to allow for duct expansion.
 3. Fasteners: Secure hangers to steel beams or metal deck with beam clamps or drop through connections from the metal or concrete deck.
- C. Acoustical Duct Liner: Liner shall be attached to the sheet metal ducts using a full coverage coat of Foster's 85-20 adhesive and mechanical fasteners applied as follows. On horizontal ducts, install mechanical fasteners on underside of the tops of ducts over twelve inches (12") in width and on the insides of ducts over sixteen inches (16") in height. On vertical ducts, install mechanical fasteners on all duct surfaces exceeding twelve inches (12"). Install fasteners within two inches (2") of the leading edge of each duct section and within three inches (3") of the leading edge of cross joints in insulation within any given duct section. Pins shall thereafter be spaced at not more than fifteen inches (15") on centers. Pins shall be installed in strict accordance with manufacturer's instructions. All exposed edges and the leading edge of all cross joints of liner shall be coated with Foster's 30-36.
- D. Flexible Duct: Make connections from all types of medium pressure ductwork to terminal units (variable volume boxes, fan terminal units, etc.) with appropriate lengths of medium pressure flexible duct unless other type at connection is indicated. Install all flexible round duct without kinks or similar obstructions so that pressure drop is minimized. Cut and remove excess lengths as necessary.
- E. Insulated Duct: Where ducts will be insulated, make provision for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. A metal collar equivalent in depth to insulation thickness and of suitable size to which insulation may be finished shall be mounted on duct.
- F. Wall and Floor Openings: All openings in floor slabs and partitions through which ducts pass shall be filled tightly with mineral or glass wool batting.
- G. Range Hood Exhaust Ducts: Installation shall comply with requirements of NFPA 96. Maintain eighteen inches (18") clearance between exhaust duct and combustible materials.
- H. Change in Shape or Dimension: Where duct size or shape is changed to effect a change in area, the following shall apply:
1. Where the area at the end of the transformation results in an increase in area over that at the beginning, the slope of the transformation shall not exceed one inch in seven inches.
 2. Where the area at the end of the transformation results in a decrease in area from that at the beginning, the slope of the transformation may be one inch in four inches, but one inch in seven inches is preferable, space permitting.
 3. The angle of transformation at connections to heating coils or other equipment shall not exceed thirty degrees from a line parallel to the air flow on the entering side of the equipment, nor fifteen degrees on the leaving side. The angle of approach may be increased to suit limited space conditions when the

- transformation is provided with vanes approved by the Architect.
4. All changes in shape or dimension must be approved by Engineer before installation of duct.
- J. Changes in Direction: Changes in direction shall be basically as indicated on the drawings and the following shall apply:
1. Supply duct turns of ninety degrees in low pressure duct shall be made with mitered elbows fitted with closely spaced turning vanes designed for maintaining a constant velocity through the elbow.
 2. Return and exhaust duct turns of ninety degrees in low pressure duct shall be made with mitered elbows, as specified hereinbefore, for supply ducts, unless radius elbows are indicated in which case they shall be vaned and constructed with a throat radius three-quarters the duct width and a full radius heel.
 3. Tees in low pressure duct shall conform to the design requirements specified hereinbefore for elbows.
 4. Branch take-offs in low pressure duct shall be made with extractors or splitter dampers, as indicated, in square take offs.
 5. Branch take-offs in high pressure duct shall be made with conical taps.
- K. Phenolic foam duct system: The contractor responsible for the fabrication and installation of phenolic foam pre-insulated ductwork shall be authorized by Knauf Insulation to fabricate and install ductwork system. All ductwork shall adhere strictly to the Knauf KoolDuct System Design Guide.
- L. Other Requirements:
1. Do not use sound attenuating acoustically lined ductwork, fiberglass ductwork or any fiberglass turning vanes in the following applications:
 - a. Exhaust and/or ventilation ductwork where airborne moisture or other vapors may cause damage to the duct system.
 - b. Exhaust duct systems for range hoods, dishwasher hoods, paint spray booths and similar situations.
 2. If ductwork materials are installed which do not meet these specifications, Contractor shall remove such ductwork materials and replace them with the specified materials. Any delay in job progress will be the responsibility of the Contractor.
 3. Properly install all control related devices which are part of the duct systems. See Section(s) describing control systems.
- M. Application:
1. Interior Concealed Supply and Return Low Pressure Ductwork: Sheet Metal.
 2. Interior Exposed Supply and Return Low Pressure Ductwork: Sheet Metal.
 3. Exterior Supply and Return Low Pressure Ductwork: Sheet Metal.
 4. Outside Air and Exhaust Ductwork: Sheet Metal.

3.02 AIR DISTRIBUTION DEVICES

- A. General: Install neatly where indicated in accord with manufacturer's recommendations and in accord with SMACNA recommendations and as otherwise indicated. Properly test, balance and adjust to produce quiet, draftless operation to best degree possible. Coordinate the installation of the air distribution equipment with related work and finishing of adjacent surfaces to prevent damage to the devices or adjacent finishes.

Protect the finish of all air distribution equipment until final acceptance. Replace or repair to the Architect's satisfaction any damaged equipment.

- B. Diffusers: Where diffusers are the lay-in type, they shall be supported by the inverted T-bar suspension system but all ducts connected thereto shall be supported independently of the ceiling. Surface mounted diffusers shall be supported by the duct runouts or drops where rigid ducts are indicated and by separate hangers where flex runouts are indicated. All ceiling diffusers shall be installed with their lines parallel and perpendicular to the building line and properly aligned with the ceiling.
- C. Grilles and Registers: Mount securely to the duct system flanges using finish screws and in accordance with accepted good practice.
- D. Ceiling Mounted Exhaust and Return Air Registers/Grilles: Mount as specified hereinbefore for surface mounted ceiling diffusers except use finished screws provided and secure to duct and finished ceiling (or finished ceiling for nonducted returns) in accordance with the manufacturer's instructions. Where required to provide adequate support for nonducted registers or grilles, provide appropriate mounting frame for incorporation into the ceiling system.

(END OF SECTION 15700)

SECTION 15900

TEST AND BALANCE OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. General Contractor shall obtain services of a test and balance agency that specializes in and whose business is limited to the testing and balancing of air conditioning systems and is a true third party of the mechanical contractor. Test and Balance agency shall not be contracted by the Mechanical contractor. The agency selected shall be a fully Certified Member of the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau. (NEBB)
- B. Testing and balancing shall be performed in complete accordance with the latest edition of the AABC Standards for Field Measurement & Instrumentations, as published by the Associated Air Balance Council or latest edition of NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.
- C. Instruments used for testing and balancing of sound, vibration and air systems must have been calibrated within a period of six months prior to balancing. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration.
- D. One (1) copy of the initial data shall be submitted directly to the Engineer for his evaluation and approval. When this approval is given, three (3) copies of the completed test reports shall be submitted to the Engineer prior to final inspection of the Project. These three (3) copies shall be returned to the Contractor for placing in the portfolios outlined in Section 15950 - "System Completion". The report format shall follow the standard format and information as recommended by AABC.
- E. Name of Test and Balance Agency shall be submitted to the Engineer for approval within 20-days after receipt of contract. Contractor shall furnish to balancing agency a complete set of plans and specifications and an approved copy of all equipment submittal data, and shop drawings. Test and balance agency shall notify Engineer of any additional required test cock locations, balancing damper locations, etc. within 30-days after approval of the agency. Any additional balancing devices required by the Test and Balance Agency after this period will be installed at no expense to the Owner by the Contractor.
- F. Test and Balance Agency shall include an extended warranty of 90-days, after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck or resetting of any items included in the air distribution systems. The agency shall provide technicians to assist the Engineer in making any test he may require during this period of time.
- G. The Test and Balance Agency shall furnish the Engineer and Owner a standard "National Project Certification Performance Guaranty."
- H. Subcontractor shall provide sufficient time before the substantial completion date so that tests and balancing can be accomplished. Test and Balance Agency shall accompany the Engineers on four (4) site visits to insure that balancing devices are installed so that each system can be properly balanced.

1.02 CONTRACTOR COOPERATION

- A. The General Contractor and Mechanical Contractor shall cooperate with the Test and Balance Agency in the following manner:
 - 1. Provide immediate labor and tools to make corrections when required without undue delay.
 - 2. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing. All dampers shall be left 100% open.
 - 3. Install final filters in accordance with Section 15950 - "System Completion" and assure cleanliness.
 - 4. Test and Balance Agency shall be kept informed of any major changes made to system during construction which will affect test and balance.
 - 5. Contractor shall include the costs of dampers, pulleys and belt changes in his contract.

- B. Control system contractor shall certify in writing that all control systems have been calibrated. They shall also furnish necessary operating personnel for testing and balancing of control operation and set points to satisfy the Engineer's requirement that all controls are functioning properly.

1.03 FINAL TESTS, INSPECTION, AND ACCEPTANCE

- A. Capacity and Performance Tests: Make tests to demonstrate that capacities and general performance of air distribution systems comply with contract requirements.
 - 1. Final Inspection: At the time of final inspection, the Contractor shall recheck, in the presence of the Engineer, random selections of data including water and air quantities and flow rates, air motion and sound levels as recorded in the certified report.
 - 2. Measurement and Test Procedures: As approved for work forming basis of certified report.
 - 3. Selections for Recheck (specific plus random): In general, selections for recheck will not exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

- B. Retests: If random tests reveals measured flow deviation of ten percent or more from, or a sound level of 2 dB or more, greater than that recorded in the certified report listings, at ten percent or more of the rechecked locations, the report shall be automatically rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new certified reports submitted, and new inspection tests made.

- C. Marking of Settings: Following final acceptance of certified reports by the Engineer, the settings of all splitters, dampers and other adjustment devices shall be permanently marked by the Contractor, so that adjustment can be restored if disturbed at any time. Do not mark devices until after final acceptance.

- D. Contractor to provide adequate closure for all test holes made in ductwork and equipment to accomplish test and balance.

PART 2 - EXECUTION

2.01 TEST AND BALANCE PROCEDURE

Test and Balance of entire HVAC systems in accordance with latest AABC or NEBB Standards. In addition, refer to requirements of Section 15950 - "System Completion." The report shall indicate the location on a plan of each measurement as documented in the report.

- A. Air moving equipment: Data sheets in accordance with AABC shall be submitted for each piece of air moving equipment.
 - 1. Total cfm for supply return and outside air ducts where applicable shall be tested by traversing each duct and record the data on the air moving equipment data sheet and duct traverse data sheet.
 - 2. Static pressure profile shall be taken and recorded on the static pressure profile sheet for all modular air moving equipment.
 - 3. Direct expansion cooling coil shall be tested and recorded on the direct expansion cooling coil data sheet.
 - 4. Direct expansion heating coil in the heat pump mode shall be tested and recorded on the direct expansion heating coil data sheet.
 - 5. Electric unit or duct heater shall be tested and recorded on the electric heater data sheet.
 - 6. Chilled water cooling coil shall be tested and recorded on the cooling coil data sheet.
 - 7. Hot water heating coil shall be tested and recorded on the heating coil data sheet.
 - 8. Air distribution devices shall be tested and recorded on the air distribution data sheet.
 - a. Ceiling air devices shall be tested with a calibrated captive hood where possible.
 - b. Air devices such as (slot diffusers and bar grilles) may be tested with a calibrated deflecting vane anemometer.
 - c. Air devices such as supply / return grilles and hoods may be tested with rotating vane anemometer.
 - 9. Air moving equipment fan data shall be tested and recorded on the air moving equipment data sheet.
 - a. Each fan 5HP or greater shall include a manufacturer's fan curve indicating the field tested system curve.
 - b. Each fan less than 5HP shall include, at the minimum, the field tested data indicated on the manufacturer's fan table sheet.

- B. Kitchen Systems:
 - 1. Test, adjust and balance each exhaust and make up air fan and record data on the fan data sheet.
 - 2. Calculate and record exhaust airflow through face of hood in accordance with AABC guidelines.
 - 3. Smoke machine shall be used to evaluate hood system and kitchen pressure with respect to non-kitchen spaces.

2.02 VIBRATION TESTING

- A. The Test and Balance Agency shall make vibration tests on all rotating equipment specified in Section 15600 of the project specifications.

- B. Test shall be taken in general on top and side of each bearing, two points on equipment housing, and base 90 degrees apart, and on duct or pipe after the flexible connection. Each point shall be read in mils of deflection, then compared with allowable tolerance for the respective unit of equipment and recorded on the proper AABC or NEBB form. Where vibration readings deviate from normal, a separate report shall be forwarded to the Engineer with recommended action to be taken (i.e., a dynamic and static field balance performed by a specialist, recommendation that surrounding structure be tested for other source of vibration, etc.)

2.04 SOUND TESTING

The test and balance agency shall document the sound power levels throughout the facility including equipment rooms and occupied spaces. Sound power measurements shall be taken across all major octave band center frequencies and recorded on a NC level chart.

(END OF SECTION 15900)

SECTION 15950

MECHANICAL SYSTEMS COMPLETION

PART 1 - GENERAL

1.01 INSTRUCTIONS

Contractor shall coordinate the work of all sections pertaining to mechanical system installation and insure that it is accomplished in a timely and proper manner. Prior to requesting Substantial Completion inspection, the Contractor shall provide the Engineer with a letter stating that the requirements of this section have been met. The letter shall contain an itemized list indicating that each item has been personally checked by the Superintendent and that it is ready for inspection. With letter, provide reports, schedules, etc. as required. This section is intended as a checklist for the Contractor to insure that items specified are properly installed and to insure that a premature Substantial Completion Inspection is not requested.

PART 2 - EXECUTION

2.01 PERFORMANCE

- A. Check air distribution systems and insure that systems are properly tested and balanced. Cooperate with Test and Balance Agency.
- B. Install new air filters of the correct sizes and types in all air handling equipment prior to substantial completion inspection.
- C. Lubricate fans, motors, etc. Provide a schedule listing each piece of equipment requiring lubrication, the points to be lubricated, the product and device to be used, and the frequency of lubrication required.
- D. Provide for a check of instrumentation. Check the installation of air filter gauges, water pressure gauges and cocks, gauge connection points, gauge manifolds on pumps, thermometers, thermometer wells, pitot traverse stations, and flow measuring devices. The check shall include location of point of reading, to be certain the device is accurately measuring what it is intended to measure, scale ranges of gauges and thermometers, proper positioning of instrument to allow reading from convenient location and insure all instruments are properly calibrated.
- E. Provide analysis of chilled, hot and condenser water after cleaning and degreasing. Temporary start-up strainers shall be utilized in each system to insure that each system is properly and thoroughly cleaned. Insure temporary strainers are removed.
- F. Check all refrigeration systems. Insure that each system has proper refrigerant, is properly charged and is adjusted to the proper operating charge for the temperature and load conditions. Check to insure that the system is not contaminated with moisture. Provide factory start-up report of chillers; report shall be signed by manufacturer's representative performing the start-up.
- G. Check and insure that all equipment is properly installed, mounted as specified and in

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accordance with manufacturer's recommendation. At the time of equipment start-up insure that control, power wiring, and interlocks are complete. Check the alignment of motors and drives. Verify that overload heaters are properly sized. Check motor rotation.

- H. Provide coordination with work under Controls Section to have control diagrams and sequences of operation corrected to "as-built" condition, reflecting changes brought about by contract modification and to changes to make the installed system control as intended by the Engineer. These latter changes may be required when the system is formally checked throughout its full range and set points are verified by the Engineer.
- I. Provide System Identification as specified. Coordinate labeling of control instruments with functional designations on the drawings and in the sequences, install corresponding nameplates on each instrument.
- J. Provide check out of safety and operation controls. This shall include a systematic check out of safety controls of equipment along with operational check of associated control sequences such as emergency by-passes of equipment, cooling tower fan cycling, factory mounted controls, relief valve, etc.
- K. Provide for a thorough cleaning of the installation. This shall include removing temporary covers, removal of adhesive applied stickers except those giving specific maintenance instructions which were intended to remain on the equipment, remove cord and wire affixed tags, clean paint spatters, clean coating and adhesive spatters, and vacuum inside of AHU's plenums and control cabinets.
- L. Provide for touch-up painting of factory finished equipment. Touch-up painting is intended to cover minor dents, scratches, etc. Surface shall be prepared by light sanding or derusting with chemical compounds such as naval jelly, then coated with a compatible primer and followed by a matching top coat. Where major damage has occurred or equipment is deeply or widely rusted, the entire piece shall be refinished as directed by the Engineer.
- M. Provide for the preparation of four (4) portfolios containing operational, installation, and maintenance data for each system. Portfolios shall be organized in a 3-part format using 3-ring binders. Part 1 - General; Provide data on installing Contractor, with principal Subcontractors and equipment suppliers, including home address, telephone numbers, and special telephone numbers for service departments on normal and emergency call basis. Include copies of certificates issued for the building system, letter of Contractor work guarantee and dates of coverage (to be provided after final inspection and acceptance of work), letter of Contractor providing operating instructions to the Owner's personnel, and copies of start-up reports. Part 2 - Operating Instructions; Provide narrative description of system start-stop procedures, seasonal changeover, and routine maintenance. Include valve tag schedule and diagrams, and piping identification legend, as color code and abbreviation. Part 3 - Maintenance Instructions; Provide copies of the manufacturer's maintenance instructions along with approved shop drawings of the specific equipment and complete parts list. On packaged equipment, provide a bill of materials with purchase order numbers for the supplier's identification of equipment orders. Provide lubrication schedule and charts, water treatment data and Test and Balance Report.

1. SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section.

a) Package Quality:

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

b) Package Content:

Data package content shall be as shown in the paragraph titled "INFORMATION REQUIRED IN O&M DATA PACKAGES." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission.

c) Changes to Submittals:

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

2. INFORMATION REQUIRED IN O&M DATA PACKAGE

a) Operating Instructions

b) Safety Precautions

c) Operator Prestart

d) Preventive Maintenance Instructions

e) Troubleshooting Guides and Diagnostic Techniques

f) Wiring Diagrams and Control Diagrams

g) Maintenance and Repair Procedures

h) Spare Parts and Supply Lists

i) Appendices

i. Parts Identification

ii. Warranty Information:

- 1) Include warranty information for primary components such as the compressor of air conditioning system.

iii. Contractor Information:

- 1) Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system.

- N. Provide for formal instruction session to instruct Owner's operating personnel in the system's operation; these sessions shall be in a class room setting. The Contractor shall also provide for an orientation tour of the facility to properly instruct the operating personnel. The Contractor shall obtain a receipt from the Owner's Representative stating that operating instructions have been completed. Include letter of operating instructions described in section 15000 - "General Requirements for Mechanical Work" and the receipt in the portfolio after final inspection and acceptance of work has taken place. Provide As-Built Drawings before requesting a

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final inspection.

(END OF SECTION 15950)

SECTION 16010

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selecting products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. See other Division 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

- D. **Manufacturer's Warranty:** Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. **Special Warranty:** Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- F. **Substitution Requests:** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. **Substitution Request Form:** Use CSI Form 13.1A.
 - 2. **Documentation:** Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 - 3. **Engineer's Action:** If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of

proposed substitution within **15** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.

- a. Form of Acceptance: Written Notification.
- b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.

1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered.
5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

7. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Substitutions **may** be considered.
8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Engineer will consider requests for substitution if received within **60** days after **commencement of the Work**. Requests received after that time may be considered or rejected at discretion of Engineer.
- B. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
 5. Samples, if requested.

END OF SECTION 16010

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Common electrical installation requirements.
 - 5. Additional work.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Plastic. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 ADDITIONAL WORK

- B. Contractor shall include as part of the base bid allowance for providing additional electrical work as may be required on this project and as itemized below:
 - (1) Exit signs (Type "E").
 - (2) Type "D1" fixtures.
 - (2) Type "D2" fixtures.
 - (2) Duplex receptacles.
 - (2) Data outlets.
 - (2) Single pole toggle switches.
 - (1) Fire alarm/speaker/light.
 - (1) Fire alarm pull stations.
 - (1) Heat detectors.

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- C. Allowance shall include all cost for required wires and conduits, fittings, support, connections, boxes, accessories, all costs for purchase, transportation, and installation of additional electrical work. General contractor's insurance, bond, overhead and profit shall be included in the base bid. Location of lighting fixtures, and devices as directed by architect/engineer.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION 16050

SECTION 16060

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: 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 (6 mm) 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 (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory 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, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

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. Bury at least 24 inches (600 mm) below grade.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. 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. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- B. 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.
- C. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.
- D. 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.
- E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a **1/4-by-2-by-12-inch (6-by-50-by-300-mm)** grounding bus.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Metal 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.

3.3 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 Rods: Drive rods until tops are **2 inches (50 mm)** 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.

- C. 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 so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

- D. 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, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, 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.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
 - a. Measure ground resistance not less 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.

- B. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 2 ohms.
 - 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 2 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 2 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 2 ohm(s).

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16072

ELECTRICAL SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of five times the applied force.
- B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.
 - 1. Available Manufacturers:
 - a. Cooper B-Line; a division of Cooper Industries.
 - b. ERICO International Corporation.
 - c. Allied Support Systems; Power-Strut Unit.
 - d. GS Metals Corp.
 - e. Michigan Hanger Co., Inc.; O-Strut Div.
 - f. National Pipe Hanger Corp.
 - g. Thomas & Betts Corporation.
 - h. Unistrut; Tyco International, Ltd.
 - i. Wesanco, Inc.
 - 2. Channel Dimensions: Selected for structural loading.

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- C. Raceway and Cable Supports: As described in NECA 1.
- 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. 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. Available Manufacturers:
 - 1) Cooper B-Line; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Construction Products.
 - 5) MKT Fastening, LLC.
 - 2. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
 - 5. Toggle Bolts: All-steel springhead type.
 - 6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems, unless requirements in this Section or applicable Code are stricter.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 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 (90 kg).
- 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. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
- 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. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.
- B. Construct concrete bases of dimensions indicated but not less than **4 inches (100 mm)** larger in both directions than supported unit, and so expansion anchors will be a minimum of 10 bolt diameters from edge of the base.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch (450-mm)** centers around full perimeter of the base.
 - 2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 6. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete member.

END OF SECTION 16072

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Equipment identification labels.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

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- 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: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. **1/4-inch (6.4-mm)** grommets in corners for mounting. Nominal size, **7 by 10 inches (180 by 250 mm)**.
- D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with **0.0396-inch (1-mm)** galvanized-steel backing; and with colors, legend, and size required for application. **1/4-inch (6.4-mm)** grommets in corners for mounting. Nominal size, **10 by 14 inches (250 by 360 mm)**.
- E. Fasteners for Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
- F. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR **36 INCHES (915 mm)**."

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. 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 (10 mm)**.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 - 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with **1/2-inch- (13-mm-)** high letters on **1-1/2-inch- (38-mm-)** high label; where 2 lines of text are required, use labels **2 inches (50 mm)** high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
 2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Electrical switchgear and switchboards.
 - c. Transformers.
 - d. Disconnect switches.
 - e. Enclosed circuit breakers.
 - f. Motor starters.
 - g. Push-button stations.
 - h. Power transfer equipment.
 - i. Contactors.

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.

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- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - 1. Color shall be factory applied.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.

END OF SECTION 16075

SECTION 16120

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Available Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.

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- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN and SO complying with NEMA WC 5 or 7.

2.3 CONNECTORS AND SPLICES

- A. Available Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. O-Z/Gedney; EGS Electrical Group LLC.
 - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- I. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. 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.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements.
- G. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least **12 inches (300 mm)** of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

END OF SECTION 16120

SECTION 16130

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
- C. See Division 16 Section "Seismic Controls for Electrical Work" for bracing of raceways, boxes, enclosures, and cabinets.
- D. See Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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

2.2 METAL CONDUIT AND TUBING

A. Available Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflec Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type.

F. FMC: Aluminum.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arcco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiraldut, Inc./AFC Cable Systems, Inc.

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13. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

2.4 METAL WIREWAYS

- A. Available Manufacturers:
 1. Hoffman.
 2. Square D.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.
- C. Fittings and Accessories: Include 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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. Emerson/General Signal; Appleton Electric Company.
 3. Erickson Electrical Equipment Co.
 4. Hoffman.
 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 6. O-Z/Gedney; Unit of General Signal.
 7. RACO; Division of Hubbell, Inc.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Scott Fetzer Co.; Adalet-PLM Division.
 10. Spring City Electrical Manufacturing Co.
 11. Thomas & Betts Corporation.
 12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

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- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Under Aluminum Canopy: ARC
 - 3. Concealed: Rigid steel or IMC.
 - 4. Underground, Single Run: RNC.
 - 5. Underground, Grouped: RNC.
 - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 7. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
 - 1. Exposed: EMT.

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2. Concealed: EMT.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: **1/2-inch trade size (DN 16)**.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- 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 embedded in or in contact with concrete.

3.2 INSTALLATION

- A. Keep raceways at least **6 inches (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least **2 inches (50 mm)** of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than **1-inch trade size (DN 27)** parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than **200-lb (90-kg)** tensile strength. Leave at least **12 inches (300 mm)** of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, **2-Inch Trade Size (DN 53)** and Smaller: In addition to above requirements, install raceways in maximum lengths of **150 feet (45 m)** and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-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 at the following points:

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1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used **6 inches (150 mm)** above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of **72 inches (1830 mm)** of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, and ground-fault circuit interrupters.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.

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- e. Pass & Seymour/Legrand; Wiring Devices Div.
- f.

2. Floor Service Outlets:

- a. Hubbell Incorporated; Wiring Device-Kellems.

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a **2-3/4-inch- (70-mm-)** deep outlet box without an adapter.

2.3 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 - 1. Switch: 20 A, 120/277-V ac.
 - 2. Receptacle: NEMA WD 6, Configuration 5-15R.
- D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 - 1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
 - 2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and **5-inch (130-mm)** wire connecting leads.
 - 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 10 percent of full brightness.

2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.

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2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 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 with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, white finish, unless otherwise indicated.

2.6 FINISHES

- A. Color:
 1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging.
- C. Install unshared neutral conductors on line and load side of dimmers.
- D. 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.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification."

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1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 16140

SECTION 16289

SURGE PROTECTIVE DEVICES

Part 1 - GENERAL

1.1 This section describes the materials and installation requirements for Surge Protective Devices (SPDs), formerly TVSS, for the protection of AC electrical circuits.

1.2 STANDARDS - Most Recent Editions of:

- A. Underwriters Laboratories: UL1449 and UL 1283
- B. ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002
- C. National Electrical Code: Article 285
- D. NEMA LS-1 (rescinded Aug 19, 2009, replacement undetermined)

1.3 LISTING REQUIREMENTS

- A. SPD shall bear the UL Mark and shall be Listed to most recent editions of UL 1449 and UL 1283. "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification.
- B. SPD and performance parameters shall be posted at www.UL.com under Category Code: VZCA. Products or parameters without posting at UL.com shall not be approved. (To access UL Category Code VZCA click on Certifications on the upper right of UL's home page. Type VZCA into the Category Code search box and click Search.)

1.4 SUBMITTAL REQUIREMENTS

- A. Submittals shall include UL 1449 Listing documentation verifying:
 - 1. Short Circuit Current Rating (SCCR)
 - 2. Voltage Protection Ratings (VPRs) for all modes
 - 3. Maximum Continuous Operating Voltage rating (MCOV)
 - 4. I-nominal rating (I-n)
 - 5. Type 1 Device Listing
- B. Submittals shall include shop drawings including the manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure,

internal wiring diagram illustrating all modes of protection in each type of SPD required, wiring diagram showing all field connections and manufacturer’s recommended wire and breaker sizes.

- C. Upon request, an unencapsulated but complete SPD shall be presented for visual inspection; proprietary technology included. MOV type & quantity shall reflect kA ratings on cutsheets, verification of diagnostic monitoring, thermal & overcurrent protection, etc.
- D. Minimum of five (5) year warranty.

Part 2 – PRODUCTS

- A. Subject to compliance, the following manufacturers are acceptable:
 - 1. Advanced Protection Technologies or approved equal.
- B. SPD shall be UL labeled with 100 kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.
- C. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
- D. SPD shall be UL labeled with 20 kA Inominal (I-n), which is verifiable at UL.com, for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
- E. Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30 mm diameter.
- F. Minimum surge current capability (single pulse rated) per phase shall be:
 - Service Entrance, Transfer Switch, Emergency System Switchboard: 300 kA
 - Distribution and Emergency System Distribution Panelboards & MCC: 200 kA
 - Branch and Emergency System Branch Panelboards: 100 kA
- G. SPD shall provide surge current paths for all modes of protection: L-N, L-G, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
- H. UL 1449 Third Edition Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

<u>System Voltage</u>	<u>L-N</u>	<u>L-G</u>	<u>L-L</u>	<u>N-G</u>
208Y/120	700 V	700 V	1200 V	700 V
480Y/277	1200 V	1200 V	2000 V	1200 V

I. UL 1449 Third Edition Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

<u>System Voltage</u>	<u>Allowable System Voltage Fluctuation (%)</u>	<u>MCOV</u>
208Y/120	25%	150V
480Y/277	15%	320V

- J. SPD shall include a serviceable, replaceable module.
- K. SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of -50 dB at 100 kHz.
- L. SPD shall include visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED. SPD shall include an audible alarm with on/off silence function and diagnostic test function (excluding branch).
- M. OPTIONS (select as appropriate per project):
 - 1. SPD shall be provided with surge event counter with back up power source.
 - 2. SPD shall be provided with integral disconnect switch when 3-pole breaker is not available for connecting the SPD.

Part 3 – EXECUTION

- A. At Service Entrance or Transfer Switch, a UL approved disconnect switch shall be provided as a means of servicing disconnect if a 60 A breaker is not available.
- B. At Distribution, MCC and Branch, SPD shall have an independent means of servicing disconnect such that the protected panel remains energized. A 30 A breaker (or larger) may serve this function.
- C. SPD shall be installed per manufacturer’s installation instructions with lead lengths as short (less than 24”) and straight as possible. Gently twist conductors together.
- D. Installer may reasonably rearrange breaker locations to ensure short & straightest possible leads to SPDs.
- E. SPD shall be installed on the load side of the main service disconnect.
- F. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

END OF SECTION 16289

SECTION 16410

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Enclosures.

1.2 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Available Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. 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; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Available Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, 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. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.

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3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 1. Outdoor Locations: NEMA 250, Type 3R.
 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.
- B. Concrete base is specified in Division 16 Section "Basic Electrical Materials and Methods".
- C. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- D. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.
- E. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."
- F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- G. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

3.2 FIELD QUALITY CONTROL

- A. Prepare for acceptance testing as follows:
 1. Inspect mechanical and electrical connections.
 2. Verify switch and relay type and labeling verification.
 3. Verify rating of installed fuses.
- B. Perform the following field tests and inspections and prepare test reports:

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1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. 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.

END OF SECTION 16410

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective 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. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
 - 3. Field quality-control test reports.
 - 4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Protection Div.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D.

2.2 MANUFACTURED UNITS

- A. Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- C. Conductor Connectors: Suitable for use with conductor material.
 - 1. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Rating:
 - 1. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.3 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

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- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. 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.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with series-connected rating 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. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
 - 3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.7 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.

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- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."
- C. Mount top of trim **74 inches (1880 mm)** above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four **1-inch (27-GRC)** empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four **1-inch (27-GRC)** empty conduits into raised floor space or below slab not on grade.
- H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."
- I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- J. Ground equipment according to Division 16 Section "Grounding and Bonding."
- K. Connect wiring according to Division 16 Section "Conductors and Cables."

2.8 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. 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.

END OF SECTION 16442

SECTION 16511

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures with lamps and ballasts.
 - 2. Lighting fixtures mounted on exterior building surfaces.
 - 3. Emergency lighting units.
 - 4. Exit signs.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
 - 1. Include wiring diagrams.
- C. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 15 Section "Diffusers, Registers, and Grilles."
 - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.

2.3 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.4 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: **1/2-inch (13-mm steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture).**

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- C. Twin-Stem Hangers: Two, **1/2-inch (13-mm)** steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage **2.68 mm**.
- E. Rod Hangers: **3/16-inch (5-mm)** minimum diameter, cadmium-plated, threaded steel rod.
- F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than **6 inches (150 mm)** from fixture corners.
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two **3/4-inch (20-mm)** metal channels spanning and secured to ceiling tees.
- C. Suspended Fixture Support: As follows:
 - 1. Suspend from cable.
- D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16511

SECTION 16723

SCHOOL INTERCOM AND PROGRAM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes direct-connected, manually switched, school intercom and program equipment independent of telephone equipment.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. All-call amplifier.
 - 2. Intercom amplifier.
 - 3. Paging amplifier.
 - 4. Loudspeakers/speaker microphones.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Comply with UL 50.

1.4 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted speaker microphones and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Speakers: Free of noise and distortion during operation and when in standby mode.

2.3 EQUIPMENT AND MATERIALS

- A. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.
- B. Equipment: Modular type using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.
- C. Waterproof Equipment: Listed and labeled for duty outdoors or in damp locations.

2.4 ALL-CALL AMPLIFIER

- A. Comply with TIA/EIA SE-101-A.
- B. Minimum Output Power: 1-W RMS for each station and speaker that can be connected in all-call mode of operation, plus an allowance for future stations.
- C. Total Harmonic Distortion: Less than 5 percent at rated output power with load equivalent to quantity of stations connected in all-call mode of operation.
- D. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.
- E. Frequency Response: Within plus or minus 2 dB from 50 to 12,000 Hz.
- F. Output Regulation: Maintains output level within 2 dB from full to no load.
- G. Input Sensitivity: Compatible with master stations and central equipment so amplifier delivers full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on master station, speaker microphone, or handset transmitter.
- H. Amplifier Protection: Prevents damage from shorted or open output.

2.5 INTERCOM AMPLIFIER

- A. Comply with TIA/EIA SE-101-A.
- B. Minimum Output Power: 15 W and adequate for all functions.
- C. Total Harmonic Distortion: Less than 5 percent at rated output power with load equivalent to 1 station connected to output terminals.
- D. Minimum Signal-to-Noise Ratio: 50 dB, at rated output.
- E. Frequency Response: Within plus or minus 3 dB from 70 to 10,000 Hz.
- F. Output Regulation: Maintains output level within 2 dB from full to no load.
- G. Input Sensitivity: Matched to input circuit and providing full-rated output with sound-pressure level of not more than 10 dynes/sq. cm impinging on microphones in master stations, speaker microphones, and handset transmitters.
- H. Amplifier Protection: Prevents damage from shorted or open output.

2.6 PAGING AMPLIFIER

- A. Comply with TIA/EIA SE-101-A.
- B. Input Voltage: 120-V ac, 60 Hz.
- C. Frequency Response: Within plus or minus 3 dB from 60 to 10,000 Hz.
- D. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.
- E. Total Harmonic Distortion: Less than 3 percent at rated output power from 70 to 12,000 Hz.
- F. Output Regulation: Less than 2 dB from full to no load.
- G. Controls: On/off, input levels, and low-cut filter.
- H. Input Sensitivity: Matched to input circuit and providing full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.
- I. Amplifier Protection: Prevents damage from shorted or open output.

2.7 CONE-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES

- A. Comply with TIA/EIA SE-103.
- B. Minimum Axial Sensitivity: TIA/EIA SE-103 pressure rating of 45 dB.

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- C. Frequency Response: Within plus or minus 3 dB from 70 to 15,000 Hz.
- D. Minimum Dispersion Angle: 100 degrees.
- E. Line Transformer: Comply with TIA/EIA-160, maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least 4 level taps.
- F. Enclosures: Steel housings or back boxes, acoustically dampened, with front face of at least 0.0478-inch (1.2-mm) steel and whole assembly rust proofed and factory primed; complete with mounting assembly and suitable for surface ceiling, flush ceiling, pendant or wall mounting; and with relief of back pressure.
- G. Baffle: For flush speakers, minimum thickness of 0.032-inch (0.8-mm) aluminum, with textured white finish.
- H. Size: 8 inches (200 mm) with 1-inch (25-mm) voice coil and minimum 5-oz. (140-g) ceramic magnet.

2.8 CONDUCTORS AND CABLES

- A. Conductors: Jacketed, twisted pair and twisted multipair, untinned solid copper. Sizes as recommended by system manufacturer, but not smaller than No. 22 AWG.
- B. Insulation: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.
- C. Shielding: For speaker-microphone leads and elsewhere where recommended by manufacturer; No. 34 AWG tinned, soft-copper strands formed into a braid or equivalent foil.
 - 1. Minimum Shielding Coverage on Conductors: 60 percent.
- D. Plenum Cable: Listed and labeled for plenum use.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wiring Method: Install wiring in raceways except within consoles, cabinets, desks, and counter.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.
- C. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.
- D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) for speaker microphones and adjacent

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parallel power and telephone wiring. Separate other school intercom and program equipment conductors as recommended by equipment manufacturer.

- E. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- F. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- G. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.
- H. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 GROUNDING

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.
- C. Install grounding electrodes as specified in Division 16 Section "Grounding and Bonding."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Schedule tests with at least seven days' advance notice of test performance.
 - 2. After installing school intercom and program equipment and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Operational Test: Test originating station-to-station, all-call, and page messages at each intercom station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.
 - 4. Frequency Response Test: Determine frequency response of two transmission paths, including all-call and paging, by transmitting and recording audio tones. Minimum acceptable performance is within 3 dB from 150 to 2500 Hz.
 - 5. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
 - a. Disconnect speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure signal-to-noise ratio at paging speakers.
 - b. Repeat test for three speaker microphones, one master station microphone, and for each separately controlled zone of paging loudspeakers.
 - c. Minimum acceptable ratio is 45 dB.

6. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each intercom, paging, and all-call amplifier. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 5 percent total harmonics.
 7. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each paging zone. Maximum permissible variation in level is plus or minus 3 dB; in levels between adjacent zones, plus or minus 5 dB.
 8. Power Output Test: Measure electrical power output of each paging amplifier at normal gain settings of 150, 1000, and 2500 Hz. Maximum variation in power output at these frequencies is plus or minus 3 dB.
 9. Signal Ground Test: Measure and report ground resistance at system signal ground. Comply with testing requirements in Division 16 Section "Grounding and Bonding."
- B. Retesting: Correct deficiencies and retest. Prepare a written record of tests.
- C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging and independent room speaker-line matching transformers.
- D. Prepare written test reports.
1. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

3.4 ADJUSTING

- A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

END OF SECTION 16723

SECTION 16730

ADDRESSABLE FIRE ALARM & PROTECTIVE SYSTEM

PART 1 - GENERAL

1.1. DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor 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 No. 72 for Local Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
 - 1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.
- C. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof) and devices shall be UL listed for use with panel.
- D. Underwriters Laboratories Inc. (UL) - USA:
 - No. 38 Manually Actuated Signaling Boxes
 - No. 50 Cabinets and Boxes
 - No. 864 Control Units for Fire Protective Signaling Systems
 - No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - No. 268A Smoke Detectors for Duct Applications
 - No. 346 Waterflow Indicators for Fire Protective Signaling Systems
 - No. 464 Audible Signaling Appliances
 - No. 521 Heat Detectors for Fire Protective Signaling Systems
 - No. 1971 Visual Notification Appliances

1.2. SCOPE:

- A. An intelligent, microprocessor-controlled, fire alarm 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 B (NFPA Style B) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) as part of an addressable device connected by the SLC Circuit.
4. All circuits shall be power-limited, per 1995 UL864 requirements.
5. 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.
6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.

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 FACP shall flash.
2. A local piezo electric signal in the control panel shall sound.
3. A backlit 80-character LCD display on the FACP 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 from the control panel and history recording shall log the information associated each new fire alarm, along with time and date of occurrence.
5. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm

1.3. SUBMITTALS

A. General:

1. Two 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 qualified 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. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

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.

1.4. 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.

1.5. MAINTENANCE:

- A. Maintenance and testing shall be on a semi-annual schedule or as required by the local 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.
- 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.

1.6. 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 control 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

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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.

1.7. 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. 13	Sprinkler Systems
No. 70	National Electric Code (NEC)
No. 72	National Fire Alarm Code
No. 101	Life Safety Code

- B. 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.

- C. Local and State Building Codes.

- D. All requirements of the Authority Having Jurisdiction (AHJ).

1.8. APPROVALS:

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc

PART 2 - 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 fire 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.

- D All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

2.2. CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. 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 760-29.
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 (19.1 mm) 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 (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) 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. Wiring used for the multiplex communication circuit (SLC) shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.

5. All field wiring shall be electrically supervised for open circuit and ground fault.
6. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems, which 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. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the 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.

2.3. MAIN FIRE ALARM CONTROL PANEL:

- A. The existing FACP is an EST 3X voice evacuation system. 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, voice evacuation control panel, and other system controlled devices.

2.4. SYSTEM COMPONENTS:

A. Programmable Electronic Speakers:

1. Electronic speakers shall operate on 24 VDC nominal.
2. Electronic speakers shall be field programmable without the use of special tools, to provide audio with an output sound level of at least 90 dBA measured at 10 feet from the device.
3. Shall be flush or surface mounted as show on plans.

B. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 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.
4. The strobe shall have a selectable candela power of 15/75/110 candela.

C. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

D. Duct Smoke Detectors

Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes. Detectors shall be addressable.

E. 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 which are permanently fixed are not acceptable.

F. Addressable Devices - General

1. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
2. Detectors shall be addressable and intelligent, and shall connect with two wires to the fire alarm control panel signaling line circuits.
3. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash 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 illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
4. 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.
5. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in (local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.
6. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.

7. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
8. Detectors shall provide address-setting means using decimal switches.

G. 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.
2. The detectors shall be ceiling-mounted and available in an alternate model with a integral fixed 135-degree heat sensing element.
3. Each detector shall contain a remote LED output and a built-in test switch.
4. Detector shall be provided on a twist-lock base.
5. 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.
6. 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 periodically flash to indicate that the detector is in communication with the control panel.
7. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).
8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

H. Intelligent Ionization Smoke Detector

1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

I. 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.

J. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of conventional Notification Appliance Circuits (NACs) of compatible, 24 VDC powered, polarized audio/visual notification appliances.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. 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. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all NACs may be energized at the same time on the same pair of wires.
4. 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.

K. Addressable Control Relay Module

1. Addressable control relay modules shall be provided to control the operation of fan shutdown and other auxiliary control functions.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control relay module will provide a dry contact, Form-C relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.
4. The control relay module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

L. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Style 6 (Class A) or Style 4 (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 any 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 mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It 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.

M. Serially Connected Annunciator

1. The annunciator shall communicate with the fire alarm control panel via a two-wire EIA 485 (multi-drop) communications circuit.
2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits. The following operations shall also be provided:
 - a. Up to 32 annunciators, each with up to 64 points, may be installed on the system.
 - b. The annunciator shall include a single electrical keyswitch to disable all switch functions.
 - c. The annunciator shall provide alarm and trouble resound, with flash for new conditions.

N. 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.

O. Manual Fire Alarm Boxes

1. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on

recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Station Reset: Key- or wrench-operated switch.
3. Clear hinged shield.

2.5. BATTERIES:

- A. Upon loss of Primary (AC) power to the control panel, the batteries shall have sufficient capacity to power the fire alarm system for required standby time (24 or 60 hours) followed by 5 minutes of alarm.
- 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.
- D. If necessary to meet standby requirements, external battery/charger systems may be used.

PART 3 - 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 pull stations shall be suitable for surface mounting or semiflush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2. TEST:

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.

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- 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.
- 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 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.
 - B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION 16730

SECTION 17000

VOICE AND DATA COMMUNICATION CABLING

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Related Documents: The requirements of Divisions 0 and 1 are hereby made a part of this section as if fully repeated herein.

DIRECT PURCHASING: This Section is subject to the terms described in Section 01042, Direct Purchasing Procedures, whereby the Owner reserves the right to recover the sales tax on materials by purchasing directly the materials required for this Section. Issuance of Purchase Orders by the Owner shall not relieve the Contractor of any of his responsibilities regarding material purchases or installations, with the exception of the payments for the materials as purchased.

17000 PROJECT OVERVIEW

This standard is drawn from the EIA/TIA Structured Wiring Standards and the Bicsi TDMM, 9th Edition and is designed to support the goals of the District Technology Plan.

1. The base facilities required are to include communications equipment rooms, Main Cross-Connects, Telecommunications Closets, distribution panels (from now on referred to as MC, TC, and DP), cableways, electrical power distributions systems, electrical power surge suppression at the source, and electrical power supply capacity improvements.
2. Unless otherwise noted, every Instructional area shall receive sufficient workstation outlets to allow for a minimum of eight (8) Category-6A drops plus one CCTV video (Instructional TV) connections. Each administrative office and secretarial location shall be provided with a minimum of four (4) Category-6A drops per workstation location. ITV will be provided to designated administrative areas as determined by the school or district. Selected areas may be provided with two (2) Category-6A drops, as directed by Clay County School District Information Services Personnel.
4. All data and voice connections shall be done using #24 AWG unshielded twisted pair wire that surpass the currently proposed Category 6A UTP, or better, for use with voice and data communications networks. The ITV connections will use "F" connectors and RG/U 6 coaxial workstation cable connected to an RG11 backbone.
5. All workstation outlets shall use EIA/TIA 568B 8-pin modular jacks (RJ-45) that meet or exceed the current specification of the TIA/EIA Category-6A requirements.
6. All cabling from workstation outlets must be Home Run to each distribution closet and all wires terminated at each end on a one to one pin basis.
7. Workstation power wiring shall not be bundled in the same conduit as the communications wiring unless the conduit contains partitions for power and communications wiring within a conduit approved for this purpose. Combination power and data outlet boxes (typically used in floor installations) shall contain no cross over wiring. I/O must maintain a straight throughway passage.
8. Fiber optic cabling is the preferred distribution method between buildings, for Data distribution, because of its transmission speed, bandwidth capability, elimination of inter-building grounding problems, and safety from lightning strikes. Copper cabling is acceptable for telephone and CCTV distribution but lightning protection must be used at both ends (as required by Code).
9. Fiber optic cabling is to be used for horizontal and vertical distribution between distribution closets for data communications. PowerSum Category-5e copper cabling shall also be pulled whenever Fiber Optic Cabling is pulled for backbone use between closets for Voice applications.
10. The speed rating of the wiring distribution system support apparatus (patch panels, communications outlets, etc.) shall be 10000-MBPS (10-GBPS) or better and shall be so certified.
11. Detailed documentation of the installed system shall be provided which is capable of being used by non-technical personnel for use to facilitate system administration, maintenance and future changes. This requirement shall include as-built drawings, detailed cable drawings with all cables and terminations identified, detailed pathway locations, bill of materials of all installed equipment and wiring, rack or backboard equipment layouts showing placement of support equipment, specifications for connectors and cables, and models and serial numbers of installed equipment.
12. System test and performance verification documentation is to be provided by the contractor following system installation. School and district personnel shall be notified of the test and performance verification schedule and invited to observe the testing and verification. Test results are to be provided in the following manner:

Two (2) Printed Reports divided by Closet ID in notebooks w/clear front and side pockets to allow labeling.

Two (2) disk copies in a format specified by owner or with the necessary licensed software to allow for viewing of the results.

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One set of test results shall be left in the main Telecommunications Closet for the campus, the other set is to be turned in to the District Office Information Services Administration Personnel/

13. Training shall be provided to designated school and district personnel (a minimum of 2 school and 1 district) on the operation, administration and maintenance of the wiring distribution system and support electronics.

17010 BASIC COMMUNICATION REQUIREMENTS

17020 QUALITY ASSURANCES

The installation shall be made in a workmanlike manner, with all parts securely fastened according to accepted standards for an educational environment and as approved by the Clay County School Board.

All materials shall be new and free of defects and shall be the manufacturer's latest standard design. All materials shall carry the UL label or shall be manufactured according to that agency's standards where such standards have been established.

All electrical and conduit work shall be performed by or under the on-site supervision of a Master Electrician.

The Contractor shall have a BICSI Corporate Number

The Contractor shall have a BICSI RCDD Engineer on staff.

020.1 INSTALLATION TEAM:

The installation team shall be lead by a minimum of one (1) BICSI Installer with current status. The preferred installation team will consist of BICSI trained and/or experienced cable installers.

020.2 COPPER TERMINATION TEAM:

1. The copper termination team shall consist of personnel trained by BICSI, and will possess a minimum rating of Apprentice. The Copper Termination Team shall report directly to the Lead Installer, to verify correct installation procedures.
2. Must have attended factory conducted IDC installation training course with written certification.
3. Must have factory attended conducted design course with written certification.
4. A minimum of 50 % of the staff needs to be trained with certification (training course PSC 103 or manufacturer equivalent)
5. Must have a minimum of 2 days of formal fiber optic installation course (PSC 203 or manufacturer equivalent) training course and 2 weeks of supervised field fiber optic installations with an experienced fiber optic technician.
6. Copper connectivity warranty must cover cost of both labor and repair/replacement.
7. Must have attended a certified Category 6 installation class with written certification from manufacturer/certifying entity.
8. Must comply with EIA/TIA-568-A.
9. Must have required factory taught bi-annual hands on training.
10. All copper warranty must be managed by the connectivity manufacturer.

020.3 OPTICAL FIBER TERMINATION TEAM:

The optical Fiber termination team shall have received a certificate from an Optical Cable manufacturer, whose minimum requirements for completion are listed below:

020.4 OPTICAL FIBER COURSE DOCUMENTATION

Theory and Principles of Fiber Optics
Fiber Types and Fiber Manufacture
Cable Types and Cable Manufacture
Building and Fire Code Considerations
Cable Placement Techniques

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- Fiber Optic Cable Sheath Removal
- Installing a Wire Mesh Pulling Grip
- Installing a Wire Mesh Split Grip
- Hardware Types
- Use and Operation of Optical Time Domain Reflectometer with Multimode Modules
- Installation of Indoor Buffer Tube Fanout Kits
- Installation of Outdoor Buffer Tube Fanout Kits
- Splicing and Termination
- Theory and Principles of Splicing and Connectorization
- Fusion Splicing with Fusion Splicer
- Single-Fiber Mechanical Splicing
- Cable Preparation Procedures for Installing Optical Connectors
- Installing the Glass Insert Connector on Multimode Fiber
- Cable System Testing and Documentation Overview
- Attenuation Test Procedures
- Correct installation procedures into Optical Fiber Cable Distribution Cabinets
- Correct installation procedures into Optical Fiber Cable Splice Cabinets

In addition, installation team MUST have completed, at a minimum, Corning Cabling Systems System course that includes the following:

Mock-Up Installing Corning Cable Systems' UniCam® Connector

The School Board's Information Services Department has the authority to stop work at any time if the work does not comply with specifications.

The Contractor and the Information Services Department shall have weekly meetings to cover concerns, questions, and general progress information.

The Contractor shall request an inspection at the final completion of the job.

The project will be considered completed and full payment rendered when the final walkthrough has been completed, cabling plant documentation and test results, and "AS-BUILT" drawings have been turned over to the Information Services Department and has agreed that the contractor has meet 100% of the project Scope of Work.

Only after Final Completion has been agreed upon by the Information Services Department will payment be made for the project.

020.5 TESTING / CERTIFICATION

All cabling will be certified as meeting ANSI EIA/TIA 568, 569, TSB67 Standards.

Test Type:

All horizontal cabling shall be tested and verified using a **Basic Link** or **Channel** test depending on Installation, as directed by the Clay County School District

No marginal (*) test results will be accepted.

All horizontal cabling shall be tested and verified using the **current revision of EIA/TIA Category 6A specifications**. Results will be collected for each cable, saved on diskette or Compact Disc, printed, bound in a 3-ring notebook, and forwarded in both formats to the Clay County School Board Information Services Department. If a connection fails to certify at the **current revision** of EIA/TIA Category 6A specifications, the Contractor shall take steps necessary to correct the problem, including replacing the cabling and termination hardware at the Contractor's expense, if the cable is not found to be at fault. This does not include cabling that is already in place, and the contractor is only terminating for the Clay County School Board. If the cabling or termination hardware is found to be at fault, the contractor should look to the manufacturers warranty for replacement and reimbursement of the time and materials for correcting the problem.

020.6 OPTICAL CABLE EXTENDED WARRANTY PROGRAM

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The contractor shall provide a **One-Year Warranty** guarding against defects in workmanship. The Contractor shall also provide the CCSD Information Services Department with a **TWENTY-FIVE YEAR** Manufacturer's Warranty on all products installed. This Manufacturer's Warranty shall cover each individual component installed in the Optical Fiber Cabling system. This includes Optical Fiber Cables, Interconnection and splice hardware, Mechanical Splice Components, and Field Installable Connectors.

The Manufacturer will repair or replace, at no cost to the customer, the defective components. In addition, the 62.5/125um Optical Fiber Cable will be guaranteed to provide a minimum of 500MHz*km fiber bandwidth at 1300nm and 160MHz*km at 850nm as well as providing a minimum of 300-meter link length guarantee for Gigabit Ethernet applications.

This "Extended Warranty" may only be provided if the contractor is certified by the manufacturer to provide the extended warranty

020.7 HORIZONTAL COPPER EXTENDED WARRANTY PROGRAM

The contractor shall provide a **One-Year Warranty** guarding against defects in workmanship. The Contractor shall also provide the CCSD Information Services Department with a **TWENTY-FIVE YEAR** Manufacturer's Warranty on all products installed. This Manufacturer's Warranty shall cover each individual component installed in the Horizontal Copper Cabling system. This includes Horizontal Cabling, Patch Cables, Jacks, and Patch Panels.

The Manufacturer will repair or replace, at no cost to the customer, the defective components. In addition, Horizontal Station Cable and termination components will be guaranteed to provide a minimum of 350MHz bandwidth as well as providing a minimum of 100-meter link length guarantee for Gigabit Ethernet applications for the life of the warranty.

This "Extended Warranty" may only be provided if the contractor is certified by the manufacturer to provide the extended warranty.

Only certified personnel shall terminate, splice, or test optical fiber cabling

All materials and workmanship described in this document shall conform to the standards as set forth by the latest editions of the following manuals as if they were physically part of this document:

- Florida Administrative Code, Chapter 6.A-2, school installation requirements
- State Uniform Building Code for Public Education Facilities Construction
- EIA/TIA-569 commercial building standard for telecommunications pathway and spaces
- EIA/TIA-568 commercial building telecommunications wiring standard
- EIA/TIA TSB-36 technical systems bulletin, additional transmission specifications for unshielded twisted pair cables
- EIA/TIA PN-2948 technical systems bulletin, additional transmission specifications for unshielded twisted pair connecting hardware; Draft #7
- EIA/TIA-492 detail specification for 62.5 Micrometer core diameter/125 micrometer cladding diameter class Ia Multimode, graded index optical waveguide fibers
- NEC - National Electrical Code
- Florida DMS/DOC general facility requirements for telecommunications system
- BICSI - Building Industry Consulting Service International, Inc. Telecommunications Distribution Design Manual
- LPC lightning protection code (NFPA-78)
- IEEE 802.3 - Institute of Electrical and Electronics Engineers LAN standard for Ethernet
- UL listed - Underwriter's Laboratories listed

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- ANSI - American National Standards Institute
- TIA/EIA TSB-67 - Cable Testing Standards
- TIA/EIA TSB 72 - Centralized Optical Fiber Cabling Guidelines
- ITA/EIA TSB 75 - Additional Horizontal Cabling Practice for Open Offices
- TIA/EIA-606 - The Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
- TIA/EIA-607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

17030 MANUFACTURER SPECIFICATION:

The combination of Belden's MediaTwist bonded pair cable and Panduit's GIGA-TX□ connector technology provides higher performance than the currently proposed Category-6 specifications. This measurement is a key factor in determining the effective useable bandwidth of the channel. The typical installation of these items has more than 9.2dB margin PSACR over the currently proposed Category-6 requirements. This exceeds the currently proposed TIA/EIA Category-6 limit by more than 8 times.

Attenuation is a measure of the loss of signal strength as the signal travels the length of the channel. Belden's MediaTwist, with bonded pairs and larger conductor diameter, reduce channel attenuation. The results: A solution 119% better in attenuation than the currently proposed TIA/EIA Category-6 proposed industry standards.

Return loss is a measure of the reflected signal caused by impedance mismatches within and between cable, connector and patch cord. A large reflected signal in a full-duplex Gigabit Ethernet network can cause errors, which result in retransmissions. The typical installation of these items yields 77% less reflected signal than the currently proposed TIA/EIA Category-6 standard allows.

NEXT (Near End Crosstalk) is a measurement of the coupled signal induced on an adjacent pair and measured at the same end. Near end crosstalk is minimized through the use of Panduit's GIGA-TX□ modular jack termination technology and Belden's MediaTwist cable with bonded pairs, which virtually eliminate conductor untwist in the termination area. The results: A solution that provides pair-to-pair NEXT performance that exceeds the currently proposed TIA/EIA Category-6 requirements by 56%.

PowerSum NEXT (PSNEXT) indicates the calculated near end crosstalk induced on a pair by all adjacent pairs. This is increasingly important in a full-duplex network such as Gigabit Ethernet. The typical installation of these items yields 74% less PSNEXT than the currently proposed TIA/EIA Category-6 standard allows.

Pair-to-Pair ELFEXT (Equal Level Far End Crosstalk) is a measure of the undesired signal coupling onto an adjacent pair along the entire cable run that is measured at the far end, relative to the transmitted signal. In a full duplex network, a large ELFEXT induced signal can cause network errors. The typical installation of these items exceeds the ELFEXT listed in the currently proposed TIA/EIA Category-6 limit by 62%.

PowerSum ELFEXT (PSELFEXT) indicates the calculated equal level far end crosstalk induced on a pair by all adjacent pairs. The bi-directional nature of gigabit Ethernet requires a "clean" signal at both ends of the channel. The installation of these items provides a typical 22.2dB PowerSum ELFEXT result, 90% better than the currently proposed TIA/EIA Category-6 industry requirements.

Given the amount of headroom the installation of these items give over the currently proposed TIA/EIA Category-6 specifications, and the fact that no single distributor is locked out of participating in the reselling of these products, the Clay County School Board Information Services Department has standardized on these products for ALL installations. There are no allowances for substitutions without prior authorization from the Information Services Department. Any deviation from the products specified will result in the contractor being held responsible for removing said equipment, and replacing the equipment in question with the proper items. Failure to heed these notices may result in the contractor possibly being removed from the bid list for future projects.

17050 DEFINITIONS

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Administrative Area	An office or location identified for use by secretaries, guidance, administrative, or support personnel.
CCTV	Closed Circuit Television
DP	Distribution Panel. An enclosure used to secure the wiring terminations and electronic equipment when limited space is available. Primarily used within classrooms when no suitable closets are available.
Horizontal Wiring	Twisted Pair copper cable pulled between the distribution frames and workstation outlets without any intermediate splices.
TC	Telecommunications Closet (formerly Intermediate Distribution Frame). The location where the horizontal wiring terminates and connection to the main backbone occurs with the necessary electronic equipment.
Instructional Area	A room or location dedicated to instructional purposes. (i.e. classrooms, media center, auditorium, etc.)
MCC	Main Cross-Connect (formerly Main Distribution Frame). The location where the schools backbone wiring system joins with services provided by outside sources, such as the Telephone Company.
PR	Power receptacle; provides the grounded 110v electrical power to the workstations.
Workstation	Any device connected to the distributed wiring system in instructional or administrative areas. Includes computers, TV, telephones, etc.
WO	Workstation outlet; contains the RJ-45 and/or "F" connections to the horizontal wiring used for connecting the data, voice, and video equipment to the wiring infrastructure.

17060 CUTTING AND PATCHING

Cut and patch as necessary for the installation of this system. All repairs are to meet all fire codes and be left in a first class condition. Workers who are experienced in the work involved shall do such cutting and patching. Cut no joint, beam, girder, column or other structural member without first obtaining written permission of the Clay County School Board.

Conduits shall not penetrate, be installed on or attached to any roofing material. Conduits shall not be mounted on the exterior of any permanent building or structure without first obtaining written permission of the Clay County School Board Information Services Department.

Where concrete floors must be cut or chased to install floor boxes, insure adequate provisions to control the spread of dust and debris. Carefully plan cuts to minimize impact on overall floor integrity. Where such cutting affects existing reinforcing provide replacement reinforcing interfaced with existing reinforcing members such that the completed installation will have a strength equivalent to the original.

Paint all exposed conduit surfaces as directed by CCSB staff.

17100 - CABLE PLANT

100.1 WIRING DISTRIBUTION SYSTEM OVERVIEW

Every Instructional area shall receive a minimum of two (2) workstation outlets. One (1) WO in the location designated for the instructional staff work area, One (1) WO in the location designated for the student station work area. Student WO locations shall consist of six (6) cables, Instructional Staff WO shall consist of a minimum of two (2) cables. Additionally, one CCTV video (Instructional TV) connection shall be placed in each Instructional Area. Each administrative office and secretarial location shall be provided with a minimum of four (4) drops per location to allow for one data, one voice and future expansion. ITV will be provided.

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ed to designated administrative areas as determined by the school or district. **NO Horizontal Cable is to exceed 90 m or 295 ft including service slack.**

A conduit/J-hook system is the preferred method for protection of the wiring system. This is required for use in all grade or below grade level concrete slabs and for inter-building distribution. All data wiring between the MCC and TCs must be run in metal conduit and make accommodations for fiber optic cabling such as minimum bend radii and a minimum number of bends.

Where suspended ceiling are available, the design of the horizontal distribution cable system from the TC to workstations may use cable tray to support the main length of the cables. The wire from wall stub ups to the tray would then be installed using cabling tray attached every 5 feet for support. Cables are to be bundled loosely using ties with no more than 24-cables per bundle. Any areas within closets are to use Velcro Ties, NO nylon or metal cable ties are to be used in closet areas. Plenum rated cabling and support hardware shall be required if the suspended space is return air plenum.

The CCTV system shall be a Tap Trunk System using Directional Taps, and RG-11 cable for trunk lines. Coax cabling for the CCTV system shall be distributed to all areas to be occupied by students, excluding restrooms. Additional outlets should be provided in areas to be occupied by more than 35 students at a time. TV outlets should be provided in areas including, but not limited to all classrooms, conference rooms, media centers, guidance areas, admin office areas, teacher planning, cafeteria, and gym.

All large group areas such as the media center, cafeteria, etc., shall have a TV outlet located every thirty feet around the room perimeter. In no situation shall a large group room have less than two outlets on each wall.

The internal distribution system shall provide to each television receiver outlet a signal level, on each channel, not less than +2 DBMV, nor greater than +6 DBMV.

17110 - COMMUNICATIONS EQUIPMENT ROOMS

110.1 DATA DISTRIBUTION BACKBOARDS, RACK, AND CABINETS

Each communications backboard shall be made of 3/4" thick, marine grade plywood panel painted with a minimum of 2 coats of fire retardant, gray semi-gloss enamel. Install a 14 gauge, galvanized steel slotted channel at top of plywood panel spanning full width of panel to support and align conduits. Install a minimum of two (2) double-duplex 20a receptacles and associated surge protector for equipment power at bottom-left, bottom-center, and bottom-right corner of backboard. Conduits for said power should be run around the backboard, not over or through it. Each conduit extended to the backboard shall terminate just below the provided channel with a non-metallic bushing.

Racks shall be securely attached to mounting surface (floor or wall). Wall racks shall be installed in a manner suitable for supporting 140 pounds of equipment installed within the rack. Equipment power receptacles and associated surge protector shall be mounted within 6 usable feet from the lower left corner of any rack.

Where existing conditions are not suitable for installation of racks, cabinets must be utilized. Cabinets shall be securely attached to mounting surface (floor or wall). Wall cabinets shall be installed in a manner suitable for supporting 140 pounds of equipment installed within the rack. Hub power receptacles and associated surge protector shall be mounted within the lower left corner of any cabinet. Provide a 2" grommetted opening in the bottom of the rack rear section to accommodate future extension of cables to peripheral devices. All cables extended to terminal cabinets and hub backboards shall be provided with a minimum of 36-inches slack cable either at terminal locations or in slack-loops in the ceiling above the cabinets.

110.2 MODULAR PATCH PANELS

Patch panels shall be provided in the MCC, TC, and DP for termination of horizontal cabling. Modular feed through and patch panels shall be rack, cabinet, or wall mounted in the closets and panels for termination of horizontal cabling. Modular patch panels for use with the workstation cables shall:

- (1) Have 8 wire, 8 position (8W8P) EIA/TIA 568B modular output ports capable of supporting "Category-6" jacks. Each individual port shall provide for color-coding capabilities. Each horizontal cable will be terminated to the corresponding color-coded connection on the patch panel using the manufacturer recommendations and the currently proposed Catego-

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ry-6 standards.

- (2) be suitable for rack mounting to EIA standard 19-inch racks and/or wall mounting using hinged brackets.
- (3) not exceed 48 ports.
- (4) be provided with respectively sized hinged brackets or hinged racks when wall mounted patch panels are use on backboards for access to the termination connectors.
- (5) Each patch panel port shall be labeled to indicate the respective data cable connected thereto using computer generated label strips installed so the designations shall not be easily removed.

110.3 WIRE MANAGEMENT

Each rack or cabinet where termination to patch panels occurs shall include both vertical and horizontal wire management for patch cables to be neatly routed.

Each patch panel shall include corresponding wire management modules so that a module will be located at both the top and bottom of the rack as well as between each patch panel. *A minimum of 3" or 2U square module shall be used*

Wire Managers shall have plastic, slotted-fingers, with bend-radius managers at the horizontal exit points. Wire Managers used for Patch Panels shall provide for management of cables on both front and rear.

110.4 FIBER TERMINATION GUIDES

Fiber Backbone cables shall terminate in an appropriately sized fiber distribution box. Fiber bulkheads shall always be enclosed.

110.5 TELEPHONE BACKBONE CABLE TERMINATION

Telephone Backbone Cables shall terminate on Category 5 110-Punch Down Blocks. Provide surge protection where appropriate. Extend the cabling from the 110-Block to the Telephone Distribution Patch Panel. *See Telephone Patch Panel Detail.*

110.6 CONNECTORS AND TERMINATIONS

1. Horizontal cables shall be connected to patch panels and Workstation Outlets in compliance with currently proposed EIA/TIA 568A Category-6 wiring requirements. Connections are to be made in accordance with the manufacturer's recommendations, using tools specifically designed for making such terminations.
2. Coaxial cables shall be carefully stripped to avoid damaging the insulation on the core conductor. Install connection with base set tight against outer cable jacket and crimp such that uniform tension will be applied on the cable perimeter.

The CCTV outlets and inputs shall be "F" type female fittings. All F connectors shall be crimp style Augat AMF11db for RG-11 cable and AMF-6 for RG-6 type cable or better. Connectors are to be installed with the proper tools according to manufacturer instructions.

3. Fiber optic cable connectors and fan-out kits shall be installed in strict accordance with manufacturer instructions. All tools, sealant, lapping film and etc. for installation of each connector shall consist of products specifically recommended by the connector manufacturer for the type of connector provided. Only people certified by the manufacturer shall terminate fiber optic cable.

110.7 CABLE TRAY

Ladder or basket type cable tray 18" wide by 4" deep, with a rung spacing not to exceed 9", should be installed from the rack to the telephone board. Cable tray is to be installed as high as possible to make maximum use of the backboard and to coordinate with conduits entering the MCC. The tray is to be used to dis-

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tribute cables from point of entry to the designated termination points. Distribution from the cable tray to termination shall be done utilizing the cavity created by the backboards and struts.

17120 - DISTRIBUTION CLOSETS AND SERVICE ENTRANCES

120.1 MAIN CROSS-CONNECT (MCC)

This room is the entry point for incoming cables servicing the school and the origination point for all internal communications systems. Typically, the MCC houses the system equipment and is connected to TCs for distribution to the end user. System documentation and test equipment should be contained in this room.

The MCC shall include enough room to house the distribution equipment and documentation for the system. Considerations in MCC design include environmental conditioning, power, security and access by maintenance personnel.

120.2 TELECOMMUNICATIONS CLOSET (TC)

The TC is an interconnection point between the wiring backbone and the horizontal wiring to the workstations within a building. TCs concentrate horizontal wiring from user areas and distribute the signal to other TCs or the MCC equipment. The TC is to contain only equipment related to data, voice, and video distribution.

The TC shall be located so that NO cables run to the workstation outlets exceed 90 meters (295 feet) including maintenance slack.

All interconnections between the MCC, other TCs and DPs may be either hard piped using appropriately sized conduit or appropriate wireways through the ceilings. If underground conduits are used, all cabling used in these pathways shall be rated for outdoor use, and have a minimum of a PE-89 rating. All copper cabling used in underground pathways shall terminate within 50-feet of exiting the conduit on lightning protector blocks.

The MCC and TCs are not to serve as storage or janitorial rooms. Water pipes and mechanical rooms are to be avoided. Security should be provided for the MCC through the use of locking hardware and door contacts.

120.2a Room Finishes

The floor of the MCC/TC shall be smooth, free of cracks, crevices and dust, and capable of supporting a 250-lbs/ft² load. If concrete is used, a dust protective sealer shall be applied. Carpet is not acceptable. The wall should have 3/4 inch flame retardant marine grade plywood backboards installed from near floor to near ceiling. Plywood shall be painted light gray on both sides with a fire retardant paint.

Finished ceilings are not required. A 9'-0" or higher ceiling is desirable. Extend all walls to the roof deck when no ceiling is provided. There shall be NO roof penetrations above the MCC/TC.

No windows, louvers, or access panels are to be in the MCC/TC.

A 3'-0" x 6'-8" minimum door is required. Doors should be metal or solid core wood with lockable hardware.

Non-EMI generating lighting should be installed in a manner to eliminate shadows. A minimum lighting level of 50 foot-candles measured at 3 feet above the floor shall be provided.

120.2b Cable Tray

Ladder type cable tray 18" wide by 4" deep, with a rung spacing not to exceed 9", should be installed around from the rack to the telephone board. Cable tray is to be installed as high as possible to make maximum use of the backboard and to coordinate with conduits entering the MCC/TC. The tray is to be used to distribute cables from point of entry to the designated termination points. Distribution from the cable tray to termination shall be done utilizing the cavity created by the backboards and struts. Cabling should be protected from excessive stress by hanging from high cable trays by installing a "vertical riser" from the cable tray manufacturer, connecting the cable tray to the backboard. No cabling shall drop from the ceiling or ca-

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ble tray directly to the equipment rack. All cabling shall rest on the horizontal cable tray that connects the equipment rack to the backboard.

120.2c Electrical

Double duplex outlets shall be installed on the bottom-left, bottom-center, and bottom-right of each individual backboard. All receptacles should be 120 volt, 20 ampere outlets NEMA 5-20R. Receptacles shall be fed with a dedicated 20 Amp breaker. Convenience outlet shall be located around the room in eight-foot intervals. Double duplex outlets shall be located to provide power to racks within the room.120.2d Grounding

A ½ inch trade-size conduit shall be provided from the MCC/TC to the building-grounding electrode. A ground bus sized for #6 AWG ground conductors shall be installed to the plywood backboard. A #6 AWG stranded copper insulated grounding wire shall be provided from the ground bus to the building main electrical service entrance disconnect enclosure. Separate stranded #6 AWG insulated grounding wires shall also be connected between the ground bus and the building grounding system. Bond all racks/cabinets/wireways/ladder Racks to the grounding system. A ½ inch trade-size conduit shall be provided from the TC to the MCC ground bus. Each TC shall be connected to the MCC ground bus utilizing a #6 AWG ground conductor. Each lightning protector shall be connected to the MCC Ground Bus utilizing a #6 AWG ground conductor. When utilizing OSP cabling, the shielding on all cabling shall be connected to the MCC Ground Bus utilizing a #6 AWG ground conductor utilizing "3-M bullet-bond" type connectors, correctly sized for the diameter of the cabling.

120.2e Cableway

The MC and TC shall be connected to the backbone cableway for routing of communications from other communications closets or equipment rooms and the user outlets. The cableway may be provided by cable raceway or conduit nipple through the MC and TC wall toward the ceiling raceway system. One 4" conduit nipple shall be provided for every 24 WO served. In addition, a minimum of one 3" conduit nipple shall be provided for every MCC or TC located on the same floor and for every MCC or TC located on other floors that will be interconnected with any particular closet. Conduits or nipples shall be labeled on both ends.

120.2f Environmental

See Section 17610

120.3 DISTRIBUTION PANELS

When the area served has limited space to provide a TC, a distribution panel may be used. This panel shall consist of either a floor standing or wall mounted cabinet. This cabinet shall be secured, vented, enclosed, and provide access to its entire interior. All cable terminations, equipment mounting, and necessary power outlets shall be contained within the cabinet. Hinged doors are required, as well as louvered side panels, and a minimum of six (6) 75cfm fans installed.

The backbone cableway requirements also apply to DP floor consoles or wall mount cabinets.

If floor standing consoles or wall mount cabinets (DPs) are used in lieu of a TC then all equipment mounting and cable terminations must be accomplished within the cabinet.

Floor standing consoles or wall mount cabinets (DPs) used in lieu of a TC, shall have the grounding system connected to the cabinet frame.

Doors on floor consoles or wall mount cabinets (DPs) used shall provide access to all internal equipment and cable terminations. Louvered panels on sides are mandatory. A minimum of six (6) 75cfm fans shall be installed in the roof of each cabinet to eliminate heat-buildup in the cabinet.

Double duplex outlets shall be installed on the lower left quadrant of each individual cabinet. All receptacles should be 120 volt, 20 ampere outlets NEMA 5-20R. Each double duplex receptacle should be on its own 20 Amp breaker.

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120.4 PATCH PANELS

Patch Panels will be used to terminate all horizontal wiring. All patch panels shall have 8 wire, 8 position (8W8P) EIA/TIA 568B modular ports capable of supporting Snap-in Modular RJ-45 jacks that meet or exceed the currently proposed Category-6 specifications. Each individual port shall provide for color-coding capabilities. Each horizontal cable will be terminated to the corresponding color-coded connection on the patch panel. The Patch Panels and the Communication Outlet hardware including the Jacks shall be from the same manufacturer.

The panels shall perform to the currently proposed Category-6 specifications, as well as EIA/TIA 568A TSB-36 and TSB-40. (See Section 17110)

120.5 GROUNDING AND BONDING INFRASTRUCTURE

Each telecommunications bonding conductor shall be labeled in accordance to TIA/EIA-607 5.1.5 and ANSI/TIA/EIA 606 Section 7. See the appropriate standards for specifics.

120.6 CABINETS AND RACKS

Cabinets or racks shall be used for the installation of cable termination and equipment mounting. All cabinets and racks shall include the appropriate slotted-finger wire management guides for both the horizontal and vertical management of patch cables. Installation is to insure that all terminated cables are relieved of any strain, and that the rack (whether floor or wall mounted) allows for both the cable to be terminated and the electronic equipment to be mounted. Each cabinet shall be an industry standard, floor or wall mounted, ventilated, cabinet constructed of 16 gauge steel with a durable enamel paint finish applied over an iron phosphate coating for rust prevention.

Cabinets shall have provisions for conduit entry. The cabinet body shall have pre-drilled mounting rails designed for supporting E.I.A. standard 19" wide units, these rails are to be adjustable from front to back so they may accommodate various equipment depths. The cabinet shall have hinged doors to allow access to the front and rear terminals of installed equipment. Cabinet front sections shall be a one-piece hinged door with flush keyed latch. All cabinets at each respective facility shall be keyed alike. Cabinet sizes shall be determined based on the project design. Power strips and fans shall be included. Doors on floor consoles or wall mount cabinets (DPs) used shall provide access to all internal equipment and cable terminations. Louvered panels on sides are mandatory. A minimum of six (6) 75cfm fans shall be installed in the roof of each cabinet to eliminate heat-buildup in the cabinet. Vertical cable management shall be provided for patch cables.

Double duplex outlets shall be installed on the lower left quadrant of each individual cabinet. All receptacles should be 120 volt, 20 ampere outlets NEMA 5-20R. Each double duplex receptacle should be on its own 20 Amp breaker. 17130 – Interior pathways

130.1 CABLE DISTRIBUTION SYSTEM

The minimum bend radius required by manufacturer specifications or the EIA/TIA standards (whichever is greater) for the cabling specified in this document shall be required for all conduit systems. Conduit shall have no more than 180° of bend between pull boxes. Conduits for all workstation cables shall be arranged so that no single cable pull will be longer than 150 feet and no cable will be pulled through more than 180 degrees of total conduit bend or offset in a single pull. Provide pull boxes, stand-off channels, or conduits as necessary to comply with this requirement.

1. A conduit system is the preferred method for protection of the wiring system. This is required for use in all grade or below grade level concrete slabs and for intrabuilding distribution. All wiring between the MCC and TCs must be run in metal conduit and make accommodations for the use of fiber optic cabling such as minimum bend radius with a minimum number of bends. Where suspended ceiling are available, the design of the horizontal distribution cable system from the TC to workstations may use PVC or Plenum rated cable, whichever is necessary per code. This cable would then be installed using cable tray with a maximum support spacing of 5 feet. Cables are to be loosely bundled using tie wraps with no more than 24 cables per bundle. Plenum cable shall be required where the suspended space is return air plenum. Where open cables penetrate a wall, floor, or other building member provide a conduit sleeve with a non-metallic bushing on each end to extend a minimum of 2-inches beyond each side of the penetration.

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2. All workstation and backbone cables in exposed locations, and extending from above accessible ceilings to wall mounted outlets, terminal cabinets, and backboards shall be installed in conduit or raceway.
3. All cables shall be installed in continuous runs from outlet to TC, MCC to TC etc. without any intermediate splices. Provide separate conduits for backbone and workstation data cables. **All conduits for backbone cables shall be 2 inch diameter minimum and account for the minimum bend radius of the specified fiber optic cable. Conduits used for workstation data cables shall be 1-inch diameter minimum.** Larger conduit runs or trays used to serve multiple data outlets via distribution junction boxes shall be used where practical instead of using individual home run conduits to serve each outlet. Locate main runs of conduit or tray systems serving multiple outlets at common corridors or walkways instead of routing through classrooms and administrative areas when possible. Provide "tee" type conduit fittings in main conduit runs to accommodate branch runs to individual outlet locations.
4. Conduits for all data cables shall be arranged such that no single cable pull will be longer than 150 feet and no cable will be pulled through more than 180 degrees of total conduit bend or offset in a single pull, to insure that cables will not be subjected to excessive stress. Provide pull boxes standoff channels, or conduits as necessary to comply with this requirement.
5. Installation of all backbone fiber optic cables shall be done by people who are certified installers of fiber optic cables by Bicsi and the Fiber Optic Cabling Manufacturer and shall be done in strict compliance with the cable manufacturer's written recommendations and instructions for each installation. These instructions shall be included as part of the shop drawing submittal for the fiber optic cable.
6. The installation path for all cables shall be carefully planned to minimize the total length of each cable run. The total twisted pair cable length between a distribution frame termination and a workstation outlet shall not exceed 295 feet, including an allowance of 10 feet of service slack at the closet and 5 feet at the outlet. All proposed installation paths should be reviewed by the owner prior to installation.
7. **All TV wiring shall be enclosed in conduit.** Uses the following guidelines for conduit sizing:
 - 1 RG-11 cable shall be in 1" minimum conduit.
 - 2 RG-11 cables shall be in 1 1/4" minimum conduit.
 - 2 - 2" conduit shall be installed from the headend equipment to the utility pole supplying local cable.

130.2 RACEWAY DESCRIPTION

Unless noted otherwise, raceways shall conform to the following:

1. Raceways shall be heavy wall, hot dipped galvanized steel for the following application:
 - a. Metallic raceways buried in earth.
 - b. Raceways exposed to weather.
 - c. Exposed raceways where subject to mechanical damage.
 - d. All exposed raceway to 7'-0" above finished floor level, unless specifically approved and noted otherwise.
2. Raceways shall be electrical metallic tubing with insulated throat, steel, compression connectors and fittings, for the following applications:
 - a. Raceways installed in riser shafts, concealed above suspended ceilings, and at underside of slabs in unfinished areas where not subject to mechanical damage.
 - b. Raceways installed in interior partitions.
3. Plastic raceways may be used in lieu of rigid steel providing such plastic raceways and the installation conform to Article 347 of the National Electrical Code and the following restrictions:

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- a. Plastic raceways shall be permitted to be direct buried in earth provided the earth or sand is carefully compacted around the raceway conduit above grade shall be galvanized rigid steel.
 - b. Plastic raceways shall not be used for exposed work. For power circuits an insulated copper grounding conductor shall be provided in each plastic raceway and bonded to a grounded metal enclosure or device at origin and at each outlet. It shall be the responsibility of the Contractor to increase the conduit size to accommodate the ground conductor.
 - d. All plastic raceways shall be UL listed and meet applicable NEMA Standards. All plastic raceways shall be Schedule 40 PVC.
4. Intermediate metallic conduit may be used in lieu of rigid steel provided installation is in full compliance with Article 345 of the National Electrical Code. Flexible conduit shall **NOT** be used to house data wiring for any reason.

130.3 RACEWAY INSTALLATION

1. Raceways shall be sized to accommodate the conductors in accordance with the tables in the latest edition of the National Electrical Code. All raceways shall be continuous from cabinet to device, device to device, etc. and shall be secured to all boxes so that an electrically continuous system ground will be maintained. All rigid steel or IMC raceways entering a cabinet pull box, junction box, gutter, or outlet box shall be fastened to the box with two locknuts and a substantial insulated bushing. All EMT raceways shall be fastened to the box with a single locknut and insulated connector providing a smoothly rounded surface to protect the conductors. Locknuts shall be the type with sharp edges for digging into the wall of the metal enclosure.
2. Where possible conceal conduits within finished walls and ceilings. Exposed conduit on the exterior of permanent structures is not allowed, without express permission of the CCSB. Exposed conduit shall be parallel with or at right angles to building lines, beams, or ceilings. Symmetrical bends or metal boxes shall be placed at changes in direction or taps. Where conduits cross expansion joints provide suitable expansion fittings and bonding jumpers.
3. Conduits 3/4-inch and smaller shall be fastened to the building structure with approved heavy-duty steel pipe straps, or an approved equal. Nails, metal plumbers tape, or tie wire shall not be used. Conduit 1-inch and larger and multiple runs of smaller conduits shall be suspended from the building structure by means of trapezes consisting of pre-galvanized channel supported from the structure by minimum 1/4-inch galvanized threaded rod. The load applied to fasteners shall not exceed one-fourth of the proof test load. Conduit supports, straps, hangers, etc. attached to concrete or concrete block walls shall be so attached with case-hardened steel, self-drilling anchors equal to Red Head #S-14 or larger, and to steel members with approval beam clamps. Trapezes shall be sized as necessary with conduits resting on and secured to cross bars. Conduits shall be braced to prevent sway.
4. No conduit, conduit support, or outlet boxes shall be attached to ducts, piping, or mechanical equipment unless specifically approved by the Owner.
5. Where exposed conduits are installed at walls and ceilings having existing exposed piping or conduit which must be crossed by the new conduits, install conduits using galvanized slotted channels on maximum 10 feet spacing such that conduit may be installed in a straight run without having multiple offsets at the intersections with existing piping or conduits.
6. Where exposed conduits are installed below 7'-0" above finished floor level in areas which may be occupied by students without supervision, i.e. locker rooms, corridors, etc. Install conduits flat against wall. Offsets shall be permitted only to enter an outlet or pull box. Support conduits on 5-foot maximum centers and within 12-inches of each outlet using two-hole conduit straps attached to surface with tamper resistant screws or bolts.
7. In suspended ceiling construction, run conduit above the ceiling and support conduit independently from the existing ceiling grid and ceiling grid supports. Do not use ceiling grid support wires to support conduits.
8. Protect all conduit stubs during construction with a disc or cap to prevent entrance of foreign material.

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9. Install No. 12 gauge galvanized steel or nylon pull wires in all conduit runs where wires or cables are not installed.
10. All conduit, conduit stub, and conduit sleeve terminations shall be provided with a bushing and nylon insert providing a smoothly rounded surface to protect the conductors.
11. All conduits shall be labeled per TIA/EIA 606, at both ends.

130.4 PENETRATIONS

Openings around penetrations through fire-resistance rated walls, partitions, floors, or ceilings shall be sealed with appropriate UL listed fire-stopping materials installed in accordance with manufacturer's written instructions. Openings around penetrations through non-fire resistance-rated walls, partitions, floors or ceilings shall have an annular space not exceeding 0.125 inches and shall be sealed on both sides of each penetration with waterproof silicon caulking compound.

130.5 PULL BOXES

Boxes shall be constructed of code gauge galvanized steel with removable screw cover attached to enclosure with corrosion resistant hardware. Boxes for indoor applications shall be NEMA 1. Boxes installed in straight runs shall be sized in accordance with the NEC based on the size of conduits entering and exiting the box. Boxes installed for angle runs or changes in direction shall be installed prior to the bend with the long radius bend to occur afterward.

Note: Condulets and Elbows are not allowed in data conduits. Pull boxes are to be located at the end or beginning of the sweep, they are not to be used for directional changes.

Provide pull boxes as required to facilitate the initial installation, to properly accommodate system maintenance, and to allow for future system expansion. Install pull-boxes in conduits for data cables at the following locations as a minimum.

1. At each location immediately prior to or after a change in direction is required which utilizes a long radius bend.
2. At selected locations to limit the total length of any cable pull not to exceed 150 feet.

Boxes installed for angle runs or changes in direction shall be sized to provide a bending radius for each pair of corresponding conduits equivalent to the bending radius provided by a long radius conduit elbow.

130.6 WIREWAYS

Where required, approved metal wireways shall be provided and installed complete with all necessary fittings, connectors, and knockouts required for the complete installation. Wireways shall be code gauge galvanized steel, with a baked enamel finish, of the lay-in type with removable covers for full channel access. The cross sectional area of the wireway shall be in accordance with the NEC for the number and size of conductors installed. The length of the wireway shall be suitable for the number and size of devices or conduits to be supplied therefrom.

130.7 FLOOR BOXES

Install and adjust floor boxes to be fully flush with all trim surfaces installed in continuous contact with floor. Install boxes parallel with or at right angles to room walls and aligned with adjacent boxes in each direction with an alignment tolerance of 1/16-inch. Walker RFB4-SS, with one or two RFB-3T-SS as needed and required trim plates with wire management blocks.

130.8 UTILITY POLES

Install vertically plumb and in alignment with adjacent poles in each direction. Support the bottom and top of pole from building structure in addition to connecting to ceiling tee system.

130.9 WORKSTATION AND ELECTRICAL OUTLET BOXES

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1. The Contractor shall coordinate his work with existing conditions so that exact locations may be obtained for all devices and wiring.
2. It shall be understood that any newly installed outlet may be relocated a distance not exceeding 15 ft. from the initial location prior to or during rough-in, if so directed by the Owner without additional cost to the Owner.
3. In open overhead spaces, cast boxes threaded to raceways need not be separately supported. Support sheet metal boxes directly from the building structure or by approved bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type fastener not more than 24-inches from the box. If approved to penetrate reinforced concrete members, avoid cutting any reinforcing steel.
4. Thru-wall type boxes are not acceptable. Outlets on opposite sides of the same wall shall be installed in separate boxes joined by an offset or close nipple with minimum length of 2-inches. Flush back-to-back boxes connected by a chase nipple are not acceptable.
5. Provide a minimum of two quad receptacles on each wall of the distribution frames, a quad outlet in each distribution panel, and one duplex receptacle at each workstation outlet, unless otherwise directed.

130.10 WORKSTATION OUTLETS

Workstation outlets shall be provided in all administrative spaces, classrooms, media centers and other locations as specified by the Owner. Install in-wall outlets in a double gang, minimum 2-1/8 inch deep cast threaded hub device boxes with mud ring. Surface mounted boxes or channel shall be of the same depth and minimum 4" x 4" square. Mounting height to be typically 18-inches above floor except where directed otherwise. Each modular jack shall be supplied with a separate workstation data cable. Provide the corresponding blank covers and wall plates based on the number of outlets needed in each location.

The WO may be recessed into the wall or surface mounted. Recessed WO boxes shall be 4" x 4" square boxes with a plaster mud ring assembly for attachment of a standard outlet cover plate. The WO may also be installed in mod furniture, in metal surface mounted raceway (i.e.- Wire-Mold) or in plastic surface mounted raceway systems (i.e. – Panduit)

Where installations allow wall outlet boxes, baseboard raceways and modular office partition to be fed by conduit simply stubbed into the ceiling, the conduit shall be 1-inch minimum in size, which has been reamed and bushed.17140 - Exterior Pathways

140.1 RACEWAYS

Unless noted otherwise, raceways shall conform to the following:

1. Raceways shall be heavy wall, hot dipped galvanized steel for the following application:
 - a. Metallic raceways buried in earth.
 - b. Raceways exposed to weather.
 - c. Exposed raceways where subject to mechanical damage.
 - d. All exposed raceway to 7'-0" above finished floor level, unless specifically approved and noted otherwise.
2. Raceways shall be electrical metallic tubing with insulated throat, steel, compression connectors and fittings, for raceways installed in riser shafts, and at underside of slabs in unfinished areas where not subject to mechanical damage.
3. Plastic raceways may be used in lieu of rigid steel for data only (no power), providing such plastic raceways and the installation conform to Article 347 of the National Electrical Code and the following restrictions:
 - a. Plastic raceways shall be permitted to be direct buried in earth provided the earth or sand is carefully compacted around the raceway. Conduit above grade shall be galvanized rigid steel.

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- b. Plastic raceways shall not be used for exposed work.
 - c. All plastic raceways shall be UL listed and meet applicable NEMA Standards. All plastic shall be Schedule 40 PVC.
4. Intermediate metallic conduit may be used in lieu of rigid steel provided installation is in full compliance with the NEC.

Flexible conduit shall **NOT** be used to house data wiring for any reason. 140.2 Pull Boxes

Boxes shall be constructed of code gauge galvanized steel with removable screw cover attached to enclosure with corrosion resistant hardware. Boxes installed outdoors shall be NEMA 3R, and shall be painted to match adjacent surfaces with a minimum of two coats of rust inhibiting paint. Boxes installed in straight runs shall be sized in accordance with the NEC based on the size of conduits entering and exiting the box. Boxes installed for angle runs or changes in direction shall be sized to provide a bending radius for each pair of corresponding conduits equivalent to the bending radius provided by a long radius conduit elbow.

Note: Condulets and Elbows are not allowed in data conduits. Pull boxes are to be located at the end or beginning of the sweep, they are not to be used for directional changes.

140.3 PROVISIONS FOR PORTABLE CLASSROOMS

Inter-building wiring distribution shall be similar to standard buildings. Fiber optics shall be used for data services. Lightning protection devices are required at each end of the cable where copper telephone and CCTV cabling is provided. *See sample details for portable distribution.*

Power wiring for workstation PRs shall be as described earlier, including surge suppressors at the power distribution panels and insulated PR grounding to the power distribution panel.

140.4 ON-SITE FIELD OBSERVATIONS

All conduits installed underground in floor slabs or concealed in ceilings or walls shall be observed prior to cover up or reinstallation of finished ceilings. The Contractor shall notify the CCSB at least (2) two days prior to completing work necessitating this required field observation. 17150 - Backbone Cabling Requirements

150.1 INTER-BUILDING BACKBONE WIRING SUMMARY

- (A) - Multimode fiber optic cable with a minimum of 12 62.5/125 micron fibers in innerduct A (Data)
- (B) - 1 RG/U 11 Coaxial Cables (Television/Video).
- (C) - PowerSum Category-5e multipair cable as necessary. Terminate on Surge Suppression within 50' of entering the building, Cross-Connect using 110-blocks, then a tie should be made to the rack patch panel(s). Terminate according to Telco Patch Panel detail.

Note: *All copper cabling requires lightning protection devices at both ends of each pair of wires or each coaxial cable.*

150.2 INTRA-BUILDING BACKBONE HORIZONTAL WIRING

- (A) - Multimode fiber optic cable with a minimum of 12 62.5/125 micron fibers (Data)
- (B) - 2 RG/U 11 Coaxial Cables (Television/Video)
- (C) - PowerSum Category-5e multi-pair cable as necessary (Voice). Terminate on 110-blocks. Surge suppression is necessary if cabling is underground (under slab). Tie to the telephone patch panel.

150.3 VERTICAL BACKBONE RISER WIRING

- (A) - Multimode fiber optic cable with a minimum of 12 62.5/125 micron fibers (Data/Voice)

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- (B) - 2 RG/U 11 Coaxial Cables (Television/Video)
- (C) - PowerSum Category-5e multi-pair cable as necessary(Voice). Terminate on 110-block, tie to patch panel.

150.4 CABLE REQUIREMENTS

The wiring systems specified in these guidelines are based on the requirements of the IEEE, ANSI, EIA/TIA 568 and TSB 36, and BICSI for horizontal premise wiring. All products must be UL listed and meet applicable local and State codes.

150.5 FIBER OPTIC CABLE

Fiber optic cable must be used for the data system backbone wiring. This includes all MCC to TC, TC to TC, and TC to DP wiring, and vertical risers if necessary. The fiber used shall meet EIA/TIA 492 AAAA standard. **A minimum of 12 fibers shall be included in all backbone cables.** All fibers must be terminated and contain no breaks. Cables that provide additional fibers to replace defective fibers are not permitted.

Fiber cable used in buried or aerial installations shall be loose tube, gel-filled design, composed of all dielectric materials and rated for outdoor use ("Indoor/Outdoor" cable shall be allowed when approved by the owner). Intra-building cabling between MCCs and TCs that has been installed above the ceiling shall be a tight buffer, non gel-filled design composed of all dielectric materials and installed in conduit.

Fiber is also to be used for the connection of multiple story riser applications. To connect TCs in multi-level buildings, a riser or plenum rated cable shall be installed. The cable must be marked OFNR (UL) and meets the UL 1666 flame test to qualify. Plenum rated cable marked OFNP (UL) may substitute for riser cable.

Backbone fiber optic cable shall be a minimum 12-fiber multi mode cable conforming to the following:

1. All backbone fiber optic cables shall be installed in conduit.
2. The contractor shall provide a **One-Year Warranty** guarding against defects in workmanship. The Contractor shall also provide the CCSD Information Services Department with a **TWENTY-FIVE YEAR** Manufacturer's Warranty on all products installed. This Manufacturer's Warranty shall cover each individual component installed in the Optical Fiber Cabling system. This includes Optical Fiber Cables, Interconnection and splice hardware, Mechanical Splice Components, and Field Installable Connectors.
3. The Manufacturer will repair or replace, at no cost to the customer, the defective components. In addition, the 62.5/125um Optical Fiber Cable will be guaranteed to provide a minimum of 500MHz*km fiber bandwidth at 1300nm and 160MHz*km at 850nm as well as providing a minimum of 300-meter link length guarantee for Gigabit Ethernet applications.
4. All-dielectric cable construction to consist of optical fibers enclosed in individual color-coded buffer tubes stranded around a fiberglass epoxy rod stabilization member. Cable core assembly to have a PVC inner jacket, a kevlar braid for tensile strength, and a black polyethylene outer jacket. The cable shall have a nominal tensile load rating of 600 pounds with a minimum bending radius of 7 inches for initial installation.
5. Each end of each installed backbone fiber optic cable shall be provided, when necessary, with a cable fanout complete with boot to allow each optical fiber to be provided with an individual connector. Each individual optical fiber in each cable shall be terminated in a standard "SC" multi-mode, epoxy cured or crimp-on connector. Small form factor MT-RJ may also be specified when necessary.

150.6 TELEPHONE BACKBONE CABLE

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Install PowerSum Category-5 multi-pair cable as necessary(Voice). Terminate on 110-blocks. Tie to the telephone patch panel. Surge-suppress as necessary.

150.7 COAX CABLE SYSTEM

School TV distribution system should be composed of RG-11 trunk lines carrying high level signal and going to each major area of the school. Appropriate value down taps, (Viewsonics VSPTRE Model Series Taps) are to be installed in the truck line to supply each classroom area with a signal between +2 and +6 db on all channels.

All Directional/Coupler Taps and splitters (if needed) shall be Indoor/Outdoor, solder back construction/RFI Integrity 100db minimum. All taps are to be installed in 8" x 8" x 4" metal boxes. All end of run trunks shall be terminated. All terminations shall use 75 ohm terminators. All unused ports on taps shall also be terminated.

Interconnect the Media Production Room and Headend with a direct cable link of the appropriately sized cable.

17160 - HORIZONTAL CABLING REQUIREMENT

160.1 INTRABUILDING HORIZONTAL WIRING

The horizontal wiring from the MCC, TC, DP to the workstation outlets is to be 24 AWG bonded pair technology, four (4) pair unshielded twisted pair (UTP). The UTP cable used must be certified to meet the industry proposed Category-6 specification. The UTP cable used must meet NFPA 262-1985 and UL 910 standards and be marked CMR or CMP or Plenum (UL) wherever necessary. The following are minimum quantities:

8 (minimum) Four Pair, 24 AWG, bonded-pair technology, "Category-6" data grade UTP cables to each classroom. Teacher location is to receive two cables, student location to receive 6.

4 (minimum) Four Pair, 24 AWG, bonded-pair technology, "Category-6" data grade UTP cables to each office location.

1 - RG/U 6 Coaxial Cable to each classroom for CCTV.

160.2 HORIZONTAL CABLE SPECIFICATIONS

Horizontal distribution cables shall be a 4 pair, bonded-pair technology, 24 AWG, 4 x 0 FEP, solid copper cable.

Non-plenum rated cables shall have semi-rigid PE insulation with PVC outer jacket. Plenum rated cables shall have FEP insulation with a brightly colored ECTFE outer jacket. Both cable types shall meet the following minimum standards:

160.2a Physical Characteristics:

Temperature Range:	-20 to 80°C
Insulation Material:	Polyolefin
Jacket Material:	PVC
Max. Pulling Tension:	45 lbs.
Min. Conductor OD:	0.022"
Min. Insulation OD:	0.038"
Min. Bend Radius:	0.1"
Nom. Diameter:	0.365" X .165"
Applicable Specifications:	TIA/EIA Draft 6 Category 6
Flame Rating and Test:	UL Type CMR, UL 1666 Riser C(UL) Type CMR, CSA FT4

160.2b Color Code:

Pair#1:White/Blue	&	Blue
Pair#2:White/Orange	&	Orange

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Pair#3: White/Green
 Pair#4: White/Brown & Brown

&

Green

160.2c Electrical Characteristics:

Max. Operating Voltage: 300 V RMS
 Nom. Capacitance @ 1 KHz: 15 pF/ft.
 Nom. Velocity of Propagation: 70%

	Delay Skew (ns/100 m)	Delay @ 100 MHz (ns/100 m)	Capacitance Unbalance (pF/100 m)	DCR @ 20°C (Ohms/100 m)	DCR Unbalance (%)
Maximum	18	510	49.2	9.0	3.0
Typical	10	480	20.0	7.4	0.8

IMPORTANT NOTE: The impedance and RL (return loss) values specified below are based on swept frequency cable input measurements only. Curve fitting or smoothing functions have not been utilized to improve the values. TIA/EIA 568-A testing allows for the use of a curve fitting function to remove the effects of random structural variations. Return Loss values are based on a 100-Ohm impedance, which is the impedance of most systems, and are not based on the fitted impedance. A Return Loss requirement is more difficult to meet than an SRL requirement. Return Loss represents the losses for the system, whereas SRL is merely a cable specification. A fitting function would improve the reported impedance and RL values.

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Frequency (MHz)	Typical Impedance	Input Spec.	Impedance	Typical (dB)	RL Min. (dB)	RL
1.0	104+/-4%	100+/-12%		29	20.0	
4.0	101+/-5%	100+/-12%		31	23.0	
8.0	100+/-5%	100+/-12%		33	24.5	
10.0	100+/-5%	100+/-12%		34	25.0	
16.0	100+/-5%	100+/-12%		34	25.0	
20.0	100+/-7%	100+/-12%		35	25.0	
25.0	100+/-7%	100+/-15%		35	24.3	
31.25	100+/-7%	100+/-15%		35	23.6	
62.5	100+/-7%	100+/-15%		35	21.5	
100	100+/-7%	100+/-15%		33	21.0	
155	100+/-7%	100+/-15%		33	21.0	
200	100+/-7%	100+/-15%		31	21.0	
250	100+/-10%	100+/-20%		30	18.0	
350	100+/-12%	100+/-22%		30	17.0	

Frequency (MHz)	Min. PSum ACR (dB/100 m)	Typ. PSum ACR (dB/100 m)	Min. PSELFEXT (dB/100 m)	Typ. PSELFEXT (dB/100 m)
.772	72	86	67	85
1.0	70	84	64.8	82
4.0	59	73	52.7	72
8.0	53	68	46.7	68
10.0	51	65	44.8	66
16.0	46	62	40.7	62
20.0	44	60	38.7	60
25.0	42	59	36.8	57
31.25	39	55	34.9	55
62.5	30	46	28.8	50
100	25	35	24.8	45
155	16	29	20.9	40
200	10	22	18.7	38
250	3	17	-	-
300	>0	15	-	-
350	-	8	-	-

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Frequency (MHz)	Min. PSNEXT (dB)	Typ. PSNEXT (dB)	Max. Atten. (dB/100 m)	Typical Atten. (dB/100 m)
.772	74	88	1.7	1.5
1.0	72.3	86	1.9	1.7
4.0	63.3	76	3.7	3.4
8.0	58.8	73	5.3	4.9
10.0	57.3	70	5.9	5.5
16.0	54.3	69	7.6	7.0
20.0	52.8	68	8.4	7.9
25.0	51.3	66	9.5	8.8
31.25	49.9	65	10.7	10.0
62.5	45.4	60	15.5	14.1
100	42.3	54	19.9	18.5
155	39.5	52	25.3	23.3
200	37.8	50	29.1	27.8
250	36.3	48	33.0	31.5
350	34.2	46	40.0	38.5

The data in the above tables represents discrete frequency points. All test must be sweep tested out to 350 MHz. The equations below are used to calculate the limits for each attribute so that a maximum (or minimum) value can be calculated at any frequency in the range.

160.2d Electrical Performance Equations:

<u>Input Impedance:</u>	1.0 - 20.0 MHz, 100 +/- 12 Ohms
	20.0 - 200.0 MHz, 100 +/- 15 Ohms
	200.0 - 310.0 MHz, 100 +/- 20 Ohms
	310.0 - 350.0 MHz, 100 +/- 22 Ohms
	350.0 - 550.0 MHz, 100 +/- 32 Ohms*
<u>Min. Return Loss:</u>	1.0 - 10.0 MHz, 20 + 5*LOG(f), dB
	10.0 - 20.0 MHz, 25 dB
	20.0 - 75.0 MHz, 25 - 7*LOG(f/20) dB
	75.0 - 200.0 MHz, 21 dB
	200.0 - 310.0 MHz, 18 dB
	310.0 - 350.0 MHz, 17 dB
	350.0 - 550.0 MHz, 14 dB*
<u>Fitted Impedance*:</u>	1.0 - 10.0 MHz, 105 +/- 10 Ohms
	10.0 - 550.0 MHz, 100 +/- 8 Ohms
<u>Max. Attenuation (dB/100 m):</u>	1.82*sqrt(f) + 0.017*f + 0.05/sqrt(f)
<u>Min. NEXT (dB):</u>	76 - 15*LOG(f/.772)
<u>Min. PSNEXT (dB):</u>	74 - 15*LOG(f/.772)
<u>Min. PSACR (dB/100 m):</u>	74 - 15*LOG(f/.772) - (1.82*sqrt(f) + 0.017*f + 0.05/sqrt(f))
	+25 up to 100 MHz
	+10 up to 200 MHz
	>0 up to 300 MHz (positive PSACR)
<u>Min. ELFEXT (dB/100 m):</u>	70 - 20*LOG(f/.772), up to 200 MHz
<u>Min. PSELFEXT (dB/100 m):</u>	67 - 20*LOG(f/.772), up to 200 MHz

where f is the frequency from 0.772 to 350 MHz.160.3 CCTV Cables

Classroom branch cables should be RG-6 foam dielectric, braid-over foil, double shielded cable.

1. RG-6 shall be used for TV wiring going to the TV outlet.
2. RG-6 shall be used between In-House channel inputs and the Headend equipment.
3. Inter connections at the Headend equipment shall be RG-6.

The contractor will provide jumper cables with standard "F" connectors to connect stand or wall mounted televisions to the wall plates.

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160.4 WORKSTATION OUTLET

The workstation outlet (WO) is the connection point between the horizontal cable and the user area. The power receptacles (PR) provide the workstation devices connection to the power circuits. Connections are accomplished using jacks/ports for the workstation outlet and plugs for the power outlet. Every user area shall include a minimum of one WO and one PR. Alternate room arrangements that would meet instructional need should be considered during installation. Long areas designated as workstation areas may be served by using dual channel divided wire mold with receptacles and WO located as needed. Eight position modular jacks shall be used in all work areas and shall exceed the current connector requirements of the proposed TIA/EIA Category 6 standard. The jack termination to 4 pair 24 AWG 100ohm solid unshielded twisted pair cable shall be accomplished by use of a forward motion

Termination cap and shall not require the use of a punchdown tool. The Baseplate jacks shall be 8-position non-keyed (EIA/TIA 568B) jacks. **The application of the jacks will be universal and is determined by the connection made at the MCC, TC, or DP (i.e. data, voice or video).** Workstation outlets shall be provided in configurations of one, two, three, four, five, or six modular jacks installed as specified in the design documents. Installations should use 6-position faceplates and fill unused positions with blank modules when necessary.

Each workstation shall have a WO and PR within six feet.

Currently Proposed Category-6 Connecting Hardware Specifications:

Frequency (MHZ)	Atten.	NEXT	FEXT	PS NEXT	PS FEXT	Return Loss
20	< 0.09	>68.0	>57.1	>64.0	>54.1	>35.0
100	<.20	>54.0	>43.1	>50.0	>40.1	>24.0
200	<.28	>48.0	>37.1	>44.0	>34.1	>18.0
250	<.32	>46.0	>35.1	>42.0	>32.2	>16.0

All values are in dB

160.5 PORTABLE PROVISIONS

ITV outlets for future use in connecting portables or temporary classrooms will be installed on the outside of the school buildings at DESIGNATED LOCATIONS in a weatherproof box above the ground. The standard F-81 connector will be used to terminate inside the box. (*See Portable Distribution Detail*).

17170 - IDENTIFICATION, TESTING, AND ADMINISTRATION

170.1 IDENTIFICATION

170.1a Hub Backboards and Terminal Cabinets

Each data cabinet, closet, etc. (The term cabinet will be used generically) shall be identified with a unique designation consisting of the space "fish" number where the cabinet is located and its logical location on the backbone. This will create a unique identifier such as "Data Cabinet - 110A", or "Data Cabinet - 225C".

Each data cabinet shall have an identifying nameplate affixed such as "DATA CABINET - 110A", etc. Nameplates shall be laminated plastic with 1/4-inch high white engraved letters on black background. Nameplates shall be affixed by two rustproof screws, epoxy cement, or substantial double-stick tape.

All cables for both communications and power, shall be identified and labeled at the origination point (MCC, TC, DP, etc) and at the termination point (WO and PR).

170.1b Conduit and Pull Boxes

All pull boxes and data conduits at each pull box, hub backboard and hub terminal cabinet shall be marked using an indelible marker to indicate origination and destination, i.e. "From Data Cabinet 110A to Workstation 100A."

170.1c Data Conductor Color Coding

Color-coding shall be by factory applied color-impregnated insulation.

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170.1d Backbone and Workstation Cables

Each backbone cable shall be identified with a unique number at each end, and at all pull or junction boxes. Additionally, at each cabinet location each backbone cable shall be provided with a vinyl cable tag marked to indicate the destination of the respective cable i.e. "To Data Cabinet 110A" etc. Each workstation data cable is to be identified at each end with a standard vinyl cable tag located within 12-inches of the cable's end. The Clay County School District has implemented a "Color Code Sequence" for all Workstation Outlets.

Jack "A" = Grey
Jack "B" = Red
Jack "C" = Yellow
Jack "D" = Blue
Jack "E" = Green
Jack "F" = Violet

Color Coding shall apply to the horizontal cabling and all termination hardware (Jacks, Patch Panels Ports, Modules, etc)

170.1e Patch Panels and Workstation Outlets

Each data outlet connector and associated port in the respective patch panel shall be identified with a unique designation consisting of the space "fish" number where the outlet is located and a sequentially incrementing suffix number for each outlet connector located in the space (i.e. 100-1, 100-2, etc.). Labels shall be nominal 1/4-inch high, 1-inch wide, machine printed, self-laminating, vinyl labels with white background and black text. Attach labels directly adjacent to respective connector. Patch Panel designations shall be identified by the Workstation Outlet designation (101-1) as well as the Jack Location Letter (A-F), to provide a cohesive labeling scheme for non-technical staff to be able to follow. All color coding sequences as listed above shall be followed on Workstation Outlets and Patch Panels, concerning the Jacks and Cabling. **Use final FISH identifiers for final labeling and not temporary construction identifiers.** See *Sample Patch Panel Detail. Coordinate Labeling with CCSD Technology Division.*

170.1f CCTV Outlets and TAPS

Each tap shall be labeled so as to identify the CCTV outlet to which it is connected, i.e. <To F100> where the "F" stands for the TV "F" connector and the 100 the room number where the outlet is located. The corresponding room outlet shall be labeled in the same manner (F100).

CCTV Outlets in specially designated locations shall be placed at a 60" height above floor grade, to provide for customer connection to either a television, or remote video production gear. This provision is a modification to the previous requirements of having one outlet 18" below ceiling height, and one 18" above floor grade for these locations.

170.2 SYSTEM TESTING

Upon final walkthrough, the Contractor shall present the documentation of the installed cabling system. This includes, but is not limited to, Test Results for the Copper cabling plant, Optical Fiber Cabling Plant, Ground measurements in Ohms, Backbone Plant Design, and "As-Built" drawings in paper and electronic format. The test results shall be bound in 3-ring binders. Individual binders may be necessary for each building on a campus, however, at a minimum dividers shall be placed inside the binder to designate individual building cabling test results. Summary reports are to precede the detailed cabling test results for each individual conductor/strand of fiber. At no time shall a summary report replace detailed reporting of a cable.

A 20% random verification test will be performed against the test results. Both Information Services Staff and the Contractor Staff shall perform this test. The same test equipment MUST be used for the random verification test as was used to derive the original test reports. Serial numbers will be verified as to eliminate any calibration differences. Fully charged batteries will be brought to the walkthrough procedure, eliminating the need to use building power / power transformers which may skew the cable test results.

If 20% of the selected tests are found to not match the reported test results, then a 100% re-test shall be performed, comparing the results against the initial test results. If 20% of the entire cabling plant fails this final test, and the failure cannot be shown to be the responsibility of the product manufacturers, then the Con-

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tractor shall remove all existing cabling and termination hardware, and re-install the complete cabling system within a timely manner, replacing all installed equipment at no cost to the Clay County School District.

170.3 APPROVED DATA TEST EQUIPMENT

Microtest - Omni Scanner2, Cat 6 Link Test
Datacom Textron, DSP, Cat 6 Link Test
Fluke - DSP 4000, Cat 6 Link Test
Scope Communications - Wirescope 350, Cat 6 Link Test
Wavetek, LT8600, Cat 6 Link Test
Corning Cable Systems, OTDR Mini

170.4 CABLING TEST DOCUMENTATION

Upon completion of each installation and prior to acceptance by the Clay County School Board the contractor shall test the cabling system using test equipment complying with the current specifications of the TIA/EIA Category-6 and TSB-67 Level II E, or better, and approved by the CCSB Technology Division. Upon completion of testing the contractor shall compile and submit a sorted report. **Reports shall be tabulated and sorted on a per cable basis using the outlet number for horizontal cables or the tagged cable identification number for backbone cables. The report is to include 2 hard copies and 2 set of data disks. The contractor must also supply the corresponding licensed software, so the Owner may read and verify the test results. These reports shall be placed in notebooks separated by closet and sorted by WO identification. The report notebooks are to be clearly identified using sheets in vinyl slipcovers. Maps identifying the areas covered by the closet are to be included.**

Test reports for copper cables shall be BASIC LINK tests to include the following information and meet the following specifications as a minimum:

Reported Test Results shall be based on these guidelines, and be verified with Test Equipment that verified the following:

- **Wire Map:** Verifies all conductors, bi-directionally
- **NEXT (Near End Crosstalk):** Tests all 8pair combinations from both directions
 1. Frequency Range: 1 to 300 MHz
 2. Dynamic Range: >100dB
 3. Measurement Accuracy: To be calculated per TIA error model
 4. Measurement Resolution: 0.1 dB
- **Return Loss:** Measure Return Loss on all 4 pairs from both directions
 1. Frequency Range: 1.0 to 300 MHz
 2. Dynamic Range: 0-25 dB
 3. Device must be factory calibrated to ensure measurement port match to reference 100 ohm impedance
 4. Measurement Accuracy: Must meet proposed 200 MHz Level III accuracy requirements
 5. Measurement Resolution: 0.1 dB
- **Attenuation:** Tests all 4 pairs using remote device as far end active signal injector
 1. Frequency Range: 1.0 to 300MHz
 2. Dynamic Range: >80 dB
 3. Measurement Accuracy: 100MHz – 0.6 dB, 200 MHz – 0.7 dB, 300 MHz – 1.0 dB
 4. Measurement Resolution: 0.1 dB
- **ELFEXT (Equal Level FEXT):** Test from both directions using remote and report all 24 pair combinations
 1. Frequency Range: 1 to 300 MHz
 2. Dynamic Range: >100 dB
 3. Measurement Accuracy: Must meet proposed 200 MHz Level III accuracy requirements
 4. Measurement Resolution: 0.1 dB
- **ACR (Attenuation to Crosstalk Ratio):** Computed for all 4 pairs from both ends at all frequency points from respective pair to pair NEXT and Attenuation Measurement
- **Length: Range:** 0 to maximum distance, where maximum distance = 457 m (1500 ft) for twisted pair cable;
 1. Accuracy: $\pm K \pm$ Length resolution \pm NVP uncertainly, where $K = \pm 4\%$ of length or 0.6 m (2 ft), whichever is greater.
 2. Length resolution: 0.3 m (1 ft)
- **Resistance: Range:** 0-500 W;

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1. Accuracy: ± 0.5 dB @ 0 to 15 W, $\pm 2\%$ @ 15 to 500 W
 2. Resolution: 0.1 dB
- **Power Sum NEXT, ACR, ELFEXT:** Computed for both ends from respective pair to pair NEXT, Attenuation and ELFEXT Measurement
Below is listed a table of the currently proposed limits for testing requirements for the currently proposed Category-6 specifications:

Attenuation (dB)
36
Return Loss (dB)
8.0
Pair-to-Pair NEXT (dB)
33.1
Pair-to-Pair ELFEXT (dB)
15.3
PowerSum NEXT (dB)
30.2
PowerSum ELFEXT (dB)
12.3
PowerSum ACR (dB)
-5.8

Test fiber optic strands at both 850 and 1300 NM. Test report for fiber optic cables shall include the following as a minimum:

1. Cable Length
2. Continuity test
3. Insertion Loss
4. Budget/Connector Loss
5. Optical Time Domain Reflectometer (OTDR) test.
6. Attenuation Graph

1. Test Process

- a) Owner reserves the right to be present during any or all of testing.
- b) Testing shall be of the optical link. An optical fiber link is defined as the passive cabling network between two optical cross-connects (patch panels or outlets). This includes cable, connectors and splices but does not include active components. The link test contains the representative connector loss at the patch panel associated with the mating of patch cords but does not include the performance of the connector at the equipment interface.
- c) All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner.
- d) 100% of the installed cabling must be tested. All tests must pass acceptance criteria defined in Part 2, section 3.
- e) Either the test equipment shall be fully charged prior to each days testing or a fresh set of batteries shall be brought to the job site.

2. Standards Compliance & Test Requirements

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a) Unless otherwise specified, multimode and single-mode fiber cable must meet the transmission performance parameters as specified in ANSI/TIA/EIA-568-B.3. Multimode fiber shall have core/cladding dimensions of 50/125 mm or 62.5/125 mm. Single-mode fiber shall be Class IVa dispersion-unshifted fiber.

b) Testing of installed multimode fiber cable.

- i) Link attenuation shall be tested in accordance with ANSI/TIA/EIA-526-14A. Reference measurements shall be made in accordance with method B or equivalent. Optical loss shall be measured on each fiber at 850 nm and 1300 nm. Loss shall be measured on each fiber from each direction (bi-directionally).
- ii) Link length shall be optically measured using an OTDR.

iii) Cabling shall meet the following loss and length criteria for either horizontal or backbone links depending upon application. Horizontal cabling is the cable between and including the telecommunications outlet/jack and the horizontal cross connect. Horizontal links are a maximum of 90 m (295 ft) in length. Backbone cabling is the cable between telecommunications closets, entrance facilities, and equipment rooms within or between buildings. It includes the cross connect connectors and splices (if any).

iv) Horizontal link criteria:

Attenuation: < = 2.0 dB at 850 nm and 1300 nm
 Length: < = 90 m (295 ft)

v) Backbone link criteria:

Attenuation 850 nm: < = fiber length (km) x 3.75 dB/km
 + number connector pairs x 0.75 dB
 + number of splices x 0.3 dB
 Attenuation 1300 nm: < = fiber length (km) x 1.5 dB/km
 + number connector pairs x 0.75 dB
 + number of splices x 0.3 dB
 Length: < = 2000 m (6560 ft)

c) Testing of installed single-mode fiber cable.

i) Link attenuation shall be tested in accordance with ANSI/TIA/EIA-526-7 method A. Reference measurements shall be made in accordance with method A.1 or equivalent. Optical loss shall be measured on each fiber at 1310 nm. Loss shall be measured on each fiber from each direction (bi-directionally), unless it is known in advance which fibers shall transmit (TX) and receive (RX).

ii) Link length shall be optically measured or calculated using cable sheath length markings.

iii) Cabling shall meet the following loss and length criteria. Single-mode fiber is typically used in backbone cabling between telecommunications closets, entrance facilities, and equipment rooms within or between buildings. It includes the cross connect connectors and splices (if any).

iv) Link criteria:

Length	< = 90 m (295 ft)	91-1000 m (3281 ft)	1001-2000 m (6562 ft)	2001-5000 m (16404 ft)
Attenuation 1310 nm	< = 2.0 dB	< = 3.0 dB	< = 3.3 dB	< = 4.7 dB

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d) All test equipment used must meet the performance specifications defined in section 5 below.

3. Documentation

a) Test reports are to be submitted in hardcopy and electronic format. Hand-written test reports are not acceptable.

b) Hardcopy reports are to be submitted in labeled 3 ring binders with a witness signature verifying passing execution of all tests.

c) Electronic reports are to be submitted on 3.5 inch diskettes or CD format. Disk or CD shall contain the software required to view test results. Electronic reports must be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate must reference traceable circuit numbers that match the electronic record.

d) Test reports shall include the following information for each cabling element tested:

i) Actual measured and maximum allowable attenuation (loss) at the specified wavelengths per Part 2 Section 3, and the margin. An individual test that fails the link criteria shall be marked as FAIL.

ii) Reference method.

iii) Number of mated connectors and number of splices (if any).

iv) Actual length and maximum allowable length per Part 2 Section 3. Any individual test that fails the link length criteria shall be marked as FAIL.

v) Group refractive index (GRI) for the type of fiber tested as reported from the OTDR when optically measured.

vi) Tester manufacturer, model, serial number and software version.

vii) Circuit ID number and project/job name.

viii) Link criteria (Autotest) used.

ix) Overall pass/fail indication.

x) Date and time of test.

e) Test reports shall be submitted within 7 business days of completion of testing.

4. Test Equipment

a) Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers must be ISO 9001 certified.

b) All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.

c) Test equipment shall be capable of measuring relative or absolute optical power in accordance with TIA/EIA-526-14A, "Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant," and TIA/EIA-526-7 method A, "Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Insertion Loss Using An Optical Power Meter."

d) Test equipment shall not include the loss or length of the test jumpers in the cable plant measurements.

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- e) Multimode test equipment shall incorporate both 850 nm and 1300 nm sources in same unit. The coupled output power into multimode fiber shall be ≥ -20 dBm at each wavelength. Detectors shall have a dynamic range of at least +3 dB to -55 dB.
- f) Sources and meters shall automatically synchronize wavelengths to prevent calibration-related errors.
- g) Test equipment shall store at least 100 tests in internal memory.
- h) Test equipment shall employ a communications port to facilitate uploading of saved information from tester to PC.
- i) The time-of-flight methodology shall be employed when optically measuring fiber length.
- j) Test equipment capable of measuring a Tx/Rx fiber pair simultaneously is recommended to enhance productivity.
- k) It is recommended that test equipment utilizing dual function main and remote units be used for bi-directional testing, eliminating the need to swap optical source and power meter.

Acceptance

1. Acceptance

- a) Once all work has been completed, test documentation has been submitted, and Owner is satisfied that all work is in accordance with contract documents, the Owner shall notify Contractor in writing of formal acceptance of the system.

2. Acceptance Requirements

- a) Contractor must warrant in writing that 100% of the installation meets the requirements specified under Part 2, section 3 (Standards Compliance & Test Requirements) above.
- b) Owner reserves the right to conduct, using Contractor equipment and labor, a random re-test of up to twenty (20) percent of the cable plant to confirm documented results. Any failing cabling shall be re-tested and restored to a passing condition. In the event more than two (2) percent of the cable plant fails during re-test, the entire cable plant shall be re-tested and restored to a passing condition at no additional cost to the Owner.
- c) Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation as described in Part 2, section 4.

3. Warranty

- a) Contractor shall warrant Installation against all product defects, and that all approved cabling components meet or exceed the requirements of this document for a ONE (1) year period. In addition to this ONE-YEAR WARRANTY, the Contractor shall provide documentation that the installation is covered by the manufacturer's Extended Warranty Plan, which covers the entire cabling system for a period no less than FIFTEEN YEARS.

170.5 CCTV SYSTEM TESTING

The CCTV system shall provide for reception of all local channels, in-school channels, and CCTV channels at every outlet, located as shown in the design drawings, equal to or superior to that obtained on a single receiver connected directly to the local CATV input.

No cross-modulation, co-channel, adjacent channel or any type of interference is to be viewed at any TV outlet using a standard cable ready color TV receiving all local cable TV channels.

Before the system's performance can be analyzed it must be aligned and balanced. This involves adjusting the gain or sensitivity of the system's amplifiers to match the signal levels and impedance within the system. Slope adjustments must be made subsequent to installation.

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Signal strength and clarity of picture and audio shall be tested and documented for every TV outlet. Each outlet is to be tested and written documentation of the test results provided to the owner in triplicate. These tests shall be conducted across the local cable spectrum; one on the low band, one on the middle band and one on the high band of the spectrum for the following items:

- Distortion
- Signal Uniformity
- Signal-to-Noise Ratio
- Signal ingress
- Hum Modulation

Any Hum modulation encountered must be corrected with the proper filters, attenuators, and amplifiers.

Once the complete system is operational, sweeps are to be done for leakage detection up to 125 - 130 MHz (Channel 15), corrections are to be made if measurements exceed 15 mV per meter.

170.6 GROUNDING AND BONDING INFRASTRUCTURE

Each telecommunications-bonding conductor shall be labeled in accordance to TIA/EIA-607 5.1.5 and ANSI/TIA/EIA 606 Section 7. See the appropriate standards for specifics.

170.7 GROUND CONDITION VERIFICATION

The final report is to include certification that proper ground conditions exist with any variations indicated. All cabinets and/or racks must be grounded and/or bonded to the Telecommunications Main Grounding Bus Bar (TMGGB).

170.8 SYSTEM DOCUMENTATION

As part of the wiring system installation, the contractor shall provide detailed documentation of the distribution system to facilitate system administration, system maintenance and future system changes. This requirement includes as-built drawings with all cables and terminations identified, a bill of materials of all installed equipment and wiring, rack and backboard equipment layouts showing placement of support equipment, and model and serial numbers of all installed equipment. The labeling nomenclature describe earlier is to be used on documentation and the cable labeling which facilitates locating and identifying each cable.

Provide simple maps to identify the rooms and areas closet serves. Maps shall be located in the folders for each closet containing the local copy of the cabling test results.

After completion of the work, the contractor shall furnish three (3) complete sets of operating instructions, including circuit diagrams and other information necessary for proper operation and maintenance of system components.

17180 - CUTOVER & TRAINING

180.1 TRAINING

Training of school and district personnel shall be provided. Training will cover the location nomenclature, documentation structure and contents, documentation maintenance procedure, a "walk through" for location and labeling orientation, system reconfiguration using MCC, TC, and DP facilities (termination hardware, patch cables, etc.), operation of the network equipment provided as part of the contract, test documentation, and trouble shooting of the signal and power cable portion of the installation.

17190 MANUFACTURER'S WARRANTY OF INSTALLED EQUIPMENT

It is required that the Installation Contractor(s) offer manufacturer extended warranties for the systems installed. The details of the extended warranties are listed below. It would be advantageous to seek out select contractors that meet the qualifications of the manufacturers of ALL systems installed. It is typical of high quality contractors to be certified in the installation of Copper Cabling, termination of Copper Cabling, Installation of Optical Fiber Cabling, and termination of Optical Fiber Cabling. These contractors typically

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are corporate members of one or more professional cabling organizations, such as BICSI ([Building Industry Standards Consultants International](#)), ACP ([Association of Cabling Professionals](#)), AECT ([Association for Educational Communications & Technology](#)), CSI ([Construction Specifications Institute](#)), FOA ([Fiber Optic Association](#)).

190.1 BELDEN CABLE/PANDUIT SYSTEMS EXTENDED MANUFACTURER WARRANTY

Panduit Systems, in conjunction with Belden, Inc. offer advanced training for Contractors/Installers. The Panduit training program includes the ANSI/TIA/EIA 568-A and IEC/ISO 11801 standards as well as the proper installation techniques for Panduit Network Connectivity Group products. Contractors/Installers that successfully complete this training have the ability to offer an Extended Warranty on the installed cabling system. This Extended Warranty covers the cabling as well as ALL termination hardware, and support equipment as supplied by the manufacturer. This warranty covers the material, as well as the time and labor for repairs. The warranty offers an umbrella of coverage that states that the ENTIRE COPPER CABLING SYSTEM will perform to the highest standards available at the time of install, for a period of 15-years in addition to other system warranties.

Contractors/Installers will bear the following logo to show they have successfully completed the training listed above:



Contact Panduit Systems for a current list of PSC Certified installers.

190.2 CORNING SYSTEMS EXTENDED WARRANTY

In order to protect our Fiber Optic Cabling Solution, Corning Cable Systems offers the LANscape Extended Warranty. The warranty covers each product component as well as the total performance of the Corning Cable Systems cabling system. Corning Cable Systems guarantees to repair or replace defective products free of charge after installation. Corning Cable Systems' network of nationwide Extended Warranty Program (EWP) installers are carefully selected. Each member-company meets Corning Cable Systems' stringent requirements for technical experience, financial strength, and proven dedication to quality. EWP installers must demonstrate ongoing commitment to extensive factory training and are required to update training at least once every two years.

Below is a list of Corning Certified EWP installers in the Florida region:

BMW Communications, Inc. [Sanford](#) FL 32771 407-321-5160
Commercial Communications Systems, Inc. [Orlando](#) FL 32808 407-578-5160
Compulink Network Installation Services [St. Petersburg](#) FL 33716 727-579-1600
Converged Communications [Jacksonville](#) FL 32258 904-886-0080
Custom Cable Industries [Tampa](#) FL 33619
Data One, LLC [Port St. Lucie](#) FL 34952 561-337-4753
Delta Technologies [Crawfordville](#) FL 32326 850-575-3977
Dial Communications [Tallahassee](#) FL 32310 850-877-3282
Emerald Coast Communications [Milton](#) FL 32570 850-623-6231
Fisk Information Technologies [Miami](#) FL 33178 888-374-1223
Florida Intranet Group, Inc./Black Box [Miami](#) FL 33186 800-606-6467
Milcom Corp. [Pensacola](#) FL 32505 850-478-4836
Miller Electric Company [Jacksonville](#) FL 32201 904-981-0235
Morse Communications [Melbourne](#) FL 32940 407-259-8469
Network Cabling Services [Orange Park](#) Florida
Precision Contracting Services, Inc. [Jupiter](#) FL 33458 561-743-9737
TeleCommunication Systems [Tampa](#) FL 33629 813-831-6353
Total Cabling Solutions [Sawgrass](#) FL 33325 954-846-8787
Universal Fiber Optics, Inc. [Altamonte Springs](#) FL 32714 800-583-6462

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VCH Communications, Inc. [Orlando](#) FL 32809 407-857-7333

Additional contractors may join this list in the future, so a current listing should be obtained from Corning Cabling Systems prior to posting the RFQ/RFP for the contract.

190.3 BELDEN REGISTERED INSTALLATION CONTRACTORS (BRICs)

Below is a list of Contractors that have received certification from Belden Cable as BRICs.

Company Name	Address	Phone/Fax	Contact
Network Cable Systems	Orange Park, FL		
TICS	Jacksonville, FL		John Gray
Converged Communications	Jacksonville, FL	904-886-0080	Ray Westhoff
Exum Communications	Jacksonville, FL		Robin Exum
Commercial Communications Systems, Inc	Orlando, FL	407-578-5160	Vicky Carter
Miller Electric	Jacksonville, FL	904-981-0235	
BMW Communications, Inc	Sanford, FL	407-321-5160	
Compulink Network Installation Services	St. Petersburg, FL	727-579-1600	
Custom Cable Industries	Tampa, FL		
Data One, LLC	Port St. Lucie, FL	561-337-4753	
Delta Technologies	Crawfordville, FL	850-575-3977	
Dial Communications	Tallahassee, F	850-877-3282	
Emerald Coast Communications	Milton, FL	850-623-6231	
Fisk Information Technologies	Miami, FL	888-374-1223	
Florida Internet Group, Inc/Black Box	Miami, FL	800-606-6467	
Milcom Corp.	Pensacola, FL	850-478-4836	
Morse Communications	Melbourne, FL	407-259-8469	
Precision Contracting Services, Inc	Jupiter, FL	561-743-9737	
Telecommunication Systems	Tampa, FL	813-831-6353	
Total Cabling Solutions	Sawgrass, FL	954-846-8787	
Universal Fiber Optics, Inc	Altamonte Springs, FL	800-583-6462	
VHC Communications, Inc	Orlando, FL	407-857-7333	

Additional contractors may join this list in the future, so a current listing should be obtained from Belden Cable prior to posting the RFQ/RFP for the contract.

190.4 RECOMMENDATION FOR CONTRACTORS THAT ARE PANDUIT PSC, BELDEN BRIC, AND CORNING EPW CERTIFIED

Below is a short list of contractors that the Clay County School District Information Services Department has had prior experience with. We have on file copies of their current manufacturer certifications. We recommend contacting them for quotes for projects, due to the locations of their offices, availability of technicians, and high level of quality and professionalism they have shown in the past.

Network Cable Systems	Orange Park, FL		
Converged Communications	Jacksonville, FL	904-886-0080	Ray Westhoff

Additional contractors may join this list in the future, so a current listing should be obtained from Information Services prior to posting the RFQ/RFP for the contract17300 - Telephone System

17480 - TRAINING

480.1 CUSTOMER TRAINING

Training of school and district personnel shall be provided. Training will cover the location nomenclature, documentation structure and contents, documentation maintenance procedure, a "walk through" for location and labeling orientation, system reconfiguration using MCC, TC, and DP facilities (termination hardware, patch cables, etc.), operation of the network equipment provided as part of the contract, test documentation, and trouble shooting of the signal and power cable portion of the installation.

17600 - ARCHITECTURAL, ELECTRICAL, & MECHANICAL REQUIREMENTS

Electrical System Overview

(Refer to Section 16000 if exists, or add electrical information here.)

17610 - CER AND ACCESS POINT REQUIREMENTS

Building design should allow for a minimum closet size of 10' x 12' for the main low voltage system closet. Design the layout of distribution closets from left to right around the room. Doors should swing out and flat against the wall or be located so they swing in and the area behind them is utilized for the entrance conduits from the outside services. See *sample diagram*.

610.1 TELECOMMUNICATIONS CLOSET (TC)

Security should be provided for the TC through the use of locking hardware and door contacts. *The TC is not to serve as storage or janitorial rooms. Water pipes and mechanical rooms are to be avoided.*

610.1a Room Finishes

The floor of the TC shall be smooth and free of cracks, crevices and dust and capable of supporting a 250 pound per square foot load. If concrete is used a dust protective sealer shall be applied. Carpet is not acceptable. The wall should have 3/4 inch flame retardant marine grade plywood backboards installed from near floor to near ceiling. Plywood shall be painted light gray on both sides with fire retardant paint.

A 9'-0" or higher ceiling is desirable. Finished ceilings are not required, but walls must then extend to the roof deck and a return air vent must be installed. Their shall be NO roof penetrations above the TC.

No windows, louvers, or access panels are to be in the TC.

A 3'-0" x 6'-8" minimum door is required. Doors should be metal or solid core wood with lockable hardware.

Non-EMI generating lighting should be installed in a manner to eliminate shadows. A minimum lighting level of 50 foot-candles measured at 3 feet above the floor shall be provided in front and in rear of telecommunications racks.

610.1b Cable Tray

Ladder type cable tray 18" wide by 4" deep, with a rung spacing not to exceed 9", should be installed from rack to backboard. Cable tray is to be installed as high as possible to make maximum use of the backboard and to coordinate with conduits entering the TC. The tray is to be used to distribute cables from point of entry to the designated termination points. Distribution from the cable tray to termination shall be done utilizing the cavity created by the backboards and struts.

610.1c Electrical

Double duplex outlets shall be installed on the Lower Left, Lower Center, and Lower Right areas of each individual Backboard to accommodate equipment. All receptacles should be 120 volt, 20 ampere outlets NEMA 5-20R. Both double duplex receptacles should be on a dedicated 20 Amp breaker.

610.1d Grounding

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A ½ inch trade-size conduit shall be provided from the TC to the building grounding electrode. A ground bus sized for #6 AWG ground conductors shall be installed to the plywood backboard. A #6 AWG solid copper insulated grounding wire shall be provided from the ground bus to the building main electrical service entrance disconnect enclosure. Separate solid #6 AWG insulated grounding wires shall also be connected between the ground bus and the building grounding system. Ground all racks and equipment as necessary. Bond all building closets together.

610.1e Room Temperature and Humidity

The room ambient temperature shall be maintained between 55° F and 78° F. Relative humidity shall not exceed 40 percent. Any required cooling shall accommodate an internal 50 watt per square foot heat load generated within the ER. Provide a separate thermostat for the room.

610.1f Fire Extinguisher

A portable carbon dioxide fire extinguisher shall be provided and maintained within the TC as close as practical to the entry or exit.

610.1g Cableway

Closets shall be connected to the backbone cableway for routing of communications from other communications closets or equipment rooms and the user outlets. The cableway may be provided by cable raceway or conduit nipple through the closet wall toward the ceiling raceway system. One 4" conduit nipple shall be provided for every 30 WO boxes served. In addition, a minimum of one 3" conduit nipple shall be provided for every IC or TC located on the same floor and for every IC or TC located on other floors that will be interconnected with this IC.

17630 - MDF REQUIREMENTS

See 17610

17640 - UPS AND BACKUP POWER REQUIREMENTS

640.1 UPS REQUIREMENTS

Provide UPS Backup as required by the equipment located in each closet.

Coordinate sizing with Clay County School District Information Services Department. 17650 - Computer Labs

650.1 GENERAL REQUIREMENTS

Electrical circuitry must be provided to supply enough electricity for the microcomputers, printers, large monitor screens, and computer projection systems to be utilized in the lab. Facilities must adequately provide for current technology and future expansion of equipment.

In addition, data cabling must be pre-routed within the lab to allow for computer networking. This network should be designed in such a way so that it may be easily connected to the school wide network. A minimum of 32 connections and shall be spaced around the computer lab, possibly through the use of Power Distribution Poles, however the use of Wall Outlets is preferred. All computer labs shall have a minimum of 32 cables.

17680 - WORKSTATION LOCATION SPACE REQUIREMENTS

Each student computer location requires a minimum of 30" x 30" of clear flat desk space. Each office computer location requires a minimum of 30" x 30" of clear flat desk space plus clear work space for phones and other office equipment. Electrical and data outlets are to be within six (6) feet of these locations.

17690 - EXTERIOR SERVICES

17800 - MISCELLANEOUS ITEMS & PRODUCTS

17810 - PATCH AND WORKSTATION CABLES

All patch cables are to be equipped with a protective collar for the connectors. The cable jacket is to be firmly encased within each collar. Patch and Workstation Cables shall range from 3 to 12 feet lengths.

4 pair UTP (unshielded twisted pair) patch cable, stranded tinned copper, polyolefin insulated adjoined singles, flexible PVC jacket. T568B RJ-45:

	Delay Skew (ns/100 m)	Delay @ 100 (ns/100 m)	Capacitance Unbalance (pF/100 m)	DCR @ 20°C (Ohms/100 m)	DCR Unbalance (%)
Maximum	18	510	49.2	9.0	5.0
Typical	10	480	20.0	8.2	0.8

Frequency (MHz)	Input Spec.	Impedance	Typical Impedance	Input Min. (dB)	RL Typical (dB)	RL
1.0	100+/-12%		104+/-4%	20.0	29	
4.0	100+/-12%		101+/-5%	23.0	31	
8.0	100+/-12%		100+/-5%	24.5	33	
10.0	100+/-12%		100+/-5%	25.0	34	
16.0	100+/-12%		100+/-5%	25.0	34	
20.0	100+/-12%		100+/-7%	25.0	35	
25.0	100+/-15%		100+/-7%	24.3	35	
31.25	100+/-15%		100+/-7%	23.6	35	
62.5	100+/-15%		100+/-7%	21.5	35	
100	100+/-15%		100+/-7%	21.0	33	
155	100+/-15%		100+/-7%	21.0	33	
200	100+/-15%		100+/-7%	21.0	31	
250	100+/-20%		100+/-10%	18.0	30	
350	100+/-22%		100+/-12%	17.0	30	

Frequency (MHz)	Min. Psum (dB/100 m)	ACR Typ. (dB/100 m)	Psum ACR Min. (dB/100 m)	PSELFEXT Typ. (dB/100 m)	PSELFEXT
.772	74.2	86	67	85	
1.0	72.3	84	64.8	82	
4.0	61.2	73	52.7	72	
8.0	55.0	68	46.7	68	
10.0	52.8	65	44.8	66	
16.0	48.0	62	40.7	62	
20.0	45.5	59	38.7	60	
25.0	42.9	57	36.8	57	
31.25	40.2	53	34.9	55	
62.5	30.4	44	28.8	50	
100	22.3	33	24.8	45	
155	11.1	27	20.9	40	
200	4.8	20	18.7	38	
250	-	15	-	-	
350	-	1	-	-	

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Frequency (MHz)	Min. (dB)	PSNEXT Typ. (dB)	PSNEXT Max. (dB/100 m)	Atten. Typical (dB/100 m)	Atten.
.772	74	88	1.8	1.5	
1.0	72.3	86	2.0	1.8	
4.0	63.3	76	4.1	3.6	
8.0	58.8	73	5.8	5.1	
10.0	57.3	70	6.5	5.8	
16.0	54.3	69	8.2	7.4	
20.0	52.8	68	9.3	8.4	
25.0	51.3	66	10.4	9.4	
31.25	49.9	65	11.7	10.7	
62.5	45.4	60	17.0	15.6	
100	42.3	54	22.0	20.8	
155	39.5	52	30.4	25.7	
200	37.8	50	35.0	31.3	
250	36.3	48	39.6	37.1	
350	34.2	46	51.1	46.2	

The data in the above tables represents discrete frequency points. All tests are sweep tested out to 350 MHz. The equations below are used to calculate the limits for each attribute so that a maximum (or minimum) value can be calculated at any frequency in the range.

810.1 ELECTRICAL PERFORMANCE EQUATIONS

Input Impedance (Ohms)	1.0 - 20.0 MHz, 100 +/- 12 20.0 - 200.0 MHz, 100 +/- 15 200.0 - 310.0 MHz, 100 +/- 20 310.0 - 350.0 MHz, 100 +/- 22 350.0 - 550.0 MHz, 100 +/- 32*
Min. Return Loss (dB):	1.0 - 10.0 MHz, 20 + 5*LOG(f) 10.0 - 20.0 MHz, 25 20.0 - 75.0 MHz, 25 - 7*LOG(f/20) 75.0 - 200.0 MHz, 21 200.0 - 310.0 MHz, 18 310.0 - 350.0 MHz, 17 350.0 - 550.0 MHz, 14*
Fitted Impedance*:	1.0 - 10.0 MHz, 105 +/- 10 Ohms 10.0 - 550.0 MHz, 100 +/- 8 Ohms
Max. Attenuation (dB/100 m):	1.967* \sqrt{f} + 0.023*f + 0.05/ \sqrt{f} , from 1 to 100 MHz 1.2*(1.82* \sqrt{f} + 0.017*f + 0.05/ \sqrt{f}), from 100 to 250 MHz 1.14*(1.967* \sqrt{f} + 0.023*f + 0.05/ \sqrt{f}), from 250 to 350 MHz
Min. NEXT (dB):	76 - 15*LOG(f/.772)
Min. PSNEXT (dB):	74 - 15*LOG(f/.772)
Min. PSACR (dB/100 m):	74 - 15*LOG(f/.772) - (1.967* \sqrt{f} + 0.023*f + 0.05/ \sqrt{f}), up to 100 MHz 74 - 15*LOG(f/.772) - 1.2*(1.82* \sqrt{f} + 0.017*f + 0.05/ \sqrt{f}), from 100 to 250 MHz 74 - 15*LOG(f/.772) - 1.14*(1.967* \sqrt{f} + 0.023*f + 0.05/ \sqrt{f}), from 250 to 350 MHz
Min. ELFEXT (dB/100 m):	70 - 20*LOG(f/.772), up to 200 MHz
Min. PSELFEXT (dB/100 m):	67 - 20*LOG(f/.772), up to 200 MHz

Supply TWO (2) patch cables for each active outlet. This requirement includes both fiber and Cat 5 cables. One Patch cable for the Station-end, and one for the Closet-End. Telephone Patch Cables shall be provided for cross-connections and patches in the closets. All telephone stations shall use the provided station cables that are provided by the telephone manufacturer.

Any custom length cables must use Belden 1875G stranded wire, and be tested to the above specifications.

810.2 WORKSTATION AND PATCH CABLES

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All Patch Cables are to be wired TIA/EIA 568B

Acceptable Patch Cables for use in Patch Panels and Station Ends are:

Panduit Giga-Channel Patch Cables, Lengths from 3 to 10-feet.

Belden 1875G Patch Cables, Lengths from 3 to 12 Feet.

Color Coding is to be followed as directed below:

Blue – Typical Patch Cable for connecting 100mbps Devices

Red – Typical Patch Cable for Connecting 10mbps Devices

White – Typical Patch Cable for connecting Digital Voice Devices

Grey – Typical Patch Cable for connecting Analog Voice Devices

Yellow- 1000mbps Rated Duplex Cross-Over Cable for connecting

Active Network Equipment (Ether-Channel)

Green – Public Network Extension Cables (T1, T3, etc...)

17910 - PM/QA

910.1 ON-SITE FIELD OBSERVATIONS

All conduit installed underground, in floor slabs, or concealed in ceilings and/or walls shall be observed prior to cover up or reinstallation of finished ceilings. The Contractor shall notify the Clay County School Board at least (2) two days prior to completing work necessitating this required field observation.

910.2 SUBSTANTIAL COMPLETION

Prior to requesting the substantial completion walk thru:

1. Complete all work required including all firestopping and labeling.
2. Furnish required wiring diagrams and test reports (2 written and 2 on data disk in approved format or with necessary software).
3. Touch-up any scratches on electrical equipment such as wireways, pull boxes, data hub cabinets etc.

Walk thru punch list items must then be completed in a timely manner. All items on the Walk Thru Check List must be complete and inspected before any payment requests can be processed.

910.3 TRAINING

Training of school and district personnel shall be provided. Training will cover the location nomenclature, documentation structure and contents, documentation maintenance procedure, a "walk through" for location and labeling orientation, system reconfiguration using MCC, TC, and DP facilities (termination hardware, patch cables, etc.), operation of the network equipment provided as part of the contract, test documentation, and trouble shooting of the signal and power cable portion of the installation.

910.4 FINAL ACCEPTANCE

Acceptance will be made by the Clay County School Board on the basis of test results, observations of the project, Owner's verification that system is capable of working as intended, and verification of the completion of the Walk Thru Check List Items. Contractor shall furnish necessary mechanics to operate systems, test instruments and equipment as required to demonstrate the working capabilities of the systems, make necessary corrections based on test results, and assist with final project review. **Final payment for the Voice, Video, and Data systems will not be authorized until all items required are complete.**

17920 - APPROVED PRODUCT MANUFACTURER SUMMARY LIST

Manufacturers and/or products are listed in order of preference. Single manufacturer names means that no other manufacturers product is accepted without written approval from the Clay County School District Information Services Department. This list is for major components and is not intended to be comprehensive. Shop drawings and/or samples for all products must be submitted for Clay County School District Information Services Department written approval.

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920.1 Data Products:

Surface Raceway: Panduit Raceway LDP-10 Series

Raceway Outlet Plates: Panduit Systems Mini-Com Executive Series

Floor Boxes: Walker RFB4-SS, with one or two RFB-3T-SS as needed, and required trim plates with wire management blocks.

Cabinets: Great Lakes Cabinets, Mid-Atlantic WRP Series

Data Surge Protection: APC, TrippLite

Fiber Optic Cable: Corning ALTOS Gigabit CL +

Fan Out Kits: Corning

Fiber Cross Connect Panels: Corning CCH and WCH Series

Fiber Cross Connect Panels (for use in Portables): Panduit MMIO

Fiber Connectors: Siecor Uni-Cam Crimp

Horizontal Station Cabling: Belden Media Twist

Outdoor Backbone Cable: Essex PE-89

Patch Cables: Belden Media Twist

Patch Panels: Panduit Giga-TX

Patch Panels (portables only): Panduit Modular Surface Mount

Data Outlet Jacks: Panduit Giga-TX

17930 - ACCEPTABLE DATA TEST EQUIPMENT

930.1 COPPER CABLING TESTS

Contractor shall test all Horizontal Copper Cabling, verifying that it meets or exceeds the current TIA/EIA Category 6 thresholds. All tests shall be performed on one of the following devices, using currently proposed TIA/EIA Category-6 thresholds

Microtest - Omni Scanner, Cat 6 Link Test

Fluke - DSP 4000, Cat 6 Link Test

Contractor shall test all Optical Fiber Cabling, verifying that it meets or exceeds the current TIA/EIA thresholds. All tests shall be performed on one of the following devices.

930.2 FIBER CABLING TESTS

930.2A Attenuation

Attenuation is optical power loss measured in decibels (dB). It is the primary limiting factor in most systems. The physical properties of fiber splices, connectors, adapters, and switches all contribute to total system attenuation. Additional loss may also be induced by tight bends or excessive forces placed on the cable during installation.

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Attenuation testing must be done after installation to ensure the cable system meets the original design intent.

930.2b Optical Bandwidth

Optical bandwidth is a measure of the information- carrying capacity of a cabling system. It depends on both fiber quality and fiber length. Optical bandwidth varies inversely with system length. A long fiber will have less total optical bandwidth available for use than a shorter fiber if both have the same optical bandwidth specifications in MHz * km.

930.c Length Testing

Length is measured to ensure the link does not exceed application-based requirements.

Length may be measured via propagation delay if the graded refraction index (GRI) of the fiber is known, or it can be measured with an Optical Time Domain Reflectometer (OTDR).

Measuring length accurately with the OTDR will require an accurate number input for the index of refraction (IOR). This number will be different for each fiber type and will vary between manufacturers. The IOR can be obtained from either the cable manufacturer or the fiber manufacturer (if known).

930.d Optical Time Domain Reflectometer (OTDR) Testing

An OTDR is used to find the cause and location of the power loss. OTDRs provide a visual display of the:

- Location of individual system components (i. e., fiber sections, splices, and connectors).
 - Approximate losses that can be attributed to each of these individual components.
- The OTDR operates essentially like radar. It sends a light pulse through a fiber, then measures the amount reflected. It requires access to only one end of the fiber.

930.e Fiber Cabling Acceptance Tests

ANSI/ TIA/ EIA- 568- B. 1 has established acceptance values for Multimode (50/ 125 µm and 62.5/ 125 µm) and Single mode links for both the horizontal and backbone. These values are based on the maximum attenuation values for the optical fiber cable, connector pairs, and length.

930.f Horizontal

The maximum allowable attenuation for a horizontal 50/ 125 µm and 62.5/ 125-µm Multimode link is 2.0 dB. This value is based on the loss of two connector pairs (one pair at the outlet and one pair at the TR) plus 90 m (295 ft) of optical fiber cable. Attenuation need only be measured at one wavelength and in one direction.

930.g Centralized

ANSI/ TIA/ EIA- 568- B. 1 established attenuation values specifically for centralized cabling. Based on a 300 m (984 ft) link and two connector pairs (one at the outlet and one at the centralized cross- connect), a centralized cabling system using a splice in the TR should have less than or equal to 2.8 dB attenuation. Using an interconnection should have less than or equal to 3.3-dB attenuation.

END OF SECTION 17000