

PROJECT MANUAL
FOR
RENOVATIONS
FOR
PINCKNEY ACADEMY
BUILDING 1

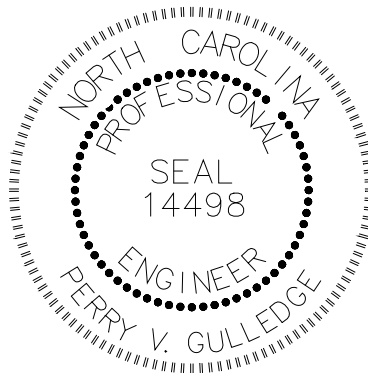
CARTHAGE, NC

MOORE COUNTY SCHOOLS

TECI PROJECT #2313

PREPARED BY:

TRIAD ENGINEERING CONSULTANTS, INC.
2638 WILLARD DAIRY RD
SUITE 100
HIGH POINT, NORTH CAROLINA



A handwritten signature in cursive script that reads "Perry Gullede".

April 04, 2024
(Revised and Reissued April 9, 2024)

PERRY GULLEDGE, PE

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SECTION 00 11 16
NOTICE TO BIDDERS

Moore County Schools invites Single Prime bids for the project “Pinckney Academy Renovations for Building 1”. Sealed bids will be received at the office of the Moore County School Board, 5277 US-15, Carthage, NC 28327, until 3:00 p.m. on **Thursday, April 25, 2024**. Bids will be opened and read aloud in the Board Room at the Administrative Offices facility. This project will be bid and awarded in accordance with G.S143-128, G.S. 143-129.

Work of the Project includes but is not limited to toilet renovations, new gyp board and acoustical tile ceilings, new floor finishes and new wall finishes, demolition of existing window AC units and installation of 14 new packaged wall mounted classroom heat pump units, ductwork air distribution, new lighting fixtures, new electrical gear to feed new and existing circuits, and associated electrical and general construction work. Work is to be completed by November 15, 2024.

A Pre-Bid Conference will be held on **Wednesday, April 10, 2024**, at 3:00 p.m. at Pinckney Academy Admin Building (Bldg. 1) 160 Pinckney Rd. Carthage, NC 28327. All questions after the conclusion of the conference shall be submitted to the Design Consultant Triad Engineering Consultants, Inc., 2638-100 Willard Dairy Rd High Point, NC 27265 or via email to: PGulledge@TriadEngMEP.com

Contract Documents, including drawings and specifications, may be downloaded from a free online Box link at: <https://app.box.com/s/qj9azpj4xk3s73e0t1jvg26xc7zsufdk> (email link is available upon request to admin@TriadEngMEP.com); complete plans and specifications may be examined at the offices of Triad Engineering Consultants, Inc. as listed in the preceding paragraph during normal office hours beginning **Thursday April 4, 2024**; or contract documents are also available for review at Moore County Schools school facilities office, 5277 US-15, Carthage, NC 28327 during normal business hours – contact Amy McCune to schedule an appointment time at (910-947-2976).

Each proposal shall be accompanied by a Bid Guarantee of five percent (5%) of the bid in cash, certified check, or a fully executed Bid Bond. The deposit shall be retained by the Owner if the successful bidder fails to execute the contract within ten (10) days after award or fails to give satisfactory surety as required herein. (General Statutes of North Carolina, Chapter 143, Article 8, Section 129.) No bid may be withdrawn for a period of ninety (90) days after the opening thereof. The successful bidder will be required to furnish 100% Performance Bond and a 100% Labor and Material Payment Bond.

Bidders for school construction and renovation projects covered by N.C.G.S. 143-128 are required to make a “good faith effort” to meet minority participation goals. Bidders shall identify on its bid the minority businesses that it will use on the project. Bidders shall submit along with the bid an affidavit listing the good faith efforts it has made pursuant to subsection (f) of G.S. 143-128.2 and the total dollar value of the bid that will be performed by the minority businesses. A bidder that performs all of the work under the contract with its own workforce may submit an affidavit to that effect in lieu of the aforementioned affidavit otherwise required under this subsection.

2313 Pinckney Academy Renovations for Building 1

Moore County Schools reserves the right to reject any and all bids, waive informalities and irregularities in bidding, and to accept bids that are considered to be in the best interest of the School System.

Date intended for Publication: Sunday April 7, 2024

END OF DOCUMENT

SECTION 00 21 13
INFORMATION FOR BIDDERS

A-1. SUBMISSION OF BIDS AND BID OPENING:

- A. Bids will be received by Moore County Schools and will be opened and read at the times and places set forth in the solicitation. Bidders, or their representative, and other interested persons may be present at the opening of proposals.
- B. The envelopes containing the bids must be sealed and addressed to Moore County School Board, Board Room, 5277 US-15, Carthage, NC 28327 and marked on the outside of the envelope Proposal for Pinckney Academy Renovations for Building 1, with the name of the Bidder and his North Carolina State Contractor's Registration Number.
- C. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

A-2. BIDDING DOCUMENTS:

- A. Bidding Documents include the Information for Bidders, Form of Proposal and the proposed Contract Documents, including any Addenda issued prior to receipt of bids. All requirements and obligations of the Bidding Documents are hereby incorporated by reference into the Contract Documents and are binding on the Successful Bidder upon award of the contract.

A-3. BIDDER'S REPRESENTATIONS:

Each Bidder by submitting his Bid represents that:

- A. He has read and understands that Bidding Documents and his Bid is made in accordance therewith; and Bidder agrees to be bound by the terms and requirements set forth in the Bidding and Contract Documents;
- B. He has visited the site, has familiarized himself with the local conditions under which the Work is to be performed herein, and has correlated his observations with the requirements of the proposed Contract Documents;
- C. The Bidder acknowledges and represents that he has made allowances for normal inclement weather indigenous to the Project Site, in his estimating, planning and scheduling of the Work. The Bidder hereby certifies that the work shall be completed, in place, in full accordance with the Contract Documents, within the time limits specified.
- D. He has made a good faith effort to solicit Minority Business Enterprises (MBEs) per N.C. Gen. Stat. 143-131 and Federal Uniform Guidance, as subcontractors.
- E. He has received the General and any Supplementary Conditions for the Project.
- F. He has reviewed all information posted in the project link for the project including but not limited to the Drawings, Project Manual and posted Addenda.

A-4. SITE CONDITIONS AND CONDITIONS OF THE WORK:

- A. Each bidder must acquaint himself thoroughly as to the character and nature of the work to be done. Each bidder furthermore must make a careful examination of the site of the

work and inform himself fully as to the difficulties to be encountered in the performance of the work, the facilities for delivering, storing and placing materials and equipment, and other conditions relating to construction and labor.

- B. No plea of ignorance of conditions that exist or may hereafter exist on the site of the work, or difficulties that may be encountered in the execution of the work, as a result of failure to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the successful Bidder to fulfill in every detail all the requirements of the Contract Documents and to complete the work or the consideration set forth therein, or as a basis for any claim whatsoever.
- C. Insofar as possible, the Successful Bidder, in carrying out his work, must employ such methods or means as will not cause interruption of or interference with the work of the Owner or any separate contractor.

A-5. BIDDER'S QUESTIONS, ADDENDA AND INTERPRETATIONS:

- A. Bidders and Sub-bidders shall promptly notify the Design Consultant of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding and Contract Documents or of the site and local conditions. No interpretation of the meaning of the drawings, specifications or other contract documents will be made to any Bidder orally.
- B. Every request for such interpretation should be in writing addressed to the Design Consultant with a copy forwarded to the Owner.
- C. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the Bidding Documents which, if issued, will be transmitted to all prospective Bidders (at the respective addresses furnished for such purposes) not later than three calendar days prior to the date fixed for the opening of bids. Neither the Design Consultant nor the Owner will be responsible for any other explanations or interpretations of the proposed documents. Failure of any Bidder to receive any such addendum or interpretation shall not relieve any bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the Contract Documents.
- D. Each Bidder shall ascertain prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge receipt and inclusion in his proposal of all Addenda.
- E. He has received the General and any Supplementary Conditions for the Project.

A-6. SECURITY FOR FAITHFUL PERFORMANCE:

- A. The Successful bidder shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the Contract Sum as security for the faithful performance of this Contract and also a Labor and Material Payment Bond in an amount not less than one hundred percent (100%) of the Contract Sum, as security for the payment of all persons performing labor and furnishing materials under this Contract. The Performance Bond and the Labor and Material Payment Bond shall be delivered to the Owner not later than the date of execution of the Contract.

A-7. LIABILITY INSURANCE AND WORKMEN'S COMPENSATION:

- A. The Successful Bidder will be required to carry public liability and workmen's compensation and other insurance in the amounts and under the terms stipulated under the General Conditions.

A-8. RIGHT TO REJECT BIDS:

- A. The Owner expressly reserves the right to reject any or all bids, to waive any informalities or irregularities in the bids received, and to accept that bid which in its judgment, best serves the interest of the Owner.

A-9. EQUAL PRODUCTS AND SUBSTITUTIONS:

- A. Unless specifically stated to the contrary, any Bidder may, with Owner's written approval, use any article, device, product, material, fixture, form or type of construction which in the judgment of the Design Consultant is equal to that specified considering quality, workmanship, economy of operation, durability, suitably for the purpose intended, and acceptability for use on the project. Approval by the Owner prior to bid opening is mandatory and acceptance of substitutions will be in the form of an Addendum to the Specifications issued to all prospective Bidders indicating that the additional makes or brands are equivalent to those specified. Nothing in this paragraph is intended to restrict or inhibit free and open competition on school system projects. The bidder may request approval for substitutions after award of the contract in accordance with the contract General Conditions.

A-10. PREPARATION AND SUBMITTAL OF FORM OF BID:

- A. Bids shall be submitted utilizing the Form of Proposal as bound herein, or otherwise provided with the Contract Documents, and shall be complete in every respect. The total bid amount shall be entered in words and figures in the space provided. Where applicable, the unit price or lump sum items, and their extensions, shall be entered in figures in the respective columns provided for each bid item. All entries shall be typewritten or printed in ink. The signatures of all persons shall be in longhand. Any entry of amount that appears on the face of the bid to have involved an erasure, deletion, white-out and/or substitution or other such change or alteration, shall show by them the initials of the person signing the bid and the date of the change or alteration. A failure to comply with this requirement may be cause for disqualification of the bid.
- B. For Unit Price bids, in the event of any discrepancies between the unit prices and the extensions thereof or the total bid amount, the unit prices shall govern. For Lump Sum bids, in the event of a discrepancy between the bid amount in writing and that in figures, the written value shall govern.
- C. Bids shall not contain any restatement or qualifications of work to be done, and alternate bids will not be considered unless called for. No oral bids or modifications will be considered.
- D. All applicable Federal, State and Local taxes shall be included in the Bidder's proposal.

A-11. MODIFICATION OR WITHDRAWAL OF BID:

- A. A bidder may withdraw his bid from consideration if such bid was based upon a mistake.
- B. Prior to the time and date designated for receipt of bids, any bid submitted may be modified or withdrawn by notice to the party receiving bids at the place designated for receipt of bids. Such notice shall be in writing over the signature of the Bidder.
- C. Withdrawn bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with this Information for Bidders.

A-12. DETAILED BID BREAKDOWN:

- A. If the Owner directs, the Bidder shall provide a detailed breakdown of his bid acceptable to the Owner. In addition to verifying accounting requirements, the breakdown may be used by the Owner to determine whether the Bidder has grossly misjudged the requirements of any area. Failure to provide the requested detailed breakdown may result in rejection of the bid proposal.

A-13. AWARD OF CONTRACT:

- A. The contract will be awarded to the lowest responsive and responsible bidder, taking into consideration quality, performance, and the time specified in the bids for the performance of the contract.
- B. The lowest bidders shall be determined by the aggregate amount of the unit prices set forth in the form of bid, if work is bid on a unit price basis, or the aggregate amount of the Base Bid, plus any Alternates selected by the Owner.
- C. A Responsible Bidder shall mean a Bidder who has the capability, in all respects, to perform fully the contract requirements and the moral and business integrity and reliability which will assure good faith performance. In determining responsibility, the following criteria will be considered:
 - 1. The ability, capacity and skill of the Bidder to perform the contract or provide the service required;
 - 2. Whether the bidder can perform the contract or provide the service promptly, or within the time specified, without delay or interference;
 - 3. The character, integrity, reputation, judgment, experience and efficiency of the Bidder;
 - 4. The quality of performance of previous contracts or services. For example the following information will be considered:
 - a. The administrative and consultant cost overruns incurred by Owners on previous contracts with Bidder,
 - b. The Bidder's compliance record with contract general conditions on other projects,
 - c. The submittal by the bidder of excessive and/or unsubstantiated extra cost proposals and claims on other projects,
 - d. The Bidder's record for completion of the work within the Contract Time or within Contract Milestones and Bidders compliance with scheduling and coordination requirements on other projects,
 - e. The Bidder's demonstrated cooperation with the Owner or the Design Consultant and other contractors on previous contracts,
 - f. Whether the work performed and materials furnished on previous contracts were in accordance with the Contract Documents;

5. The previous and existing compliance by the bidder with laws and ordinances relating to contracts or services;
 6. The sufficiency of the financial resources and ability of the Bidder to perform the contract or provide the service;
 7. The quality, availability and adaptability of the goods or services to the particular use required;
 8. The ability of the Bidder to provide future maintenance and service for the warranty period of the contract;
 9. Whether the Bidder has been declared in default on a project;
 10. Whether the bidder has demonstrated a good faith effort to use MBEs as subcontractors;
 11. Such other information as may be secured by the Owner having a bearing on the decision to award the contract, to include, but not limited to:
 - a. The ability, experience and commitment of the Bidder to properly and reasonably plan, schedule, coordinate and execute the Work,
 - b. Whether the Bidder has ever been debarred from bidding or found ineligible for bidding on any other projects.
- D. The purpose of the above is to enable the Owner in its opinion, to select the lowest responsible bidder. The ability of the low Bidder to provide the required bonds will not of itself demonstrate responsibility of the Bidder.
- E. The Owner reserves the right to require from the Bidder within twenty-four (24) hours of bid opening: (1) submissions of references to include a listing of previous and current projects, including a listing of public school construction projects completed in North Carolina, (2) financial statements indicating current financial status, prepared in accordance with generally accepted accounting principles, by a CPA licensed to do business in North Carolina, and (3) any other information deemed necessary in order to establish the responsiveness and responsibility of the bidder.
- F. The Owner reserves the right to defer award of this contract for a period of ninety (90) days after the due date of bids. During this period time, the Bidder shall guarantee the prices quoted in his bid.

END OF SECTION

SECTION 00 33 00.10
ASBESTOS NOTICE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES THE FOLLOWING DOCUMENT

- A. ASBESTOS NOTICE (dated June 2003).
 - 1. The document begins after this page and consists of 1 page.
 - 2. This Section ends at the end of the referenced document.

Asbestos Notice

June 2003

To Contractors, Subcontractors, Suppliers and Vendors:

Moore County School's facilities have some building materials that contain asbestos.

You are hereby notified that prior to doing any work in school facilities that might disturb asbestos containing building materials, you shall contact the Moore County School's Designee for Asbestos Management. Call Central Support Services at 910-947-2976 and ask to talk with the person assigned to asbestos management.

Each school campus has an asbestos management plan that will identify the materials on each campus that contain or are suspected of containing asbestos. The plan can be found in each school office and is available for public review. Floor, wall and ceiling materials can contain asbestos as well as pipe, tank and boiler insulation. The primary material remaining in Moore County School's facilities that might contain asbestos is floor tile. The tile is most generally 9" X 9" in size and the mastic that holds the tile in place may also contain asbestos; however, there are other materials that also contain asbestos. Caution shall be taken prior to any work activity that might result in asbestos exposure.

Contractors, subcontractors, suppliers and vendors should not drill, hammer, saw, cut, scratch, break or by any other method disturb any material containing asbestos.

All questions shall be directed to the school systems designee for asbestos management at 910-947-2976 x252.

Asbestos Notice

SECTION 00 41 00

BID FORM

STIPULATED SUM

HVAC Renovations for Pinckney Academy
160 Pinckney Rd
Carthage, NC 28327

Date _____

Addenda Received, Acknowledged, and Used in Computing Bids:

Addendum No. _____ through _____ (inclusive)

Name of Bidder: _____

The undersigned, as Bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud.

The bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Contract Documents relative thereto and he has taken special note that work shall be guaranteed for a period of one year after acceptance by Owner; and he has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

Liquidated damages of the following amounts apply to this project:

\$1,000 per calendar day if work is not Substantially Complete by November 15, 2024.

\$500 per calendar day if Final Completion is not achieved by December 15, 2024.

The bidder proposes and agrees if this proposal is accepted to contract with the Owner in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the work as stated below in full and in complete accordance with the Contract Documents, as prepared by Triad Engineering Consultants, Inc., with a definite understanding that no money will be allowed for extra work except as set forth in the Contract Documents for the sum of:

BASE BID

_____ Dollars

(\$ _____)

SUBCONTRACTOR LISTING

Plumbing Subcontractor _____ License No.: _____

Mechanical Subcontractor _____ License No.: _____

Electrical Subcontractor _____ License No.: _____

General Subcontractor _____ License No.: _____

The bidder further proposes and agrees to commence work on a date to be specified in a written Notice to Proceed, estimated to be on or about May 15, 2024, and shall be substantially complete with the work by November 15, 2024. The bidder also agrees to a Final Completion within 30 days from the date of the Certificate of Substantial Completion.

ALLOWANCES

The Base Bid for general construction Work shall include Allowances. The requirements for Allowances are as follows, and as further detailed in Section 01 21 00 - Allowances and the Contract Documents.

Contingency Allowances (CA)

CA-1: General Contingency Allowance:\$40,000.00

CA-2: Electrical Service Contingency Allowance:.....\$25,000.00

Stipulated Sum Allowances (SSA)

None in this bid.

Quantity Allowances (QA)

None in this bid.

ALTERNATES

Should any Alternates be accepted, the amounts written below shall be the amount to be added to or deducted from the Base Bid. The requirements for Alternates are as follows, and as further detailed in Section 01 23 00 - Alternates and the Contract Documents.

Alternate No. 1 – Provide Owner Preferred KMC brand BMS controls system integrated by Systems Contractors, Inc. of Greensboro:

State the amount to be added to the Base Bid.

Add _____ Dollars (\$ _____)

UNIT PRICES

Unit Prices quoted and accepted shall apply throughout the life of the contract, except as specifically noted. Unit Prices shall be applied, as appropriate, to compute the total value of changes in the scope of the Work in accordance with the Contract Documents. The requirements for Unit Prices are as follows, and as further detailed in Section 01 22 00 - Unit Prices and the Contract Documents.

- Unit Price No. 1 – Add Exterior Service Receptacle\$ _____ Each
- Unit Price No. 2 - Add 60 Amp circuit with Fused Disconnect\$ _____ Each
- Unit Price No. 3 - Add 100 Amp circuit with Fused Disconnect\$ _____ Each

MWBE DOCUMENTATION REQUIREMENT

Provide on the Bid - Under GS 143-128.2(c) the undersigned bidder shall identify on its bid (Identification of Minority Business Participation form) the minority businesses that it will use on the Project with the total dollar value of the bids that will be performed by the minority businesses.

Also with the Bid, submit Affidavit (A), listing the good faith efforts made to solicit minority participation in the bid effort – or – submit Affidavit (B) if the Contractor will perform all the work in the contract with its own workforce.

Submit the MB Participation Form even if there is zero participation.

After the Bid Opening - The Owner will consider all Bids and Alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file the following documents within 72 hours of notification of being the apparent lowest bidder:

Affidavit (C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total Contract Price, and which is equal to or more than the 10% goal established. This Affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit (D) is not necessary;

-OR-

Affidavit (D) shall be provided to demonstrate Bidder’s good faith effort to meet the goal if minority business participation is less than the 10% goal. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

NOTE: Bidders must always submit with their bid the Identification of Minority Business Participation listing all MBE contractors, vendors and suppliers that will be used. If there is no MBE participation, then enter zero on the form. Affidavit (A) or Affidavit (B), as applicable, also must be submitted with the Bid. Failure to file a required Affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the Bid.

PROPOSAL SIGNATURE PAGE

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the Owner's account set aside for the project as liquidated damages for such failure; otherwise, the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Attach certified check, cash, or bid bond to this Proposal.

Respectfully submitted this _____ day of _____ 20_____

(Name of Firm or Corporation Making Bid)

WITNESS: _____ By: _____

(Proprietorship or Partnership) Title: _____
(Owner, Partner, President or Vice President)

Address: _____

License No.: _____

ATTEST:

By: _____

Title: _____
(Corporate Secretary or Assistant Secretary only)

(CORPORATE SEAL)

END OF BID FORM

SECTION 00 43 39.00

**MWBE GUIDELINES FOR CONSTRUCTION CONTRACTS
(Moore County Schools)**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES THE FOLLOW DOCUMENTS

- A. GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN CONSTRUCTION CONTRACTS.
 - 1. The document begins after this page and consists of 8 pages identified in the footer as 00400-#; **and**
 - 2. **Identification of Minority Business Participation (Attach to Bid):** consisting of 1 page. This form must be completed and submitted with the bid; **and**
 - 3. **Affidavit A – Listing of Good Faith Effort (Attach to Bid):** consisting of 1 page. This completed form must be submitted with the bid unless Affidavit B (indicating that the work under the contract will be performed with Bidder’s own workforce) is submitted; **and**
 - 4. **Affidavit B – Intent to Perform Contract with Own Workforce (Attach to Bid):** consisting of 1 page. This form must be submitted with the bid if Bidder intends to perform all work under the contract with Bidder’s own workforce; **and**
 - 5. **Affidavit C – Portion of Work to be Performed by Minority Firms:** consisting of 1 page. This form is to be completed, notarized and submitted by the low bidder within 72 hours of being informed of being the low bidder if the MBE participation meets or exceeds the district goal; **and**
 - 6. **Affidavit D - Good Faith Efforts:** consisting of 2 pages - the form and an additional page of instructions. This form is to be completed, notarized, and submitted by the low bidder within 72 hours of being informed of being the low bidder if the MBE participation is below the district goal. In addition, complete supporting documentation of Good Faith Efforts claimed in Affidavit A must be submitted with this form. See the “Instructions for Affidavit D sheet for details; **and**
 - 7. **Appendix E – MBE Documentation for Contract Payments** consisting of 1 page. This form must be submitted with each payment application – see Section 01 029 00 Payment Procedures section for details.
 - 8. This Document ends after the end of the last referenced document listed above.

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128 (SB 308 ratified June 28, 1989), these guidelines establish goals for minority participation in single-prime and separate-prime construction contracts. The Moore County Board of Education provided that the Moore County Schools shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These guidelines are published to accomplish the end.

SECTION 1: INTENT

It is the intent of these guidelines that the Moore County Board of Education, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing contained in these guidelines shall be considered to require awarding authorities to award contracts or to make purchases of materials or equipment from minority-business contractors who do not submit the lowest responsible, responsive bid or bids.

SECTION 2: DEFINITIONS

1. **Minority** – a person who is a citizen or lawful permanent resident of United States and who is:
 - a. Black, that is, a person having origins in any of the black racial groups in Africa;
 - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
 - c. Asian American, that is, a person of Spanish or Portuguese culture with original peoples of the Far East, Southeast Asia, the Indian subcontinent, the Pacific Island.
 - d. American Indian or Alaskan Native, that is a person having origins in any of the original peoples of North America; or
 - e. Female.
2. **Minority Business** – means a business:
 - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons; and
 - b. Of which management and daily business operations are controlled by one or more minority persons who own it.
3. **Socially and economically, disadvantage individual** - means the same as defined in 15 U.S.C. 637. “Socially disadvantaged individuals are those who have been subject to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities”. “Economically disadvantage individuals are those socially disadvantage individuals whose ability to compete in the free enterprise

system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged”.

4. **Owner** – The Moore County Board of Education, through the Agency/Firm named in the contract.
5. **Designer** – Any person, firm, partnership, or corporation, which has contracted with the Board of Education to perform architectural or engineering services.
6. **Bidder** - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.
7. **Contract** – A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
8. **Contractor** – Any person, firm, partnership, corporation, association, or joint venture which as contracted with the Moore County Board of Education to perform construction work or repair.
9. **Subcontractor** – A firm under contract with the prime contractor for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract. Work subcontracted in an emergency and which could not have been anticipated is excluded as part of this program.
10. **Verifiable goal means:**
 - a. For purposes of separate-prime contract system, that the awarding authority has adopted written guidelines specifying the actions that the prime contractors and/or the owner must take to ensure a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded; and
 - b. For purposes of single-prime contract system, that the awarding authority has adopted written guidelines specifying that actions that the prime contractor must take to ensure a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded; the required actions must be documented in writing by the contractor to the appropriate awarding authority.

SECTION 3: RESPONSIBILITIES

1. Owners Representative (Designer)

Under the single-prime contract system, separate prime contract system, construction management at risk or alternative contracting method, the Owners Representative (Designer) will be responsible for the following:

- a. For contracts in excess of \$100,000 in estimated cost, furnish to the Minority Business Development Agency at the same time as the advertisement for bids but at least 21 days prior to bid opening the following:
 - (1) Project description and location;
 - (2) Locations where bidding documents may be reviewed;
 - (3) Name of a representative of the owner who can be contracted during the advertising period to advise who the prospective bidders are;
 - (4) Date, time and location of the bid opening.
 - (5) Date, time and location of prebid conference, if scheduled.
- b. The prebid conference, if scheduled, conducted by the representative of the owner, will be open to all known and anticipated prime contractors, subcontractors, material suppliers, and other bidders. During the conference, this program, including the bidders' responsibilities, will be fully explained.
- c. Reviewing the apparent low bidders' compliance with the items listed in the proposal that must be complied with the bid is to be considered as responsive. The Moore County Board of Education reserves the right to reject any or all bids and to waive informalities.

2. Owner

For projects under the single-prime contract system, separate prime contract system, construction management at risk or alternative contracting method handled directly by the Owner, the owner will:

- a. For contracts in excess of \$100,000 in estimated cost, furnish to the Minority Business Development Agency at the same time as the advertisement for bids but at least 21 days prior to bid opening the following:
 - (1) Project description and location;
 - (2) Locations where bidding documents may be reviewed;
 - (3) Name of a representative of the owner who can be contracted during the advertising period to advise who the prospective bidders are;
 - (4) Date, time and location of the bid opening.
 - (5) Date, time and location of prebid conference if scheduled.
- b. The prebid conference, if scheduled, conducted by the representative of the owner, will be open to all known and anticipated prime contractors, subcontractors, material suppliers, and other bidders. During the conference, this program, including the bidders' responsibilities, will be fully explained.
- c. Reviewing the apparent low bidders' compliance with the items listed in the proposal that must be complied with the bid is to be considered as responsive. The Moore County Board of Education reserves the right to reject any or all bids and to waive informalities.
- d. Maintain documentation of any contracts, correspondence or conversation with MBE firms made in an attempt to meet the goals.

3. Prime Contractor(s), CM at Risk, and Its First Tier Subcontractors

Under the single-prime contract system, separate prime contract system, construction management at risk or alternative contracting method, the contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a sub-contract where MBEs may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening. Notify certified MBEs of potential subcontracting opportunities listed in the proposal. The notification will include the following:
 - (1) A description of the work for which the subbid is being solicited.
 - (2) The date, time and location where subbids are to be submitted.
 - (3) The name of the individual within the company who will be available to answer questions about the project.
 - (4) Where bid documents may be reviewed.
 - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) certified MBEs in the area of the project, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) minimum compliance requirements listed in Appendix A.
- e. Submit with the bid a description of that portion of the work to be executed by MBEs expressed as a percentage of the total contract price.
- f. Upon being named the apparent low bidder, the Bidder shall provide the necessary documentation as listed in the contract documents. Failure to comply with procedural requirements as defined in contract documents may render that bid as nonresponsive and may result in rejection of the bid and award to the next lowest responsible and responsive bidder.
- g. During the construction of a project, if it becomes necessary to replace an MBE subcontractor, advise the owner, and the Owners Representative.
- h. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from MBEs.

4. MBE Responsibilities

While MBEs are not required to become certified in order to participate in this program, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, MBEs who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES

It is the desire of the Moore County Board of Education that disputes between an agency and another person that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, MBE disputes arising under these guidelines should be resolved, if possible, by informal proceedings arranged by the Board of Education.

Any alleged violations of the provisions of this MBE plan by any party should be reported in writing to the Superintendent of Moore County Schools.

The Superintendent of the Moore County Schools will review all facts available and report to the Board of Education. The decision made by the Board of Education will be final.

SECTION 5: These guidelines shall apply upon promulgation on construction projects. Copies of these guidelines may be obtained from the office of the Director of Planning & Construction, PO Box 1180, Carthage, North Carolina, 28327, 910-947-2976 x252

SECTION 6: These guidelines will be issued with each construction bid package for contractual compliance providing MBE participation in the construction program.

APPENDIX A

MBE CONTRACT PROVISION (CONSTRUCTION)

APPLICATION:

The requirements of the GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN CONSTRUCTION CONTRACTS are hereby made a part of these contract documents. These requirements shall apply to all contractors regardless of ownership. Copies of the MBE Plan may be obtained from the Office of the Director of Planning & Construction, Moore County Schools, PO Box 1180, Carthage, North Carolina, 28327, 910-947-2976 x252

MBE SUBCONTRACT GOALS:

The goals for participation by Minority Firms as subcontractors on this project have been set at 10%.

The bidder must identify and attach to their bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid on form "Identification of Minority Business Participation" and include Affidavit A – "Listing Good Faith Effort" or attach Affidavit B – "Intent to Perform Contract with Own Workforce", if the bidder will perform the work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

Within 72 hours of the close of the receipt of bids, the lowest responsible, responsive bidder shall provide the Owner Affidavit C – "Portion of the Work to be Performed by Minority Firms", that includes a description of the work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

or

Provide, Affidavit D – "Good Faith Efforts", that includes a description of the work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of the good faith efforts, if the percentage is less than the applicable goal.**

or

Provide, Affidavit B – "Intent to Perform Contract with Own Workforce", if the bidder will perform the work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f) and shall attach sufficient information for the Owner to determine that the bidder does not customarily subcontract work on this type project.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the Owner for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business

Guidelines shall constitute a breach of the contract. A finding by the Owner that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the Owner whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the Owner will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

- (1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.
- (2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.
- (3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
- (4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- (5) Attending any pre-bid meetings scheduled by the public owner.
- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
- (7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- (8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- (9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- (10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible, responsive bidder. The Board of Education reserves the right to waive any irregularities in MBE documentation if they can be resolved prior to award of the contract, and the Board of Education finds it to be in its best interest to do so and award the contract.

SUBCONTRACTOR PAYMENT REQUIREMENTS:

North Carolina General Statute 143-134.1 states that percentage of retainage on payments made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payment made by the Owner to the prime contractor. Failure to comply with this provision shall be considered a breach of the contract, and the contract may be terminated in accordance with the termination provisions of the contract.

The contractor shall submit Affidavit E – “MBE Documentation for Contract Payments” with each and every application for payment on the project.

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black (B), Hispanic (H), Asian American (AA), American Indian (AI), White Female (WF), Socially and Economically Disadvantaged (SED)

Approved/Certified By:

Name

Title

Date

Signature

SUBMIT WITH EACH PAY REQUEST - FINAL PAYMENT - FINAL REPORT

SECTION 00 52 00

OWNER-CONTRACTOR AGREEMENT

PROJECT NUMBER: _____

PROJECT NAME: HVAC Renovations for Pinckney Academy

THIS AGREEMENT, in four (4) copies, made this ____ day of _____, Two Thousand and Twenty-Three by and between Moore County Schools (herein referred to as the "Owner"), whose mailing address is 5277 US-15, Carthage, NC 28327 and _____ (herein referred to as the "Contractor"), whose mailing address is _____. Correspondence, submittals, and notices relating to or required under this Contract shall be sent in writing to the above addresses; unless either party is notified in writing by the other, of a change in address.

WITNESSETH:

WHEREAS, it is the intent of the Owner to obtain the services of the Contractor in connection with the HVAC Renovations for Pinckney Academy 160 Pinckney Rd. Carthage, NC (hereinafter referred to as the "Project" or the "Work"); and

WHEREAS, the Contractor desires to perform such construction in accordance with the terms and conditions of this Agreement,

NOW, THEREFORE, in consideration of the promises made herein and other good and valuable consideration, the following terms and conditions are hereby mutually agreed to, by and between the Owner and Contractor:

Article 1

DEFINITIONS

1.1 All terms in this Agreement which are defined in the Information for Bidders and the General Conditions shall have the meanings designated therein.

- 1.2 The Contract Documents are as defined in the General Conditions. Such documents form the Contract, and all are as fully a part thereof as if attached to this Agreement or repeated herein. The Contract Documents consist of the Owner-Contractor Agreement, the General and Supplemental Conditions of the Contract, the Drawings, the Specifications, all Addenda issued prior to bidding, and all Modifications and Change Orders issued after execution of the Contract.

Article 2

STATEMENT OF THE WORK

- 2.1 The Project is the Work identified in the plans and specifications prepared by Triad Engineering Consultants, Inc. dated 08/28/2023, for Moore County Schools, and for the project named HVAC Replacement and Renovations for Robbins Elementary School, including the following addenda:

List each addendum, date, and total pages. If none, delete this language and state "None".

A listing of the plans and specifications included in the Contract Documents is attached as Exhibit A.

- 2.2 The Parties agree that the Project shall include the following alternates:

List item(s) and proposed deduct/add(s). If none, delete this language and state "None".

- 2.3 The Parties agree to the following modifications to the Project's plans and specifications, including the noted value engineering items:

List item(s) and proposed deduct/add(s). If none, delete this language and state "None".

- 2.4 The Parties agree that the following allowances are included in the Contract Sum in Section 5.1 below:

List item(s) and proposed allowance(s). If none, delete this language and state "None".

2313 Pinckney Academy Renovations for Building 1

- 2.5 The Contractor shall provide and pay for all materials, tools, equipment, labor and professional and non-professional services, and shall perform all other acts and supply all other things necessary, to fully and properly perform and complete the Work, as required by the Contract Documents.

2313 Pinckney Academy Renovations for Building 1

- 2.6 The Contractor shall further provide and pay for all related facilities described in any of the Contract Documents, including all work expressly specified therein and such additional work as may be reasonably inferred therefrom, saving and excepting only such items of work as are specifically stated in the Contract Documents not to be the obligation of the Contractor. The totality of the obligations imposed upon the Contractor by this Article and by all other provisions of the Contract Documents, as well as the structures to be built and the labor to be performed, is herein referred to as the "Work".

Article 3

DESIGN CONSULTANT

- 3.1 The Design Consultant (as defined in the General Conditions) shall be Triad Engineering Consultants, Inc. whose address is 2638-100 Willard Dairy Rd High Point, NC 27265, however, that the Owner may, without liability to the Contractor, unilaterally amend this Article from time to time by designating a different person or organization to act as its Design Consultant and so advising the Contractor in writing, at which time the person or organization so designated shall be the Design Consultant for purposes of this Contract.

Article 4

TIME OF COMMENCEMENT AND COMPLETION

- 4.1 The Contractor shall commence the Work promptly upon the date established in the Notice to Proceed. If there is no Notice to Proceed, the date of commencement of the Work shall be the date of this Agreement or such other date as may be established herein.
- 4.2 Time is of the essence. The Contractor shall achieve Final Completion, as defined in the General Conditions on or before the date established for Final Completion in the Supplemental Conditions.
- 4.3 The Supplemental Conditions contains certain specific dates that shall be adhered to and are the last acceptable dates unless modified in writing by mutual agreement between the Contractor and the Owner. All dates indicate midnight unless otherwise stipulated. The only exceptions to this schedule are defined in the General Conditions under 8.3 DELAYS AND EXTENSIONS OF TIME.

2313 Pinckney Academy Renovations for Building 1

- 4.4 Should the Contractor fail to complete the Work on or before the dates stipulated for Substantial Completion and/or Final Completion, or such later date as may result from an extension of time granted by the Owner, he shall pay the Owner, as liquidated damages the sums set forth in the General and Supplemental Conditions.

Article 5

CONTRACT SUM

5.1 Provided that the Contractor shall strictly and completely perform all of its obligations under the Contract Documents, and subject only to additions and deductions by Modification or as otherwise provided in the Contract Documents, the Owner shall pay to the Contractor, in current funds and at the time and in the installments hereinafter specified, the sum of _____ Dollars (\$_____) herein referred to as the "Contract Sum". This amount includes the base bid and the Alternates in Section 2.2 above and includes the value engineering items and other contract modifications noted in Section 2.3 above that total \$_____.

5.2 Unit Prices are established as follows for the Project:

None

Article 6

PROGRESS PAYMENTS

- 6.1 The Contractor hereby agrees that on or about the First day of the month for every month during the performance of the Work he will deliver to the Owner's Project Manager an Application for Payment in accordance with the provisions of Article 9 of the General Conditions. This date may be changed upon mutual agreement, stated in writing, between the Owner and Contractor. Payment under this Contract shall be made as provided in the General Conditions. Payments due and unpaid under the Contract Documents shall not bear interest.

Article 7

OTHER REQUIREMENTS

- 7.1 The Contractor shall submit the Performance Bond, Labor and Material Payment Bond and Certification of Insurance as required by the Contract Documents.
- 7.2 The Owner shall furnish to the Contractor five (5) printed set(s) of drawings and five (5) printed set(s) of specifications, at no extra cost, for use in the Construction of the Work. Additional sets of drawings or specifications may be obtained by the Contractor by paying the Owner for the costs of reproduction, handling and mailing.
- 7.3 The Contractor shall make a good faith effort to utilize Historically Underutilized Businesses (HUB's) per N.C. Gen. Stat. 143-128.2, and as described in the construction documents.
- 7.4 The General Conditions, Supplemental Conditions and the plans and specifications, including any addenda, are incorporated herein by reference.

IN WITNESS WHEREOF, Moore County Schools (hereinbefore called the "Owner") has caused these presents to be signed and its Corporate Seal to be hereunto affixed, attested by its Chairperson and Superintendent, and _____

(hereinbefore called "Contractor") has caused these presents to be signed by its President and its Corporate Seal to be hereunto affixed, as hereinafter attested, all as of the day and year first above written.

MOORE COUNTY SCHOOLS

Board Chairperson (*signature*)

Board Chairperson (*print name*)

ATTEST:

Superintendent (*signature*)

Superintendent (*print name*)

[*Corporate Seal*]

This contract was approved by the Board on the ____ day of _____, 20__.

Contractor Company Name

2313 Pinckney Academy Renovations for Building 1

Corporate President (*signature*)

Corporate President (*print name*)

ATTEST:

Corporate Secretary (*signature*)

Corporate Secretary (*print name*)

[*Corporate Seal*]

This instrument has been preaudited in the manner required by the School Budget and Fiscal Control Act.

Finance Officer (*signature*)

Date

PERFORMANCE BOND

IT IS HEREBY AGREED that

(Insert full name and address of Contractor)

as Principal, hereinafter called Contractor, and,

(Insert full name and address of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the

as Obligee, hereinafter called Owner, in the amount of _____ Dollars (\$ _____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these obligations.

WHEREAS, Contractor has by written agreement dated _____, 20____, entered into a contract with Owner for the construction of _____
(Insert the name of the Project)

in accordance with Drawings and Specifications prepared by _____
(Insert full name and address of Architect/Engineer)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect. The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default, under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, or
2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default

or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of any applicable statute of limitations under the Contract.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this ____ day of _____ 20____.

PRINCIPAL

[Affix corporate seal]

(Name)_____

(Title)_____

(Witness)

SURETY

[Affix corporate seal]

(Name)_____

(Title)_____

(Witness)

LABOR AND MATERIAL PAYMENT BOND

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

IT IS HEREBY AGREED that

(Insert full name and address of Contractor)

as Principal, hereinafter called "Principal," and,

(Insert full name and address of Surety)

as Surety, hereinafter called "Surety," are held and firmly bound unto the

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of _____ Dollars (\$ _____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these obligations.

WHEREAS, Principal has by written agreement dated _____, 20_____, entered into a contract with Owner for the construction of _____ *(Insert the name of the Project)*

in accordance with Drawings and Specifications prepared by _____ *(Insert full name and address of Architect/Engineer)*

which contract is by reference made a part hereof, and is hereinafter referred to as the "Contract."

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:
- a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days, after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail; postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
 - b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
 - c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this ____ day of _____ 20 ____.

PRINCIPAL

[Affix corporate seal]

 (Name) _____
 (Title) _____

 (Witness)

SURETY

[Affix corporate seal]

 (Name) _____
 (Title) _____

 (Witness)

**SECTION 00 62 76.13
SALES TAX FORM**

STATE AND COUNTY SALES/USE TAX STATEMENT AND CERTIFICATION

Owner: _____ Report Sheet Number: _____ of _____
 Project Name: _____ For Period From: _____ to _____
 Contractor: _____ Payment Application Number: _____

Vendor Name/Address	Type of Materials	Invoice Number	Invoice Date	Invoice Taxable Amount	N.C. State Tax	County Tax	County Name
TOTALS							

I hereby certify that the above listings include all materials purchased by us and incorporated into the above referenced project for the period stated, became a permanent part of the project, and that the sales tax shown has been paid. The above represents a complete listing of the sales taxes paid for the payment application number indicated.

SWORN AND SUBSCRIBED BEFORE ME
 ON THIS ____ DAY OF _____, 20____
 BY: _____ TITLE: _____

NOTARY PUBLIC: _____
 MY COMMISSION EXPIRES: _____ (seal)>

**SECTION 00 72 00
GENERAL CONDITIONS**

**SECTION V
GENERAL CONDITIONS**

NOTICE OF DISCLAIMER

TAKE NOTICE, that these General Conditions may contain language and Article, Section or Paragraph headings or names which appear similar to or the same as the provisions of the "General Conditions of the Contract for Construction", published by the American Institute of Architects, AIA Document A-201.

TAKE NOTICE, however, that these General Conditions are substantially and materially different in many respects from the AIA Document A-201 and that certain additions, deletions or other modifications have been made to provisions similar to those contained in the AIA Document. This document, further, contains provisions, which do not appear in the AIA document.

The use of any language or Article or Paragraph format similar to or the same as AIA Document A-201 does not constitute an endorsement by the American Institute of Architects of this document.

**SECTION V
GENERAL CONDITIONS OF THE
CONTRACT FOR CONSTRUCTION**

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ARTICLE 1

CONTRACT DOCUMENTS

- 1.1 DEFINITIONS
 - 1.1.1 AS SHOWN, AS INDICATED, AS DETAILED: These words, and words of like implication, refer to information contained in Drawings and Specifications describing the Work, unless explicitly stated otherwise in the Contract Documents.
 - 1.1.2 CLAIM: A Claim as used in the Contract is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of contract terms, payment of money, a credit against the payment of money, extension of time or other relief with respect to the terms of the Contract. The term Claim also includes other disputes and matters in question between the parties to a contract involved in the Owner's construction and repair projects arising out of or relating to the Contract or the construction process.

- 1.1.3 **CONTRACT:** The Contract is the sum of all the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Paragraph 1.1.4. The Contract may also be referred to in the Contract Documents as “this Contract”, “this Agreement” or “the Agreement”.
- 1.1.4 **CONTRACT DOCUMENTS:** The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General and Supplemental Conditions), the Plans, Drawings, and Specifications, and all Addenda thereto issued prior to and all Modifications thereto issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties; (2) a Change Order or a Construction Change Directive issued pursuant to the provisions of Article 12; (3) a written interpretation issued by the Design Consultant pursuant to Paragraph 2.2.7; or (4) a written order for a minor Change in the Work issued pursuant to Section 12.4. The Contract Documents do not include any other documents including but not limited to soils, geotechnical or other reports, surveys and analysis, which may be printed, bound or assembled with the Contract Documents, or otherwise made available to the Contractor for review or information under this Contract, unless specifically enumerated and directly incorporated by reference in the Contract Documents.
- 1.1.5 **HE/HIS:** The term He or His is not intended to be gender specific.
- 1.1.6 **MANUFACTURER:** An individual, company, or corporation who manufactures, fabricates, or assembles a standard product. A standard product is one that is not made to special design, and if furnished by either direct sale or by contract to the Contractor, Subcontractor or Vendor.
- 1.1.7 **MATERIAL SUPPLIER OR VENDOR:** A person or organization who supplies, but who is not responsible for the installation of, materials, products and equipment.
- 1.1.8 **NOTICE:** The term Notice as used herein shall mean and include written notice. Notice shall be deemed to have been given when delivered to the address of the person, firm or corporation for whom intended, or to his, their or its duly authorized agent, representative or officer; or when enclosed in a postage prepaid wrapper or envelope addressed to such person, firm or corporation at his, their or its Notice Address and deposited in a United States mailbox by registered or certified mail. To “Notify” means to give Notice. The Notice Addresses for the Owner and Contractor are stated in the Owner-Contractor Agreement and may be changed by a party by giving Notice to the other of such change.
- 1.1.9 **PLANS OR DRAWINGS:** All drawings or reproduction of drawings pertaining to the Work.
- 1.1.10 **PRODUCT:** The term Product includes materials, systems and equipment.
- 1.1.11 **PROJECT:** The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.
- 1.1.12 **PROPOSAL:** A complete and properly signed document whereby the Contractor proposes to provide additional or a reduced scope of construction work on the Project for the sums stipulated therein, supported by data required by the Design Consultant or Owner.
- 1.1.13 **PROVIDE:** As a directive to the Contractor, and as pertaining to labor, materials or equipment, "provide" means "furnish and install completely".
- 1.1.14 **SPECIFICATIONS:** Descriptions, provisions and requirements, pertaining to method and manner of performing the Work, or to quantities and qualities of materials or equipment to be

furnished under terms of the Contract.

1.1.15 WORK: The Work comprises the construction and services required of the Contractor by the Contract Documents and includes all labor, supplies and other facilities or things necessary to produce such construction, and all materials, equipment, and supplies incorporated or to be incorporated in such construction.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contractor and Owner acknowledge that neither these General Conditions, nor any other Contract Document shall be construed against the Owner due to the fact that they may have been drafted by the Owner or the Owner's agent. For the purposes of construing these General Conditions, and any other Contract Document, both the Contractor and the Owner shall be considered to have jointly drafted them.

1.2.2 The Owner-Contractor Agreement shall be signed in not less than three (3) copies by the Owner and Contractor, and each of which shall be deemed an original, but all of which shall constitute one and the same instrument.

1.2.3 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

1.2.4 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings unless otherwise specifically defined herein. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light upon the interpretation of the provisions to which they refer.

1.2.5 The organization of the Specifications into divisions, sections and articles, and the arrangement of Drawings are for convenience only. The Contractor may subcontract the Work in such divisions as he sees fit consistent with applicable law and he is ultimately responsible for furnishing all of the Work.

1.2.6 Anything shown on the Drawings and not mentioned in the Specifications or mentioned in the Specifications and not shown on the Drawings shall have the same effect as if shown or mentioned respectively in both. Detailed specifications take priority over general specifications and detailed drawings take precedence over general drawings. Any Work shown on one drawing shall be construed to be shown in all drawings. If any portion of the Contract Documents shall be in conflict with any other portion, the various documents comprising the Contract Documents shall govern in the following order of precedence: The Owner-Contractor Agreement; the Supplemental Conditions; the General Conditions; the Specifications; the Drawings. The Contractor shall notify the Design Consultant and the Owner of all such inconsistencies promptly. Any such conflict or inconsistency between or in the Drawings or Specifications shall be submitted by the Contractor promptly to the Owner and Design Consultant and the Design Consultant's decision thereon shall be final and conclusive.

1.2.7 The Contractor agrees that nothing contained in the Contract Documents or any contract between the Owner and the Design Consultant shall create any contractual relationship

between the Design Consultant and the Contractor, or between the Design Consultant and any Subcontractor or Sub-subcontractors. The Contractor acknowledges and agrees that this Contract is not intended to create, nor shall any provision be interpreted as creating, any contractual relationship between the Owner or Contractor and any third parties.

1.2.8 The provisions of this Contract cannot be amended, modified, varied or waived in any respect except by a Modification. The Contractor is hereby given notice that no person has authority to orally waive, or to release the Contractor from any of the Contractor's duties or obligations under or arising out of this Contract. Any waiver, approval or consent granted by Modification to the Contractor shall be limited to those matters specifically and expressly stated thereby to be waived, approved or consented to and shall not relieve the Contractor of the obligation to obtain any future waiver, approval or consent.

1.2.9 Any material or operation specified by reference to published specifications of a Manufacturer, a society, an association, a code, or other published standard, shall comply with requirements of the listed document which is current on date the Owner received bids for the construction of the Project. In case of a conflict between referenced document and the Specifications, Specifications shall govern. In case of a conflict between such listed documents, the one having more stringent requirements shall govern.

1.2.10 The Contractor, if requested, shall furnish an affidavit from each or any Manufacturer certifying that materials or products delivered to the job meets requirements specified.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All Drawings, Specifications and copies thereof furnished by the Design Consultant are and shall remain the property of the Owner. They are to be used by Contractor only with respect to the Project and are not to be used by Contractor on any other project. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of Owner's rights or the Design Consultant's common law copyright or other reserved rights.

ARTICLE 2

THE DESIGN CONSULTANT

2.1 DEFINITIONS

2.1.1 The term "Design Consultant" or "A/E" or "Architect" or "Engineer" as used or set forth in the Contract Documents, shall mean the entity and its consultants or agents, or their duly authorized representatives, that is responsible for designing or engineering the Work, and performing the activities specified herein, and in the Agreement for Design Consultant Services, including any consultants to said entity or firm acting within the scope of their agreements with the Design Consultant. Such firm or agency and its representatives shall act severally within the scope of particular duties entrusted to them, unless otherwise provided for in the Contract Documents or in the Agreement for Design Consultant Services.

2.1.2 The Design Consultant may be identified in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The Design Consultant is further described as and, throughout this document, shall mean one or both of the following:

2.1.2.1 ARCHITECT, a person or other legal entity lawfully licensed to practice architecture in the State wherein the Project is located; or

2.1.2.2 ENGINEER, a person or other legal entity lawfully licensed to practice engineering in the State wherein the Project is located.

2.2 SERVICES OF THE DESIGN CONSULTANT

2.2.1 The Design Consultant will provide certain services as hereinafter described and further described in the Agreement for Design Consultant Services.

2.2.2 Should errors, omissions, or conflicts in the Drawings, Specifications, or other Contract Documents prepared by or on behalf of the Design Consultant be discovered, the Design Consultant will prepare such amendments or supplementary documents and provide consultation as may be required.

2.2.3 The Design Consultant will visit the site at intervals appropriate to the stage of construction to familiarize itself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. The Design Consultant will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work, but it shall make as many inspections as may reasonably be required to fulfill its obligations to the Owner. On the basis of such on-site observations, the Design Consultant and his consultants shall endeavour to guard the Owner against defects and deficiencies in the Work. The Design Consultant will conduct the weekly construction meeting and shall be responsible for preparing accurate and complete minutes of all such meetings and other Project meetings and distributing same to all participants.

2.2.4 The Design Consultant will render written field reports to the Owner in the form required by the Owner relating to the periodic visits and inspections of the Project required by Paragraph 2.2.3.

2.2.5 The Design Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Design

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Consultant will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any portion of the Work.

- 2.2.6 The Design Consultant shall at all times have access to the Work wherever it is in preparation or progress. The Contractor shall provide safe facilities for such access so the Design Consultant may perform his functions under the Contract Documents.
- 2.2.7 As required, the Design Consultant will render to the Owner, within a reasonable time, interpretations concerning the design and other technical aspects of the Work and the Contract Documents.
- 2.2.8 All communications, correspondence, submittals, and documents exchanged between the Design Consultant and the Contractor in connection with the Project shall be through the Owner or in the manner prescribed by the Owner. Further, all communications, correspondence, submittals and documents transmitted from the Owner or Design Consultant will be directed to the Contractor and copied to the Owner or Design Consultant.
- 2.2.9 All interpretations and decisions of the Design Consultant shall be consistent with the intent of and reasonably inferable from the Contract Documents.
- 2.2.10 The Design Consultant's decisions in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents.
- 2.2.11 If the Design Consultant observes any Work that does not conform to the Contract Documents, the Design Consultant shall report this observation to the Owner. The Design Consultant will prepare and submit to the Owner "punch lists" of the Contractor's work, which is not in conformance with the Contract Documents. The Owner will transmit such "punch lists" to the Contractor.
- 2.2.12 The Design Consultant has the authority to condemn or reject any or all of the Work on behalf of the Owner when, in its opinion, the Work does not conform to the Contract Documents. Whenever, in the Design Consultant's reasonable opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Design Consultant will have the authority to require special inspection or testing of any portion of the Work in accordance with the provisions of the Contract Documents whether or not such portion of the Work be then fabricated, installed or completed.
- 2.2.13 The Design Consultant will review the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and for general compliance with the Contract Documents. Such action shall be taken within fourteen (14) days of receipt unless otherwise authorized by the Owner.
- 2.2.14 The Owner will establish with the Design Consultant procedures to be followed for review and processing of all Shop Drawings, catalogue submittals, project reports, test reports, maintenance manuals, and other necessary documentation, as well as requests for changes and applications for extensions of time.
- 2.2.15 The Design Consultant will prepare Change Orders and Construction Change Directives when requested by the Owner.
- 2.2.16 The Design Consultant and the Owner will conduct inspections to determine the dates of Substantial Completion and Final Completion. The Design Consultant will issue a final Certification of Payment.

- 2.2.17 The Design Consultant will prepare three (3) printed copies and one (1) electronic computer file compatible with the latest version of AutoCAD, or other program designated by Owner, showing significant Changes in the Work made during the construction process, based on neatly and clearly marked-up Drawings, prints, and other data furnished by the Contractor(s) and the applicable Addenda, clarifications and Change Orders which occurred during the Project. The Design Consultant will also provide the Owner assistance in the original operation of any equipment or system such as initial start-up, testing, adjusting, and balancing.
- 2.2.18 In case of the termination of the employment of the Design Consultant, the Owner may appoint a Design Consultant whose status under the Contract Documents shall be that of the former Design Consultant.

ARTICLE 3

OWNER

3.1 DEFINITION

- 3.1.1 The Owner is the person or entity identified as such in the Owner-Contractor Agreement and may be referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative or agent. The phrase "Owner or its agent" as used in this Agreement, does not include the Separate Contractors or their Subcontractors.

3.2 INFORMATION, SERVICES AND RIGHTS OF THE OWNER

- 3.2.1 The Owner will provide administration of the Contract as herein described. The Design Consultant shall also provide aspects of administration of the Contract as herein described or as specified in the Agreement for Design Consultant Services.
- 3.2.2 The Owner shall at all times have access to the Work whenever it is in preparation or progress. The Contractor shall provide safe facilities for such access.
- 3.2.3 The Owner shall not be responsible for or have control or charge of the construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, and will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.
- 3.2.4 The Owner will have authority to require special inspection or testing of portions of the Work to the same extent as the Design Consultant in accordance with Paragraph 2.2.12 whether or not such portion of the Work be then fabricated, installed, or completed. However, neither the Owner's authority to act under Paragraph 3.2.4, nor any decision made by the Owner in good faith either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Owner to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.
- 3.2.5 The Owner shall have the authority and discretion to call, schedule, and conduct job meetings to be attended by the Contractor, representatives of his Subcontractors, and the Design Consultant, to discuss such matters as procedures, progress, problems, and scheduling.
- 3.2.5.1 The Contractor is requested and required to attend weekly job site progress conferences as called by the Design Consultant. The Contractor shall be represented at these job progress conferences by an authoritative representative of the home office of the Contractor as well as by project personnel representatives. These meetings shall be open to Subcontractors, Material

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Suppliers, and any others who can contribute shall be encouraged by the Contractor to attend. It shall be the principal purpose of these meetings, or conferences, to affect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the Project on schedule and to complete the Project within the specified Contract Time. The Contractor shall be prepared to assist progress of the Work as required in his particular contract and to recommend remedial measures for the correction of progress as may be appropriate. The Design Consultant shall be the coordinator of the conferences and shall preside as chairman.

- 3.2.5.2 If the Project is awarded as a single prime construction contract, the Design Consultant shall determine which, if any, Subcontractors and/or Material Suppliers shall be required to attend weekly job site progress conferences. The Contractor shall comply with this request and the meeting shall be conducted as described in Subparagraph 3.2.5.1.
- 3.2.6 The Owner will establish procedures to be followed for processing all Shop Drawings, catalogues, and other project reports, and other documentation, test reports, and maintenance manuals.
- 3.2.7 The Owner and Design Consultant will review all requests for changes and shall implement the processing of Change Orders, including applications for extension of the Contract Time.
- 3.2.8 The Owner, will not be responsible for the failure of the Contractor to plan, schedule, and execute the Work in accordance with the approved schedule or the failure of the Contractor to meet scheduled Completion Dates or the failure of the Contractor to schedule and coordinate the Work of his own trades and Subcontractors or to coordinate and cooperate with any Separate Contractors.
- 3.2.9 The Owner, in consultation with the Design Consultant, will review and process all Applications for Payment by the Contractor, including the final Application for Payment.
- 3.2.10 The Owner and Design Consultant shall not be responsible or liable to Contractor for the acts, errors or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons performing any of the Work or working on the Project.
- 3.2.11 The Owner shall furnish surveys describing the physical characteristics and legal limitations for the site of the Project, which are in its possession and are relevant to the Work.
- 3.2.12 The Owner shall secure and pay for necessary easements, required for permanent structures or for permanent changes in existing facilities.
- 3.2.13 The Owner shall furnish information or services under the Owner's control with reasonable promptness to avoid unreasonable delay in the orderly progress of the Work.
- 3.2.14 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, copies of Drawings and Specifications in accordance with the Supplemental Conditions.
- 3.2.15 The Owner will make reasonable efforts to make available for the Contractor's reasonable review, at the Owner's offices or together with the Contract Documents, certain boring logs, geotechnical, soils and other reports, surveys and analyses pertaining to the Project site of which the Owner is aware, has in its possession and are relevant to the Work. Any boring logs that are provided to the Contractor are only intended to reflect conditions at the locations of the borings and do not necessarily reflect site conditions at other locations. Any reports, surveys and analyses provided by Owner are for the Contractor's information only, and their accuracy and completeness are not guaranteed or warranted by the Owner or the Design Consultant, and such reports are not adopted by reference into, nor are they part of the Contract Documents.

Notwithstanding any factual statement, conclusion, or any language or recommendations contained in such reports, the Contractor assumes full responsibility for inspection of the site and determination of the character, quality and quantity of any soil, surface or subsurface conditions that may be encountered or which may affect the Work, and for the means and methods of construction that he employs when performing the Work.

3.2.16 The foregoing rights are in addition to other rights of the Owner enumerated herein and those provided by law.

3.3 OWNER'S RIGHT TO STOP OR TO SUSPEND THE WORK

3.3.1 If the Contractor fails to correct defective Work as required by Section 13.2 or fails to carry out the Work or supply labor and materials in accordance with the Contract Documents, the Owner by a written Notice may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

3.3.2 The Owner may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as he may determine to be appropriate for the convenience of the Owner.

3.3.3 If the performance of all or any part of the Work (including the work of the Contractor and its Subcontractors) is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Owner or the Design Consultant, or by failure of any one of them to act within the time specified in this Contract (or if no time is specified, within a reasonable time), an adjustment shall be made for an increase in the actual time required for performance of the Work by the Contractor, due solely to such unreasonable suspension, delay, or interruption and the Contract modified in writing accordingly. However, no Claim shall be made under this Paragraph for any suspension, delay, or interruption pursuant to Paragraph 3.4.1, or for which Claim is provided or excluded under any other provision of this Contract. No Claim under this Paragraph shall be allowed on behalf of the Contractor or its Subcontractors, unless within twenty (20) days after the act or failure to act involved, and for continuing or ongoing acts or failures to act within twenty (20) days of the first day of the act or failure to act, the Contractor submits to the Owner a written statement setting forth, as fully as then practicable, the extent of such Claim, and unless the Claim is asserted in writing within thirty (30) days after the termination of such suspension, delay, or interruption. For continuing or ongoing acts or failures to act, the Contractor shall update its written statement every twenty (20) days until the suspension, delay or interruption is terminated. The Contractor shall waive any and all Claims under this Paragraph 3.3.3 which are not filed in strict conformance with Paragraph 3.3.3. The Contractor shall indemnify, defend and hold the Owner harmless from any Claim by a Subcontractor that is waived because it is not filed in strict conformance with this Paragraph 3.3.3 or any other provision of the Contract regarding Claims.

3.3.4 In the event of a suspension of the Work or delay or interruption of the Work per Paragraph 3.3.3, the Contractor will and will cause his Subcontractors to protect carefully his, and their, materials and Work against damage, loss or injury from the weather and maintain completed and uncompleted portions of the Work as required by the Contract Documents. If, in the opinion of the Owner, any Work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect same, such Work and materials shall be removed and replaced at the expense of the Contractor.

3.3.5 No Claim by the Contractor under Paragraph 3.3.3 shall be allowed if asserted after final payment under this Contract or if it is not asserted in strict conformance with Paragraph 3.3.3.

3.4 OWNER'S RIGHT TO CARRY OUT THE WORK

3.4.1 If the Contractor defaults or otherwise neglects to carry out the Work in accordance with the Contract Documents and fails within ten (10) days after the date written Notice is given by the Owner, with a copy of such Notice sent to the Contractor's Surety, to commence and continue remedy of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, make good such deficiencies and may further elect to complete all Work thereafter through such means as the Owner may select, including the use of a new contractor pursuant to Paragraph 3.4.2. In such case, the Owner shall provide Notice to the Contractor's Surety and an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Design Consultant's additional services made necessary by such default, neglect or failure and any other damages suffered by Owner as a result of Contractor's breach, including but not limited to Owner's reasonable attorney's fees and litigation costs and expenses. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor or its Surety shall pay the difference to the Owner. Notwithstanding the Owner's right to carry out a portion of the Work, warranty, maintenance and protection of the Work remains the Contractor's and Surety's responsibility. Further, the provisions of this Paragraph do not affect the Owner's right to require the correction of defective or non-conforming Work in accordance with Section 13.2.

3.4.2 Whenever the Contractor shall be, and declared by the Owner to be in default under the Contract, the Owner having substantially performed Owner's obligations thereunder, the Surety shall promptly remedy the default, or shall be liable to Owner for damages pursuant to the Performance Bond and as provided by law. Any action by Surety or by Owner against the Surety shall not relieve Contractor of its duties, responsibilities and liabilities to Owner pursuant to the Contract or as allowed by law.

ARTICLE 4

CONTRACTOR

4.1 DEFINITION

4.1.1 The Contractor is the person or organization identified as such in the Owner-Contractor Agreement and may be referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative, who shall have authority to bind the Contractor in all matters pertinent to the Contract.

4.1.2 The Contract is not one of agency by the Contractor for Owner but one in which Contractor is engaged independently in the business of providing the services and performing the Work herein described as an independent contractor.

4.2 REVIEW OF CONTRACT DOCUMENTS

4.2.1 The Contractor represents that prior to executing this Contract, the Contractor carefully reviewed and studied the Contract Documents and notified the Owner and Design Consultant of any errors, inconsistencies or omissions of which the Contractor is aware. The Contractor agrees to continuously and carefully study and compare the Contract Documents after the execution of this Contract and shall at once report to the Owner and Design Consultant any error, inconsistency or omission he may discover, including, but not limited to, any requirement which may be contrary to any law, ordinance, rule, regulation, building code, or order of any public authority bearing on the Work. If the Contractor has reported in writing an error, inconsistency or omission, has promptly stopped the affected Work until otherwise instructed, and has otherwise followed the instructions of the Owner, the Contractor shall not be liable to the Owner or the Design Consultant for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents. The Contractor shall perform no portion of the Work at any time without it being specified in Contract Documents and, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

4.2.2 The Contractor and his Subcontractors shall keep at the site of the Work at least one copy of the Drawings and Specifications and shall at all times give the Owner, the Design Consultant, inspectors, as well as other representatives of the Owner access thereto.

4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for and have control over all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

4.3.1.1 It shall be the Contractor's responsibility to schedule the Work; to maintain a progress schedule for the Project; and to notify the Design Consultant and the Owner of any changes in the progress schedule. He shall be responsible for providing adequate notice to all Subcontractors to insure efficient continuity of all phases of the Project. The Contractor is responsible for keeping the Owner and Design Consultant fully informed as to the work progress, including immediate notification of any work progress changes.

4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and Sub-subcontractors, Suppliers, their agents and employees, and other persons performing any of the Work and for their compliance with each and every requirement of the Contract Documents, in the same manner as if they were directly contracted by the

Contractor.

- 4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the acts, failures to act or duties of the Owner or the Design Consultant in their administration of the Contract, or by inspections, tests or approvals (or the lack thereof) required or performed under Section 7.6 by persons other than the Contractor.
- 4.3.4 Before starting a section of the Work, the Contractor shall carefully examine all preparatory work that has been executed to receive his work to see that it has been completed in accordance with the Contract Documents. He shall check carefully, by whatever means are required, to ensure that his work and adjacent, related work will finish to proper and required standards for quality, contours, planes, and levels.
- 4.3.5 The Contractor understands and agrees that the Owner and Design Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and they will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Owner and the Design Consultant will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.
- 4.3.6 The Contractor shall not use or provide Subcontractor equipment, materials, methods or persons to which Owner and Design Consultant have a reasonable objection and shall remove no portion of the Work or stored materials from the site of the Work, except for defective Work the Contractor may be required to replace or repair as set forth herein.
- 4.3.7 The Contractor shall verify all grades, lines, levels and dimensions as indicated and shown on the Drawings and in the Specifications prior to beginning any portion of the Work and shall immediately report in writing any errors or inconsistencies to the Design Consultant before commencing that portion of the Work.

4.4. CONTRACTOR'S REPRESENTATIONS

- 4.4.1 By entering into this Contract with the Owner, the Contractor represents and warrants the following, together with all other representations and warranties in the Contract Documents:
- .1 That he is experienced in and competent to perform the type of work required and to furnish the Subcontractors, materials, supplies, equipment and services to be performed or furnished by him;
 - .2 That he is financially solvent, able to pay his debts as they mature, and possessed of sufficient working capital to initiate and complete the Work required under the Contract;
 - .3 That he is familiar with all Federal, State, County, municipal and department laws, ordinances, permits, regulations, building codes and resolutions which may in any way affect the Work or those employed therein, including but not limited to any special laws or regulations relating to the Work or any part thereof;
 - .4 That such temporary and permanent Work required by the Contract Documents will be satisfactorily constructed and fit for use for its intended purpose and that such construction will not injure any person, or damage any property;
 - .5 That he has carefully examined the Contract Documents and the site of the Work and that from his own investigations, he has satisfied himself and made himself familiar with:
(1) the nature and location of the Work; (2) the character, quality and quantity of surface

and subsurface materials likely to be encountered, including, but not limited to, all structures and obstructions on or at the Project site, both natural and man-made; (3) the character of equipment and other facilities needed for the performance of the Work; (4) the general and local conditions including without limitation its climatic conditions, the availability and cost of labor and the availability and cost of materials, tools and equipment; (5) the quality and quantity of all materials, supplies, tools, equipment, labor and professional services necessary to complete the Work in the manner required by the Contract Documents; and (6) all other matters or things which could in any manner affect the performance of the Work;

- .6 That he will fully comply with all requirements of the Contract Documents;
- .7 That he will perform the Work consistent with good workmanship, sound business practice, and in the most expeditious and economical manner consistent with the best interests of the Owner;
- .8 That he will furnish efficient business administration and experienced project management and supervision, and an adequate supply of workers, equipment, tools and materials at all times;
- .9 That he has carefully reviewed the Work required and that the Work can be planned and executed in a normal and orderly sequence of Work and reasonably scheduled so as to ensure completion of the Work in accordance with the Contract Documents, allowing for normal and reasonably foreseeable weather, labor and other delays, interruptions and disruptions of the Work;
- .10 That he will complete the Work within the Contract Time and all portions thereof within any required Completion Dates;
- .11 That his Contract Sum is based upon the labor, materials, systems and equipment required by the Contract Documents, without exception; and
- .12 That he will make a good faith effort to utilize Historically Underutilized Businesses (HUB's) per N.C. Gen. Stat. 143-128.2, and as described in the construction documents.

4.5 LABOR AND MATERIALS

4.5.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, supplies, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary or proper for or incidental to the execution and completion of the Work required by and in accordance with the Contract Documents and any applicable code or statute, whether specifically required by the Contract Documents or whether their provision may reasonably be inferred as necessary to produce the intended results, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Final payment will not be made until the Work is so completed and Contractor has otherwise complied with the Contract Documents in full.

4.5.2 The Contractor shall at all times enforce strict discipline and good order among his employees and Subcontractors performing any of the Work and shall not employ or contract with on the Work any unfit person or entity or anyone not skilled in the task assigned to him. The Owner may, by Notice, require the Contractor to remove from the Work any employee or employee of a Subcontractor performing any of the Work, that the Owner deems incompetent, careless or otherwise objectionable.

4.5.3 The Contractor shall be responsible for ensuring that the Work is completed in a skillful and

workmanlike manner.

4.5.4 All equipment, apparatus and/or devices of any kind to be incorporated into the Work that are shown or indicated on the Drawings or called for in the Specifications or required for the completion of the Work shall be entirely satisfactory to the Owner and the Design Consultant as regards operations, capacity and/or performance. No approval, either written or verbal, of any drawings, descriptive data or samples of such equipment, apparatus and/or device shall relieve the Contractor of his responsibility to turn over the same in good working order for its intended purpose at the completion of the Work in complete accordance with the Contract Documents. Any equipment, apparatus and/or device not fulfilling these requirements shall be removed and replaced by proper and acceptable equipment, etc. or put in good working order satisfactory to the Owner and Design Consultant without additional cost to the Owner.

4.6 WARRANTY

4.6.1 The Contractor warrants to the Owner and the Design Consultant that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all workmanship will be in accordance with generally accepted industry standards, free from faults and defects and in conformance with the Contract Documents and all other warranties and guaranties specified therein. Where no standard is specified for such workmanship or materials, they shall be the best of their respective kinds. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner or the Design Consultant, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Article 13.

4.6.2 The Contractor will be required to complete the Work specified and to provide all items needed for construction of the Project, complete and in good order.

4.6.3 The warranties set forth in this Section 4.6 and elsewhere in the Contract Documents shall survive Final Completion of the Work under Section 9.9.

4.6.4 The Contractor guarantees and warrants to the Owner all Work as follows:

- .1 That all materials and equipment furnished under this Contract will be new and the best of its respective kind unless otherwise specified;
- .2 That all Work will be in accordance with generally accepted industry standards and free of omissions and faulty, poor quality, imperfect and defective material or workmanship;
- .3 That the Work shall be entirely watertight and leak proof in accordance with all applicable industry customs and practices, and shall be free of shrinkage and settlement;
- .4 That the Work, including but not limited to, mechanical and electrical machines, devices and equipment, shall be fit and fully usable for its intended and specified purpose and shall operate satisfactorily with ordinary care;
- .5 That consistent with requirements of the Contract Documents, the Work shall be installed and oriented in such a manner as to facilitate unrestricted access for the operation and maintenance of fixed equipment;
- .6 That the Work will be free of abnormal or unusual deterioration which occurs because of poor quality materials, workmanship or unsuitable storage; and
- .7 That the products or materials incorporated in the Work will not contain asbestos.

- 4.6.5 All Work not conforming to guarantees and warranties specified in the Contract Documents, including substitutions not properly approved and authorized, may be considered defective. If required by the Design Consultant or Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- 4.6.5.1 The Contractor will submit a written affidavit certifying that none of the materials incorporated in the Project contain asbestos.
- 4.6.6 If, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof as defined in Paragraph 8.1.3 or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective, not in accordance with the Contract Documents, or not in accordance with the guarantees and warranties specified in the Contract Documents, the Contractor shall correct it within five (5) working days or such other period as mutually agreed, after receipt of Notice from the Owner to do so. The Owner shall give such Notice with reasonable promptness after discovery of the condition. For items that remain incomplete or uncorrected on the date of Substantial Completion, the one (1) year warranty shall begin on the date of Final Completion of the Work or upon correction of the defective Work.
- 4.6.7 If at any time deficiencies in the Work are discovered which are found to have resulted from fraud or misrepresentation, or an intent or attempt to or conspiracy to defraud the Owner by the Contractor, any Subcontractor or Supplier, the Contractor will be liable for replacement or correction of such Work and any damages which Owner has incurred related thereto, regardless of the time limit of any guarantee or warranty.
- 4.6.8 Any materials or other portions of the Work, installed, furnished or stored on site which are not of the character or quality required by the Specifications, or are otherwise not acceptable to the Design Consultant or the Owner, shall be immediately removed and replaced by the Contractor to the satisfaction of the Design Consultant and Owner, when notified to do so by the Design Consultant or Owner.

4.6.9 If the Contractor fails to correct defective or non-conforming Work as required by Paragraph 4.6.6, or if the Contractor fails to remove defective or non-conforming Work from the site, as required by Paragraph 4.6.8, the Owner may elect to either correct such Work in accordance with Section 3.4 or remove and store materials and equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may upon ten (10) additional days written Notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Design Consultant's additional services and Owner's reasonable attorney's fees made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

4.6.10 The Contractor shall bear the cost of making good all of the Work of the Owner, Separate Contractors or others, destroyed or damaged by such correction or removal required under this Article 4, Article 13 or elsewhere in the Contract Documents.

4.7 TAXES

4.7.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time the Owner received bids for the construction of the Project, whether or not yet effective.

4.7.2 Sales and Use Tax. Contractor shall be responsible for complying with any applicable sales and use tax obligations imposed by Chapter 105, Article 5 of the North Carolina General Statutes. Where Contractor has been contracted with to oversee "new construction" or "reconstruction" as defined in G.S. 105-164.4H, Contractor shall be responsible for issuing and maintaining an Affidavit of Capital Improvement.

4.8 PERMITS, FEES AND NOTICES

4.8.1 The Contractor shall be responsible for fees associated with permits and approval of the Drawings including but not limited to building permit, utility impact fees, stormwater permit and driveway permit.

4.8.2 The Contractor is responsible for all fees, permits and other costs associated with temporary utilities, including but not limited to installation, use, disconnection, removal and/or relocation.

4.8.3 The Contractor will pay for his own license, inspection and re-inspection fees for the proper execution and completion of the Work.

4.8.4 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work, including but not limited to all applicable building codes. If Contractor believes that any part of the Drawings or Specifications are inconsistent with applicable laws, rules, regulations, lawful orders of public authorities or building codes, Contractor shall Notify the Owner and Design Consultant of such inconsistencies immediately.

4.9 ALLOWANCES

4.9.1 The Contractor shall include in the Contract Sum all Allowances stated in the Contract Documents. Items covered by these Allowances shall be supplied for such amount and by such persons as the Owner may direct, but the Contractor will not be required to employ persons against whom he makes a reasonable objection.

4.9.2 Unless otherwise provided in the Contract Documents:

- .1 Allowances for Work: These allowances shall cover the cost to the Contractor for the materials and equipment required by the allowance delivered at the site, all applicable taxes, unloading, uncrating and storage, protection from elements, labor, installation and finishing and other expenses required to complete the installation, and a fixed percentage for overhead and profit as defined in Article 12.
- .2 Allowances for Products/Materials: Allowance includes the cost of the product, delivery to the site and applicable taxes. The Contractor's costs for unloading and handling on the site, labor, installation, overhead, profit and other expenses contemplated for the material allowance shall be included in the Contract Sum and not in the allowance;
- .3 Whenever the cost is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expense.

4.10 SUPERINTENDENT

4.10.1 The Contractor shall employ, and have approved by the Owner, a competent superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. If the Contractor employs more than a single individual in this role, the Owner shall be provided an organizational chart and personnel listing for the staff performing the functions of a superintendent. In such event, all references to the superintendent elsewhere in the Contract Documents shall mean the staff performing the functions of a superintendent.

4.10.2 The superintendent shall be in attendance at the Project site not less than eight (8) hours per day, five (5) days per week, unless the job is closed down due to conditions beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. It is understood that such superintendent shall be acceptable to the Owner and shall be the one who will be continued in that capacity for the duration of the Project, unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The superintendent shall not be employed on any other project for or by Contractor or any other entity during the course of the Work.

4.11 PROGRESS SCHEDULE

4.11.1 The Contractor shall prepare and submit to the Owner for the Owner's review and approval an estimated progress schedule for the Work.

4.12 RESPONSIBILITY FOR COMPLETION

4.12.1 The Contractor shall furnish such manpower, materials, facilities and equipment and shall work within the normal scheduled working hours to ensure the performance of the Work within the Completion Dates specified in the Owner-Contractor Agreement. If for any reason the Contractor must work outside of the normal scheduled working hours, a custodian employed by the Owner is required to be in attendance when accessing the work area. The Contractor agrees to reimburse the Owner for such custodian's time. The reimbursement is due with the subsequent payment application.

4.12.2 If it becomes apparent to the Design Consultant or Owner that the Work will not be completed within required Completion Dates, the Contractor agrees to undertake some or all of the

following actions, at no additional cost to the Owner, in order to ensure, in the opinion of the Design Consultant and Owner, that the Contractor will comply with all Completion Date requirements:

- .1 Increase manpower, materials, crafts, equipment and facilities;
 - .2 Increase the number of working hours per shift, shifts per working day, working days per week, or any combination of the foregoing, including but not limited to night shifts, overtime operations and Sundays and holidays;
 - .3 Reschedule activities to achieve maximum practical concurrence of accomplishment of activities;
 - .4 Require that his superintendent be at the Project site not less than ten (10) hours per day, six (6) days per week; and
 - .5 Reimburse the Owner in accordance with Paragraph 4.12.1 above for all work performed outside of the normal scheduled work hours.
- 4.12.3 In undertaking the actions required under Paragraph 4.12.1, Contractor shall prepare and adhere to a recovery schedule if the Project is behind schedule by four (4) or more days.
- 4.12.4 If the actions taken by the Contractor are not satisfactory, the Design Consultant or Owner may direct the Contractor to take any and all actions necessary to ensure completion within the required Completion Dates, without additional cost to the Owner. In such event, the Contractor shall continue to assume responsibility for his performance and for completion within the required dates.
- 4.12.5 If, in the opinion of the Design Consultant or Owner, the actions taken by the Contractor pursuant to this Article or the progress or sequence of the Work are not accurately reflected on the construction schedule, the Contractor shall revise such schedule to accurately reflect the actual progress and sequence of the Work.
- 4.12.6 Failure of the Contractor to substantially comply with the requirements of this Article, may be considered grounds for a determination by the Owner, pursuant to Article 14, that the Contractor is failing to prosecute the Work with such diligence as will ensure its completion within the time specified.
- 4.12.7 The Owner may, at its sole discretion and for any reason, other than due to the fault of Contractor require the Contractor to accelerate the Work by providing overtime, Saturday, Sunday and/or holiday work and/or by having all or any Subcontractors designated by the Owner provide overtime, Saturday, Sunday, and/or holiday work. In the event that the Owner requires such acceleration a Change Order shall be issued in accordance with Article 12.
- 4.12.8 This Section 4.12 does not eliminate the Contractor's responsibility to comply with the local noise ordinances, all highway permit requirements and all other applicable laws, regulations, rules, ordinances, resolutions, and permit requirements.
- 4.13 DOCUMENTS AND SAMPLES AT THE SITE
- 4.13.1 The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be delivered to the Design Consultant upon completion of the Work.

4.14 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- 4.14.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, Manufacturer, Supplier or distributor to illustrate some portion of the Work.
- 4.14.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
- 4.14.3 Samples are physical examples, which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
- 4.14.4 Manuals are manufacturer's installation, start-up, operating, and maintenance and repair instructions together with parts lists, pictures, sketches and diagrams, which set forth the manufacturer's requirements for the benefit of the Contractor and the Owner.
- 4.14.5 The Contractor shall prepare or have prepared at its expense and shall review, indicate approval thereupon, and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the other work of the Owner or any Separate Contractor, all Shop Drawings, Product Data, Manuals and Samples required by the Contract Documents.
- 4.14.5.1 Unless otherwise directed in writing, the Contractor shall submit no less than three (3) copies of each Shop Drawing, Product Data, or Manuals to the Design Consultant. Routing of said submittals will be from the Contractor to the Design Consultant with a copy of the transmittal to the Owner. The Design Consultant will return one (1) copy of the reviewed submittal to the Contractor.
- 4.14.5.2 Where the Contract calls for the submittal of manufacturer's data to the Design Consultant for information only, such submittals shall be made before the commencement of any portion of the Work requiring such submission. Work performed without benefit of approved Shop Drawings for any portion of the Work is subject to removal and replacement at no cost to the Owner.
- 4.14.5.3 For standard manufactured items not requiring special Shop Drawings for manufacture, Contractor shall submit no less than three (3) copies of Manufacturer's catalogue sheets showing illustrated cuts of item to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, wiring diagrams and controls, and all other pertinent information. One (1) copy of reviewed submissions will be returned to the Contractor.
- 4.14.5.4 Unless otherwise directed in writing, all other Shop Drawings, Contractor shall submit no less than three (3) legible copies of each drawing. Each drawing shall have a clear space for stamps. When phrase "by others" appears on Shop Drawings, the Contractor shall indicate on the Shop Drawing who is to furnish material or operations so marked before submittal. When the Shop Drawings are checked "revise and resubmit", the Contractor shall make corrections and submit new copies for review. The Shop Drawings shall contain the Contractor's "approval" and corrections.
- 4.14.5.5 For use of all trades, the Contractor shall provide such number of Shop Drawings as is required for field distribution.
- 4.14.5.6 The Design Consultant will review submittals and make marks to indicate corrections or revisions required and will stamp each submittal with an action stamp and will mark the stamp with the action required by the Contractor.

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- 4.14.5.7 Contractor shall submit names of proposed Manufacturers, Material Suppliers, dealers, who are to furnish materials, fixtures, appliances or other fittings for approval as early as possible, to afford proper investigation and checking.
- 4.14.5.8 Transactions with manufacturers, or Subcontractors, shall be through Contractor.
- 4.14.5.9 Unless otherwise specified, Contractor shall submit samples in duplicate of adequate size showing quality, type, color range, finish, and texture as indicated in the Specifications.
- 4.14.5.10 Where Specifications require manufacturer's printed installation instructions, Contractor shall submit duplicate copies of such instructions for approval.
- 4.14.5.11 When several materials are specified by name for one use, Contractor shall select for use any of those so specified.
- 4.14.5.12 Whenever item or class of material is specified exclusively by trade name, manufacturer's name, or by catalogue reference, Contractor shall use only such item, unless written approval for substitution is secured, as outlined in the Specifications and in Section 4.15 of the General Conditions.
- 4.14.5.13 Contractor shall not order materials until receipt of written approval. Contractor shall furnish materials equal in every respect to approved samples.
- 4.14.6 By approving and submitting Shop Drawings, Product Data, Manuals and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The Contractor shall adhere to any supplementary processing and scheduling instructions pertaining to Shop Drawings, which may be issued by the Design Consultant.
 - 4.14.6.1 Parts and details not fully indicated on the Drawings shall be detailed by the Contractor in accordance with standard engineering practice. Dimensions on the Drawings, as well as detailed drawings themselves are subject in every case to measurements of existing, adjacent, incorporated and completed, which shall be taken by the Contractor before undertaking any Work dependent on such data.
- 4.14.7 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Design Consultant's review of Shop Drawings, Product Data, Samples or Manuals under Paragraph 2.2.14 unless the Contractor has specifically informed the Design Consultant in writing of such deviation at the time of submission and the Design Consultant has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility to Owner for errors or omissions in the Shop Drawings, Product Data, Samples, or Manuals by virtue of the Design Consultant's review or approval thereof.
- 4.14.8 The Contractor shall make corrections required by the Design Consultant and shall resubmit the required number of corrected copies of Shop Drawings or new Product Data or Samples. The Contractor shall direct specific attention, in writing on resubmitted Shop Drawings, Product Data or Samples or Manuals, to revisions other than those requested by the Design Consultant on previous submittals. Re-submittals necessitated by required corrections due to Contractor's errors or omissions shall not be cause for extension of Contract Time or an increase in the Contract Sum.
 - 4.14.8.1 No portion of the Work requiring submission of Shop Drawings, Product Data, Samples or Manuals shall be commenced until the submittal has been approved by the Design Consultant

as provided in Article 2. All such portions of the Work shall be in accordance with approved submittals.

4.14.9 Shop Drawings, Product Data and Samples shall be dated and shall bear the name of the Project; a description or the names or equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. Shop Drawings shall be stamped and signed stating that the Contractor has determined and verified all materials, field measurements, and field construction criteria related thereto and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

4.14.10 Submittals of Shop Drawings, Product Data, Samples or Manuals shall be accompanied by a transmittal letter, in duplicate, containing the name of the Project, the Contractor's name, the number of Shop Drawings, Product Data, Samples, or Manuals, identification of Specification section and other pertinent data.

4.15 EQUAL PRODUCTS AND SUBSTITUTIONS

4.15.1 All materials, supplies and articles furnished under the Contract shall, whenever specified and otherwise practicable, be the standard products of recognized, reputable manufacturers. Unless otherwise specifically provided in the Contract Documents, the naming of a certain brand, make, manufacturer or article, device, product, material, fixture or type of construction shall convey the general style, type, character and standard of quality of the article desired and shall not be construed as limiting competition. The Contractor, in such cases, may with Owner's written approval, use any brand, make, manufacturer, article, device, product, material, fixture, form or type of construction which in the judgment of the Design Consultant is equal to that specified. An item may be considered equal to the item so named or described if, in the opinion of the Owner and Design Consultant (1) it is at least equal in quality, durability, appearance, strength, and design; (2) it will perform at least equally the specific function imposed by the general design for the Work being contracted for or the material being purchased; and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the Specifications. Approval by the Owner and Design Consultant will be granted based upon considerations of quality, workmanship, economy of operation, suitability for the purpose intended, warranty and acceptability for use on the Project.

4.15.2 To obtain such approval on makes or brands of material other than those specified in Contract Documents, and not previously approved at the time the Owner received bids for the construction of the Project, the Contractor's request for approval of any substitution shall include:

- .1 Complete data substantiating compliance of the proposed substitution with the Contract Documents;
- .2 Product identification including manufacturers' name, address, and phone number;
- .3 Manufacturer's literature showing complete product description, performance and test data, and all reference standards;
- .4 Samples and colors in the case of articles or products;
- .5 Names and addresses of similar projects on which the product was used and date of installation;
- .6 For construction methods, include a detailed description for the proposed method and drawings illustrating same;

- .7 Itemized comparison of proposed substitution with product or method specified and any cost reduction, which shall benefit the Owner;
- .8 Accurate cost data on proposed substitution in comparison with product or method specified;
- .9 All directions, specifications, and recommendations by manufacturers for installation, handling, storing, adjustment, and operation; and
- .10 Item by item comparison of characteristics of substitution item with those items specified.

4.15.3 The Contractor shall also submit with his request for approval a sworn and notarized statement which shall include all of the following representations by the Contractor, namely that:

- .1 He has investigated the proposed product or method and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents;
- .2 He will meet all contract obligations with regard to this substitution;
- .3 He will coordinate installation of accepted substitutions into the Work, making all such changes and any required schedule adjustments, at no additional cost to the Owner, as may be required for the Work to be complete in all respects;
- .4 He waives all Claims for additional costs and additional time related to substitutions, which consequently become apparent. He also agrees to hold the Owner harmless from Claims for extra costs and time incurred by other Subcontractors and suppliers, or additional services which may have to be performed by the Design Consultant, for changes for extra work that may, at some later date, be determined to be necessary in order for the Work to function in the manner intended in the Contract Documents;
- .5 He will provide the same warranty and guarantee, and perform any work required in accordance therewith, for the substitution that is applicable to the specified item for which the substitution is requested;
- .6 Material will be installed, handled, stored, adjusted, tested, and operated in accordance with the manufacturers' recommendation and as specified in the Contract Documents.
- .7 In all cases new materials will be used unless this provision is waived by Notice from the Owner or his Design Consultant, or unless otherwise specified in the Contract Documents;
- .8 All material and workmanship will be in every respect in accordance with that which, in the opinion of the Owner or Design Consultant, is in conformity with approved modern practice; and
- .9 He has provided accurate cost data on the proposed substitution in comparison with the product or method specified.

4.15.4 Subject to the provisions of any applicable laws, approval for substitutions or equal products shall be at the sole discretion of the Owner, shall be in writing to be effective, and the decision of the Owner shall be final. The Owner or Design Consultant may require tests of all materials proposed for substitution so submitted to establish quality standards, at the Contractor's expense. After approval of a substitution, if it is determined that the Contractor submitted defective information or data regarding the substitution upon which Owner's approval was

based, and that unexpected or unanticipated extensive redesign or rework of the Project will be required in order to accommodate the substitution, or that the substituted item will not perform or function as well as the specified item for which substitution was requested, the Contractor will be required to furnish the original specified item or obtain approval to use another substitution; the Contractor shall pay all costs, expenses or damages associated with or related to the unacceptability of such a substitution and the resultant utilization of another item and no time extension shall be granted for any delays associated with or related to such substitution.

4.15.5 If a substitution is approved, no further change in brand or make will be permitted unless satisfactory, written evidence is presented to and approved by the Owner that the manufacturer cannot make scheduled delivery of the approved substituted item. The Owner will not consider substitutions for approval if:

- .1 The proposed substitution is indicated or implied on the Contractor's Shop Drawing or product data submittal and has not been formally submitted for approval by the Contractor in accordance with the above-stated requirements, or
- .2 Acceptance of the proposed substitution will require substantial design revisions to the Contract Documents or is otherwise not acceptable to the Owner and Design Consultant.

4.15.6 Except as otherwise provided for by the provisions of any applicable laws, the Contractor shall not have any right of appeal from the decision of the Owner rejecting any materials submitted if the Contractor fails to obtain the approval for substitution under this Article.

4.16 USE OF SITE

4.16.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, easements, right-of-way agreements and within the limits of construction as shown on the Contract Documents. The Contractor shall not unreasonably encumber the site, in the opinion of the Owner, with any materials, equipment or trailers nor shall he block the entrances or otherwise prevent reasonable access to the site, other working and parking areas, completed portions of the Work and/or properties, storage areas, areas of other facilities that are adjacent to the worksite. If the Contractor fails or refuses to move said material, equipment or trailers within twenty four (24) hours of notification by the Owner, to so do, the Owner shall have the right, without further notice, to remove, at the Contractor's expense, any material, equipment and/or trailers which the Owner deems are in violation of this Paragraph.

4.17 CUTTING AND PATCHING OF WORK

4.17.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly and in accordance with the Contract Documents.

4.17.2 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any Separate Contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any Separate Contractor except with the written consent of the Owner and of such Separate Contractor. The Contractor shall not unreasonably withhold from the Owner or any Separate Contractor his consent to cutting or otherwise altering the Work. The Owner shall not be required to accept work with a cut, splice, or patch when such cut, splice or patch is not generally accepted practice for the particular work involved or is otherwise unworkmanlike in the opinion of the Design Consultant or the Owner.

4.17.3 Existing structures and facilities including but not limited to building, utilities, topography, streets, curbs, walks, etc., that are damaged or removed due to required excavations or other construction work, shall be patched, repaired or replaced by the Contractor to satisfaction of the Design Consultant and the Owner of such structures and facilities and authorities having jurisdiction. In event the local jurisdictional authorities require that such repairing and patching be done with their own labor and materials, the Contractor shall abide by such regulations and pay for such work with no increase in the Contract Sum.

4.18 CLEANING UP

4.18.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work and before final payment is made, he shall remove all his waste materials and rubbish from and about the Project as well as all his tools, construction equipment, machinery and surplus materials.

4.18.2 If the Contractor fails to clean up during or at the completion of the Work, the Owner may do so as provided in Section 6.3 and the cost thereof shall be charged to the Contractor.

4.19 COMMUNICATIONS

4.19.1 All communications from the Contractor relating to the Contract Documents or the construction schedule will be directed to the Design Consultant and copied to the Owner. Similarly, all correspondence from the Owner or Design Consultant will be directed to the Contractor and copied to the Owner or Design Consultant.

4.20 ROYALTIES AND PATENTS

4.20.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights arising out of the Work and shall save the Owner harmless from loss on account thereof.

4.21 INDEMNIFICATION

4.21.1 To the fullest extent permitted by law, the Contractor shall, at its sole cost and expense, indemnify, defend, and hold harmless the Owner and its agents, representatives, and employees from and against all claims, actions, judgments, costs, liabilities, penalties, damages, losses and expenses, including but not limited to attorneys' fees, arising out of and/or resulting from the performance of the Work, provided that any such claim, action, judgment, cost, liability, penalty, damage, loss or expense is caused by any negligent act, error or omission of the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be legally liable. The above obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Section 4.21.1. The parties agree that this indemnification clause is an "evidence of indebtedness" for purpose of N.C. Gen. Stat. § 6-21.2. The parties also specifically acknowledge that the Owner is a public body and it is the intent of the parties that the Owner not incur any expenses when the Contractor is solely responsible for the claims.

4.21.2 In any and all claims against the Owner or the Design Consultant or any of their agents, representatives, or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Section 4.21 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.21.3 No provision of this Section 4.21 shall give rise to any duties on the part of the Design Consultant or the Owner, or any of their agents, representatives, or employees.

4.22 PERSONS AUTHORIZED TO SIGN DOCUMENTS

4.22.1 The Contractor, within five (5) days after the earlier of the date of a Notice to Proceed or the date of the Owner-Contractor Agreement, shall file with the Owner a list of all persons who are authorized to sign documents such as contracts, certificates, and affidavits on behalf of the Contractor and to fully bind the Contractor to all the conditions and provisions of such documents, except that in the case of a corporation he shall file with the Owner a certified copy of a resolution of the Board of Directors of the corporation in which are listed the names and titles of corporation personnel who are authorized to sign documents on behalf of the corporation and to fully bind the corporation to all the conditions and provisions of such documents.

4.23 CONDITIONS AFFECTING THE WORK

4.23.1 The Contractor shall be responsible for taking all steps necessary to ascertain the nature and location of the Work and the general and local conditions that can affect the Work or the cost thereof. Failure by the Contractor to fully acquaint himself with conditions which may affect the Work, including, but not limited to conditions relating to transportation, handling, storage of materials, availability of labor, water, roads, weather, topographic and subsurface conditions, Multi-Prime Contract conditions, applicable provisions of law, and the character and availability of equipment and facilities needed prior to and during the execution of the Work, shall not relieve the Contractor of his responsibilities under the Contract Documents and shall not constitute a

basis for an adjustment in the Contract Sum or the Contract Time under any circumstances. The Owner assumes no responsibility for any understanding or representation about conditions affecting the Work made by any of his officers, employees, representatives, or agents prior to the execution of the Contract, unless such understandings or representations are expressly stated in the Contract Documents.

4.23.2 If in the execution of the Work any valuable items or materials of any kind are discovered buried or hidden within the Work, such items or materials shall be the property of the Owner. The Contractor shall take reasonable precautions to prevent any persons from removing or damaging such items or materials and shall immediately upon discovery thereof and before removal, acquaint the Owner or the Design Consultant with such discovery and carry out, at the expense of the Owner, the Owner's or the Design Consultant's orders as to disposal of the same.

4.24 COMPLIANCE WITH BOARD POLICIES AND PROCEDURES

The Contractor acknowledges that Board policies are available for review at www.ncmcs.org and agrees to comply with the policies. The Contractor also agrees to comply with the following provisions:

4.24.1 The Contractor, its Subcontractors and employees shall not possess or carry, whether openly or concealed, any gun, rifle, pistol, or explosive on any property owned by the Owner. This includes firearms locked in containers, vehicles or firearm racks within vehicles. The Contractor, its Subcontractors and employees shall not cause, encourage or aid a minor, who is less than 18 years old to possess or carry, whether openly or concealed, any weapons on any property owned by the Owner.

4.24.2 The Contractor, its Subcontractors and employees, are prohibited from profane, lewd, obscene or offensive conduct or language, including engaging in sexual harassment.

4.24.3 The Contractor and its Subcontractors shall not manufacture, transmit, conspire to transmit, possess, use or be under the influence of any alcoholic or other intoxicating beverage, narcotic drug, hallucinogenic drug, amphetamine, barbiturate, marijuana or anabolic steroids, or possess, use, transmit or conspire to transmit drug paraphernalia on any property owned by the Owner.

4.24.4 The Contractor and its Subcontractors may not at any time use or display tobacco or nicotine-containing products, including but not limited to electronic cigarettes (e-cigarettes), on school premises, both indoor and outdoor. The prohibition of the display of tobacco or nicotine products shall not extend to a display that has a legitimate instructional or pedagogical purpose. For purposes of this Contract, "tobacco product" is defined to include cigarettes, cigars, blunts, bidis, pipes, chewing tobacco, snuff, and any other items containing or reasonably resembling tobacco, tobacco products, or any facsimile thereof. "Tobacco use" includes smoking, chewing, dipping, or any other use of tobacco products.

4.24.5 The Contractor, its Subcontractors and employees shall not solicit from or sell to students or staff within the Owner's facilities or campuses, and shall not give gifts of any value to school system employees.

4.24.6 Operators of all commercial vehicles on any property owned by the Owner shall be subject to post-accident, random, reasonable suspicion and follow-up testing for drugs and alcohol.

4.24.7 The Contractor, its Subcontractors and employees are prohibited from using access to the site pursuant to this Agreement as a means to date, court, or enter into a romantic or sexual

relationship with any student enrolled in the Moore County Schools. The Contractor agrees to indemnify the Owner for claims against the Owner resulting from relationships which have occurred or may occur between a student and an employee of the Contractor or Subcontractor.

4.24.8 Lunsford Act/Criminal Background Checks. The Contractor shall conduct at its own expense sexual offender registry checks on each of its owners, employees, agents, or Subcontractors (“contractual personnel”) who will engage in any service on or delivery of goods to school system property or at a school-system sponsored event, except checks shall not be required for individuals who are solely delivering or picking up equipment, materials, or supplies at: (1) the administrative office or loading dock of a school; (2) non-school sites; (3) schools closed for renovation; or (4) school construction sites.. The checks shall include at a minimum checks of the State Sex Offender and Public Protection Registration Program, the State Sexually Violent Predator Registration Program, and the National Sex Offender Registry (“the Registries”). For the Contractor’s convenience only, all of the required registry checks may be completed at no cost by accessing the United States Department of Justice Sex Offender Public Website at [http:// www.nsopw.gov/](http://www.nsopw.gov/). The Contractor shall provide certification that the registry checks were conducted on each of its contractual personnel providing services or delivering goods under this Agreement prior to the commencement of such services or the delivery of such goods. The Contractor shall conduct a current initial check of the registries (a check done more than 30 days prior to the date of this Agreement shall not satisfy this contractual obligation). In addition, Contractor agrees to conduct the registry checks and provide a supplemental certification before any additional contractual personnel are used to deliver goods or provide services pursuant to this Agreement. Contractor further agrees to conduct annual registry checks of all contractual personnel and provide annual certifications at each anniversary date of this Agreement. Contractor shall not assign any individual to deliver goods or provide services pursuant to this Agreement if said individual appears on any of the listed registries. Contractor agrees that it will maintain all records and documents necessary to demonstrate that it has conducted a thorough check of the registries as to each contractual personnel, and agrees to provide such records and documents to the school system upon request. Contractor specifically acknowledges that the school system retains the right to audit these records to ensure compliance with this Section at any time in the school system’s sole discretion. Failure to comply with the terms of this provision shall be grounds for immediate termination of the Agreement. In addition, the Owner may conduct additional criminal records checks at the Owner’s expense. If the school system exercises this right to conduct additional criminal records checks, Contractor agrees to provide within seven (7) days of request the full name, date of birth, state of residency for the past ten years, and any additional information requested by the school system for all contractual personnel who may deliver goods or perform services under this Agreement. Contractor further agrees that it has an ongoing obligation to provide the school system with the name of any new contractual personnel who may deliver goods or provide services under the Agreement. The Owner reserves the right to prohibit any contractual personnel of Contractor from delivering goods or providing services under this Agreement if the Owner determines, in its sole discretion, that such contractual personnel may pose a threat to the safety or well-being of students, school personnel or others.

4.24.9 Contractor shall not employ any individuals to provide services to the Owner who are not authorized by federal law to work in the United States. Contractor represents and warrants that it is aware of and in compliance with the Immigration Reform and Control Act and North Carolina law (Article 2 of Chapter 64 of the North Carolina General Statutes) requiring use of the E-Verify system for employers who employ twenty-five (25) or more employees and that it is and will remain in compliance with these laws at all times while providing services pursuant to this Agreement. Contractor shall also ensure that any of its Subcontractors (of any tier) will remain in compliance with these laws at all times while providing subcontracted services in connection with this Agreement. Contractor is responsible for providing affordable health care coverage to all of its full-time employees providing services to the School System. The

definitions of “affordable coverage” and “full-time employee” are governed by the Affordable Care Act and accompanying IRS and Treasury Department regulations.

- 4.24.10 The Contractor, its Subcontractors and employees shall not interact with any students. Nothing in Paragraph 4.24 shall be construed to prevent the Contractor, its Subcontractors and employees from taking necessary measures to protect students, staff or other employees.
- 4.24.11 The Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ any unfit person or anyone not skilled in the task assigned to it. The Owner may require the Contractor to remove any employee the Owner deems incompetent, careless or otherwise objectionable.
- 4.24.12 All agents and workers of the Contractor and its Subcontractors shall wear identification badges provided by the Contractor at all times they are on the Owner’s property. The identification badges shall at a minimum display the company name, telephone number, employee name and a picture of the employee.
- 4.24.13 The Contractor shall comply with the Owner’s site or school building access procedures when working on any existing school campus.
- 4.24.14 Anti-Nepotism. The Contractor warrants that, to the best of its knowledge and in the exercise of due diligence, none of its corporate officers, directors, or trustees and none of its employees who will directly provide services under this Agreement are immediate family members of any member of the Owner’s Board of Education or of any principal or central office staff administrator employed by the Owner. For purposes of this provision, “immediate family” means spouse, parent, child, brother, sister, grandparent, or grandchild, and includes step, half, and in-law relationships. Should Contractor become aware of any family relationship covered by this provision or should such a family relationship arise at any time during the term of this Agreement, Contractor shall immediately disclose the family relationship in writing to the Superintendent. Unless formally waived by the Owner, the existence of a family relationship covered by this Agreement is grounds for immediate termination by Owner without further financial liability to Contractor.
- 4.24.15 Restricted Companies Lists. Contractor represents that as of the date of this Agreement, Contractor is not included on the Final Divestment List created by the North Carolina State Treasurer pursuant to N.C. Gen. Stat. § 147-86.58. Contractor also represents that as of the date of this Agreement, Contractor is not included on the list of restricted companies determined to be engaged in a boycott of Israel created by the North Carolina State Treasurer pursuant to N.C. Gen. Stat. § 147-86.81.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITION

- 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor may be referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative. The term Subcontractor does not include any Separate Contractor or his subcontractors.

- 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site or who contracts to perform or supply any of the Work under the scope of a Subcontractor's subcontract. The term Sub-subcontractor may be referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.
- 5.1.3 Nothing contained in the Contract Documents is intended to, nor shall it create, any contractual relationship between the Owner, the Design Consultant, or any of their agents, consultants, employees, independent contractors, or representatives and any Subcontractor, Sub-subcontractor, Supplier or Vendor of the Contractor, except the relationship between Owner and Contractor, but the Owner shall be entitled to performance of all obligations intended for his benefit, and to enforcement thereof.
- 5.1.4 The Owner and Design Consultant will not deal directly with any Subcontractor, Sub-subcontractor or Material Supplier. Communication will be made only through the Contractor. Subcontractor, Sub-subcontractors or Material Suppliers shall route requests for information or clarification through the Contractor to the Design Consultant.
- 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK
- 5.2.1 The Contractor, in compliance with the requirements of the Contract Documents and within ten (10) days after the Notice to Proceed, shall furnish in writing to the Owner the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Owner will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner to reply within a reasonable time shall constitute notice of no reasonable objection. The Contractor understands and agrees that no contractual agreement exists for any part of the Work under this Contract between the Owner and any of the Contractor's Subcontractors or Sub-subcontractors. Further, the Contractor understands and agrees that he alone is responsible to the Owner for the Work under this Contract and that any review of Subcontractors or Sub-subcontractors by the Owner will not in any way make the Owner responsible to any Subcontractor, nor responsible for the actions or failures of any Subcontractor or Sub-subcontractor.
- 5.2.1.1 The Contractor shall identify in the list of names of the Subcontractors proposed, those Subcontractors that are Historically Underutilized Businesses (HUB's) and indicate the portion of the Work that each Subcontractor will perform.
- 5.2.2 The Contractor shall not contract with any such proposed person or entity to whom the Owner has made reasonable objection under the provisions of Paragraph 5.2.1. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.
- 5.2.3 If the Owner has reasonable objection to any proposed person or entity under Paragraph 5.2.1, the Contractor shall name a substitute to whom the Owner has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued, subject to an audit of said difference by the Owner; provided, however, that no increase in the Contract Sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting names as required by Paragraph 5.2.1 and the original proposed Subcontractor was: (i) able to carry out his work under his proposed subcontract, (ii) able to comply with all applicable laws, (iii) was an ongoing business in the field of his proposed subcontract, and (iv) had a labor force, capital and a means of supply compatible with the scope of his proposed subcontract.

5.2.4 If the Owner requires a change of any proposed Subcontractor or person or organization previously accepted by him on the Project, the Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued, subject to an audit by Owner.

5.2.5 The Contractor shall notify the Owner and the Design Consultant of any substitution for any Subcontractor identified in accordance with Subparagraph 5.2.1.1. The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner or the Design Consultant makes reasonable objection to such substitution. Also, Contractor may make no substitution of Subcontractors in violation of applicable law.

5.2.6 If during the duration of the Project, the Contractor effects a substitution for any Subcontractor per Paragraph 5.2.5, or if additional subcontract opportunities become available, the Contractor shall make a good faith effort to utilize Historically Underutilized Businesses (HUB's).

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Contract Documents, assumes toward the Owner. Said agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the agreement between the Contractor and Subcontractor, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Section 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Contract Documents available to his Sub-subcontractors.

5.3.2 The provisions herein regarding Subcontractor approvals shall in no way affect the liability of the Contractor to the Owner regarding performance of all obligations by or payment of Subcontractors. Approval to subcontract with any given Subcontractor shall not to any degree relieve the Contractor of his obligation to perform or have performed to the full satisfaction of the Owner the Work required by this Contract.

5.3.3 The Contractor shall submit Notice to the Owner of any Claims by Subcontractors for which the Owner is believed to be responsible, in strict conformance with the same time requirements and other procedures established for the submission of the Contractor's Claims to the Owner.

5.4 QUALIFICATION SUBMITTALS

5.4.1 Specific qualification submittals may be required of Subcontractors, installers and suppliers for certain critical items of the Work. Required qualification submittals are set forth in detail in the Specifications and shall be collected and submitted by the Contractor for review and approval by the Design Consultant. All information required of a single Subcontractor, installer or supplier shall be contained in a single, complete submittal. The Contractor shall submit the required qualification information within ten (10) days after receipt of the Design Consultant's request.

5.4.2 The Owner and Design Consultant shall reject any proposed Subcontractor, installer or supplier, or any qualification submittals related thereto, for the following reasons:

- .1 The Contractor's failure to submit requested information within the specified time; or
 - .2 The Contractor's failure to provide all of the requested information; or
 - .3 The Contractor's submission of a Subcontractor, installer or supplier, or qualifications thereof, which are unacceptable in the judgment of the Owner or Design Consultant.
- 5.4.3 Should the Owner or Design Consultant have reasonable objection to any proposed Subcontractor, installer or supplier, the Contractor shall submit another person or firm who are reasonably acceptable to the Owner and Design Consultant.
- 5.5 PREPARATORY WORK
- 5.5.1 Before starting a portion of the Work, the Contractor and the responsible Subcontractor shall carefully examine all preparatory work that has been executed to receive his work. The Subcontractor shall check carefully, by whatever means are required, to ensure that his work and adjacent related work will finish to proper contours, planes and levels. He shall promptly notify the Contractor and the Design Consultant of any defects or imperfections in preparatory work, which will, in any way, affect satisfactory completion of his work. Absence of such notification will be construed as an acceptance of preparatory work and later Claims of defects therein will not be recognized.
- 5.5.2 Under no conditions shall a portion of the Work proceed prior to preparatory work having been completed, cured, dried, and otherwise made satisfactory to receive such related work. Responsibility for timely installation of all materials rests solely with the Contractor, who shall maintain coordination control at all times.

ARTICLE 6

WORK BY OWNER OR BY SEPARATE CONTRACTORS

- 6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS
- 6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar conditions of the Contract.
- 6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.
- 6.2 MUTUAL RESPONSIBILITY
- 6.2.1 The Contractor shall afford Separate Contractors and the Owner reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work and shall properly connect and coordinate the Work with that of the Owner and other contractors to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the Work as will not unduly or unreasonably interfere with the progress of the Work or the work of any other contractors.
- 6.2.1.1 If the execution or result of any part of the Work depends upon any work of the Owner or of any Separate Contractor, the Contractor shall, prior to proceeding with the Work, inspect and promptly report to the Owner in writing any apparent discrepancies or defects in such work of

the Owner or of any Separate Contractor that render it unsuitable for such proper execution or result of any part of the Work.

6.2.1.2 Failure of the Contractor to so inspect and report shall constitute an acceptance of the Owner's or Separate Contractor's work as fit and proper to receive the Work, except as to defects which may develop in the Owner's or Separate Contractor's work after completion of the Work and which the Contractor could not have discovered by its inspection prior to completion of the Work.

6.2.2 Should the Contractor cause damage to the Work or property of the Owner or of any Separate Contractor on the Project, or to other work on the site, or delay or interfere with the Owner's work on ongoing operations or facilities or adjacent facilities or said Separate Contractor's work, the Contractor shall be liable for the same; and, in the case of another contractor, the Contractor shall attempt to settle said Claim with such other contractor prior to such other contractor's institution of litigation or other proceedings against the other contractor.

6.2.2.1 Should a Separate Contractor be declared in default by the Owner, the Owner shall not be obligated to hire a contractor to perform the work of the Separate Contractor during the time the Separate Contractor's surety is remedying the default pursuant to Paragraph 3.4.2.

6.2.2.2 If such Separate Contractor sues the Owner or Design Consultant on account of any damage, delay or interference cause or alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend the Owner and Design Consultant in such proceedings at the Contractor's expense. If any judgment or award is entered against the Owner or Design Consultant in such proceedings, the Contractor shall satisfy the same and shall reimburse the Owner and Design Consultant for all damages, expenses, attorney's fees and other costs which the Owner or Design Consultant incurs as a result thereof.

6.2.3 Should a Separate Contractor cause damage to the Work or to the property of the Contractor or cause delay or interference with the Contractor's performance of the Work, the Contractor shall present directly to said Separate Contractor any Claims it may have as a result of such damage, delay or interference (with an information copied to the Owner) and shall attempt to settle its Claim against said Separate Contractor prior to the institution of litigation or other proceedings against said Separate Contractor.

6.2.3.1 In no event shall the Contractor seek to recover from the Owner or the Design Consultant, and the Contractor hereby waives any Claims against the Owner and Design Consultant relating to any costs, expenses (including, but not limited to, attorney's fees) or damages or other losses incurred by the Contractor as a result of any damage to the Work or property of the Contractor or any delay or interference caused by any Separate Contractor.

6.2.4 Whenever Contractor receives items from another contractor or from Owner for storage, erection or installation, the Contractor receiving such items shall give receipt for items delivered, and thereafter will be held responsible for care, storage and any necessary replacing of item or items received.

6.2.5 When certain items of equipment and other work are indicated as "NIC" (not in contract), or to be furnished and installed under other contracts, any requirements for preparation of openings, provision of backing, etc., for receipt of such "NIC" work will be furnished upon written request of the Contractor who shall properly form and otherwise prepare his work in a satisfactory manner to receive such "NIC" work.

6.3 OWNER'S RIGHT TO PERFORM DISPUTED WORK

6.3.1 If a dispute arises between the Contractor and Separate Contractors as to their responsibility for cleaning up as required by Section 4.18 or for accomplishing coordination or doing required

cutting, filling, excavating or patching as required by Section 4.17, the Owner may carry out such work and charge the cost thereof to the responsible party as the Owner shall determine to be just.

6.4 COORDINATION OF THE WORK

6.4.1 By entering into this Contract, Contractor acknowledges that there may be other contractors on the site whose work will be coordinated with that of his own. Contractor expresses, warrants and guarantees that he will cooperate with other contractors and will do nothing to delay, hinder or interfere with the work of other Separate Contractors, the Owner or Design Consultant. Contractor also expressly agrees that, in the event his work is hindered, delayed, interfered with or otherwise affected by a Separate Contractor, his sole remedy will be a direct action against the Separate Contractor as described in this Article 6. Contractor will have no remedy, and hereby expressly waives any remedy, against the Owner and/or the Design Consultant on account of delay, hindrance, interference or other event caused by a Separate Contractor.

ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 This Contract shall be governed by the laws of the State of North Carolina. The Contractor and Owner agree that Moore County, North Carolina shall be the proper venue for any litigation arising out of this Agreement.

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

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner and the Contractor's Surety.

7.3 CLAIMS AND DAMAGES

7.3.1 Should the Contractor, Subcontractor or any Sub-subcontractor suffer injury or damage to person or property because of any act or omission of the Owner or Design Consultant, or of any of their employees, agents or others for whose acts either is legally liable, the Claim on behalf of the Contractor its Subcontractors or Sub-subcontractors shall be made by giving Notice to the Owner, as provided in Article 15 ; otherwise, the Contractor, Subcontractors and Sub-subcontractors shall have waived any and all rights he may have against the Owner or the Design Consultant, or their employees, representatives and agents. The Contractor shall indemnify, defend and hold the Owner harmless from any Claim by a Subcontractor that is waived because it is not filed in strict conformance with this Paragraph or any other provision of the Contract regarding Claims.

7.4 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.4.1 The Contractor shall furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in a form and with a Surety satisfactory to the Owner.

7.4.2 The Contractor is required to furnish in duplicate a Performance Bond and a Labor and Material Payment Bond, each in the amount of one hundred percent (100%) of the Contract Sum, written by a surety company licensed to do business in North Carolina and with a minimum AM Best "A" rating or comparable rating from another service reasonably acceptable to Owner.

7.5 RIGHTS AND REMEDIES

7.5.1 The duties and obligations of the Contractor imposed by the Contract Documents and the rights and remedies of the Owner available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

7.5.2 Except as may be specifically agreed in writing, the failure of the Owner or the Design Consultant to insist in any one or more instances upon the strict performance of any one or more of the provisions of the Contract, or to exercise any right herein contained or provided by law, shall not be construed as a waiver or relinquishment of the performance of such provisions or right(s) or of the right to subsequently demand such strict performance or exercise such right(s), and the rights shall continue unchanged and remain in full force and effect.

7.5.3 The Contractor agrees that he can be adequately compensated by money damages for any breach of the Contract which may be committed by the Owner and hereby agrees that no default, act, or omission of the Owner or the Design Consultant, except for failure to make progress payments as required by the Contract Documents, shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the provisions of the Contract or (unless the Owner shall so consent or direct in writing) to suspend or abandon performance of all or any part of the Work. The Contractor hereby waives any and all rights and remedies to which he might otherwise be or become entitled, save only his right to money damages.

7.6 TESTS AND INSPECTIONS

7.6.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, the Contractor shall give the Owner and Design Consultant timely Notice of its readiness so the Design Consultant and the Owner may observe such inspection, testing or approval. Unless otherwise specifically provided in the Contract Documents, the Contractor shall bear all costs of such inspections, tests or approvals, except that Owner shall pay for "special inspections" as defined and required in Section 1704, the North Carolina State Building Code, or successor section. In the event that such "special inspections" reveal a failure of the Work to comply with the Contract Documents or applicable laws, ordinances, regulations or orders of public authorities having jurisdiction, Contractor shall reimburse the Owner for the costs of such "special inspections".

7.6.1.1 Unless otherwise stipulated in the Contract Documents, the Contractor shall pay for all utilities required for testing of installed equipment of all of his work and work of each Subcontractor. Boiler fuel other than gas shall be provided by Subcontractor furnishing boilers. Labor and supervision required for making such tests shall be provided at no additional cost to the Owner.

7.6.2 If the Design Consultant or the Owner determines that any portion of the Work requires additional inspection, testing, or approval which Paragraph 7.6.1 does not include, the Owner will instruct the Contractor to order such additional inspection, testing or approval, and the Contractor shall give Notice as provided in Paragraph 7.6.1. If such additional inspection or testing reveals a failure of any portion of the Work to comply (1) with the requirements of the Contract Documents, or (2) with respect to the performance of the Work, with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, the Contractor shall bear all costs thereof, including compensation for the Design Consultant's and Owner's additional construction management expenses made necessary by such failure.

7.6.3 With regard to inspections and tests, the costs of which the Owner is responsible for paying, they will be made by a pre-qualified, independent testing agency selected by the Owner. The cost of the initial services of such agency will be paid by the Owner. When the initial tests indicate non-compliance with the Contract Documents, any subsequent testing occasioned by non-compliance shall be performed by the same agency and the cost thereof shall be borne by the Contractor. Representatives of the testing agency shall have access to the Work at all times. The Contractor shall provide facilities for such access in order that the agency may properly perform its functions.

- 7.6.4 The independent testing agency, contracted by the Owner, shall prepare the test reports, logs, and certificates applicable to the specific inspections and tests and promptly deliver the specified number of copies to the designated parties. Certificates of inspection, testing or approval required by public authorities shall be secured by the Contractor and promptly delivered by him to the Owner, in adequate time to avoid delays in the Work or final payment therefore.
- 7.6.5 If the Design Consultant or the Owner is to observe the inspections, tests or approvals required by the Contract Documents, laws, ordinances, rules, regulations, or order of any public authority having jurisdiction or that are required to establish compliance with the Contract Documents, he will do so promptly and, where practicable, at the normal place of testing.
- 7.6.6 The Contractor shall pay for and have sole responsibility for inspections or testing performed exclusively for his own convenience.
- 7.7 UNENFORCEABILITY OF ANY PROVISION
- 7.7.1 If any provision of this Contract is held as a matter of law to be unenforceable or unconscionable, the remainder of the Contract shall be enforceable without such provision.
- 7.8 ATTORNEYS' FEES AND OTHER EXPENSES
- 7.8.1 The Contractor hereby agrees that he will not submit, assert, litigate or otherwise pursue any frivolous or unsubstantiated Claims or Claims he has specifically waived under the terms of the Contract Documents. In the event that the Contractor's or its Subcontractor's or Sub-subcontractor's Claims, or any separate item of a Claim, is without substantial justification, the Contractor shall reimburse the Owner or Design Consultant for all costs and expenses associated with defending such Claim or separate item, including but not limited to, attorneys' fees, audit costs, accountants' fees, expert witness' fees, additional Design Consultant expenses, additional construction management expenses, or services and any other consultant costs.
- 7.8.2 If the Contractor breaches any obligation under the Contract Documents, the Contractor shall reimburse the Owner and Design Consultant for all costs and expenses incurred by the Owner relating to such breach, including but not limited to attorneys' fees, audit costs, accountants' fees, expert witness' fees, additional Design Consultant expenses, additional construction management expenses, and any other consultant costs.
- 7.8.3 If the Owner or Design Consultant substantially prevails in a Claim brought against the Contractor, or in defending a Claim brought by the Contractor, including but not limited to, Claims for fraud or misrepresentation, overpayment, defective work, delay damages, and recovery of termination expenses, the Contractor shall reimburse the Owner and/or Design Consultant for all costs and expenses incurred by them relating to such Claim, including but not limited to attorneys' fees, audit costs, accountants' fees, expert witness' fees, additional Design Consultant expenses, additional construction management expenses, and any other consultant costs.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Final Completion of the Work as defined in Paragraph 8.1.4, including authorized adjustments thereto. The Contractor shall achieve Final Completion within the Contract Time.

8.1.2 The date of commencement of the Work is the date established in the Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein. The Contractor shall not commence work or store materials or equipment on site until written Notice to Proceed is issued or until the Contractor otherwise receives the Owner's written consent.

8.1.3 The date of Substantial Completion of the Work or designated portion thereof is the date certified by the Design Consultant and the Owner when the Work or a designated portion thereof is sufficiently complete, in accordance with the Contract Documents, so the Owner can fully and legally occupy and utilize the Work or designated portion thereof for the use for which it is intended, with all of the parts and systems operable as required by the Contract Documents, including a preliminary test and balance report for the mechanical system. Only incidental corrective work and any final cleaning beyond that needed for the Owner's full use may remain for Final Completion. The Contractor acknowledges and agrees that the intercom, telephone, data security, building automation system (including functional graphics at the site), MATV, and other educational operational systems are required for the Owner's use of the building for its intended purpose. The Contractor shall provide operation and maintenance manuals to the Owner as required by the Contract Documents prior to Substantial Completion and shall provide the required training on the operation of the equipment and systems within two weeks of Substantial Completion. The Contractor shall achieve Substantial Completion by the date specified in the Supplemental Conditions including authorized adjustments thereto. The Owner's occupancy of incomplete work shall not alter the Contractor's responsibilities pursuant to this paragraph. Only incidental corrective work and any final cleaning beyond that needed for the Owner's full use may remain for Final Completion. The issuance of a temporary or final certificate of occupancy shall not, in itself, constitute Substantial Completion.

8.1.4 Final Completion of the Work occurs on the date certified by the Design Consultant and the Owner when the Work is totally complete, to include punch list work, in accordance with the Contract Documents and the Owner may fully occupy and utilize the Work for the use for which it is intended. The issuance of a temporary or final certificate of occupancy shall not, in itself, constitute Final Completion.

8.1.5 The term Day as used in the Contract Documents shall mean calendar day unless otherwise specifically designated. All dates shall mean midnight of the indicated day unless otherwise stipulated.

8.1.6 Completion Dates shall mean the dates set forth in the Supplemental Conditions for Substantial Completion and Final Completion.

8.2 PROGRESS AND COMPLETION

8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract with respect to the Contractor's performance.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Paragraph

8.1.2. He shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion and Final Completion within the time frames stated in the Contract Documents.

8.2.3 Attention is directed to the fact that the Work is urgently needed by the Owner; for this reason, it shall be agreed that the Contractor and its Subcontractors will achieve Substantial Completion of the Work under the Contract within the time established under Paragraph 8.2.4 of the Supplemental Conditions after award of Contract, or Notice to Proceed, and that he will achieve Final Completion of the Work in all its details for final acceptance within the time established under Paragraph 8.2.4 of the Supplemental Conditions.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 The time during which the Contractor or any of the Subcontractors is delayed in the performance of the Work by the issuance of any required permits, acts of god, excessive inclement weather, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotions or freight embargoes, or other conditions beyond the Contractor's or the Subcontractors' control and which the Contractor or the Subcontractors could not reasonably have foreseen and provided against, except for delays caused solely by the Owner, Design Consultant or their consultants, shall be added to the time for completion of the Work stated in the Contract. Neither the Owner nor the Design Consultant shall be obligated or liable to the Contractor or the Subcontractors for indirect or direct damages, costs or expenses of any nature which the Contractor, the Subcontractors, or any other person may incur as a result of any of the delays, interferences, changes in sequence in the Work included in this Section 8.3.1. The Contractor hereby expressly waives any Claims against the Owner and the Design Consultant on account of any indirect or direct damages, lost profits, costs or expenses of any nature which the Contractor, the Subcontractors or any other person may incur as a result of any delays, interferences, changes in sequence or the like, and it is understood and agreed that the Contractor's sole and exclusive remedy in any such events shall be an extension of the Contract time in accordance with the Contract Documents.

8.3.2 In the event Project delays arise from or out of any act or omission of the Owner, Design Consultant or their consultants, the time during which the Project is delayed shall be added to the Contract and the Contractor may be reimbursed for its direct Project damages, excluding general overhead expenses and indirect costs, if the Contractor strictly complies with this Article 8.3. Notwithstanding the previous sentence, if the Contractor or Subcontractor in any way shares in responsibility for the delay, neither the Owner nor the Design Consultant shall be obligated or liable to the Contractor or the Subcontractors for indirect or direct damages, costs or expenses of any nature which the Contractor, the Subcontractors, or any other person may incur as a result of any of the delays, interferences, changes in sequence of the Work, and the Contractor's sole remedy, if any, shall be an extension of the Contract time.

8.3.3 In the event Project delays arise solely from or out of any act or omission of the Contractor, Subcontractors or their agents, the Contractor shall not be entitled to extension of the Contract time and shall be subject to the payment of Liquidated Damages as provided in this Contract.

8.3.4 The Contract time shall be adjusted only for changes pursuant to section 12.1, suspension of the Work pursuant to paragraph 3.3.2 or paragraph 3.3.3, and excusable delays pursuant to paragraph 8.3.4. In the event the Contractor requests an extension of the Contract time or files a Claim related to any form of delay, it shall furnish such justification and supporting evidence as the Owner may deem necessary for a determination of whether or not the Contractor is entitled to an extension of time under the provisions of the Contract, and shall further conform to all of the requirements of the specifications and the Contract regarding construction schedules and reports. The burden of proof to substantiate a Claim shall rest with the Contractor, including evidence that the cause was beyond its control. The Owner shall base its findings of fact and decision on such justification and supporting evidence, including a finding that the alleged delay

impacted the Project's critical path, and shall advise the Contractor in writing thereof. If the Owner finds that the Contractor is entitled to any extension of the Contract time, the Owner's determination of the total number of days of extension shall be based upon the currently approved progress schedule and on all data relevant to the extension. Such data will be incorporated into the schedule in the form of a revision thereto, accomplished in a timely manner. The Contractor acknowledges and agrees that actual delays (due to said changes, suspension of Work or excusable delays) in activities which, according to the schedule, do not affect the Contract time, do not have any effect upon the Contract time and therefore will not be the basis for a change therein. The Contractor acknowledges and agrees that time extensions will be granted only to the extent that excusable delays exceed the available float in the critical path activities in the Contractor's currently approved schedule.

- 8.3.4.1 Extensions in the Contract time by Change Orders are subject to extension-in-time audit by the Owner as follows:
- 8.3.4.1.1 The Contractor agrees that, even though the Owner, Contractor and Design Consultant have previously signed a Change Order containing an extension-in-time resulting from a change in or addition to the Work that said extension in the Contract time may be adjusted by an audit after the fact by the Owner. If such an audit is to be made, the Owner must undertake the audit and make a ruling within thirty (30) days after the completion of the Work under the Change Order.
- 8.3.4.1.2 The Contractor agrees that any extension of the Contract time to which it is entitled arising out of a Change Order undertaken on a force accounting (labor and materials) basis, shall be determined by an extension-in-time audit by the Owner after the Work of the Change Order is completed. Such rulings shall be made by the Owner within thirty (30) days after a request for same is made by the Contractor or Design Consultant, except said thirty (30) days will not start until the Work under the Change Order is completed.
- 8.3.4.1.3 Should a time extension be granted for Substantial Completion the date for Final Completion shall be appropriately adjusted unless specifically stated otherwise.
- 8.3.4.2 Subject to other provisions of the Contract, the Contractor may be entitled to an extension of the Contract time (but no increase in the Contract sum) for delays arising from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, the Subcontractors or suppliers as follows:
- 8.3.4.2.1 Labor disputes and strikes (including strikes affecting transportation), that do, in fact, directly delay the progress of the Work on the critical path; however, an extension of Contract time on account of an individual labor strike shall not exceed the number of days of said strike;
- 8.3.4.2.2 Acts of nature: tornado, fire, hurricane, blizzard, earthquake, or flood that damage Work in place or stored materials or adversely impact the schedule's critical path;
- 8.3.4.2.3 Excessive inclement weather; however, the Contract time will not be extended due to reasonably anticipated inclement weather or for delays in the aftermath of inclement weather, reasonably anticipated or excessive. The time for performance of this Contract, as stated in the Contract Documents, includes an allowance for calendar days which may not be available for construction out-of-doors; for the purposes of this Contract, the Contractor agrees that the number of calendar days per month based stated below are to be considered reasonably anticipated inclement weather and planned for in the construction schedule per the Contract. Unless the Contractor can substantiate to the satisfaction of the Owner that there was greater than the reasonably anticipated inclement weather considering the time from the notice-to-proceed until the building is enclosed using data from the national weather service station at Moore County Airport, North Carolina, and that such alleged greater than reasonably anticipated inclement weather actually delayed the Work or portions thereof which had an effect upon the Contract time, the Contractor shall not be entitled to an extension of time.

For the purpose of this Contract, the Contractor agrees to anticipate and plan for inclement weather for the number of calendar days in accordance with the following table:

Planned days/month	
Jan	12
Feb	11
Mar	6
Apr	5
May	8
Jun	6
Jul	8
Aug	5
Sep	6
Oct	4
Nov	8
Dec	10

Also the Contractor agrees that the calculation of the number of excessive inclement weather days shall be the number of days in excess of those shown for each month in the table above, in which precipitation exceeded one tenth (.10) inch, or in which the highest temperature was 32 degrees F or less as recorded at the approved weather station. Rain days from hurricanes and tropical storms not causing damage in Moore County shall be deemed inclement weather days.

If the total accumulated number of calendar days lost to excessive inclement weather, from the notice-to-proceed until the building is enclosed, exceeds the total accumulated number to be reasonably anticipated for the same period from the table above, time for completion will be extended by the number of calendar days needed to include the excess number of calendar days lost. No extension of time will be made for days due to excessive inclement weather occurring after the building is enclosed. For the purpose of this Contract, the term "enclosed" is defined to mean when the building is sufficiently roofed and sealed, either temporarily or permanently, to permit the structure to be heated and the plastering and dry-wall trades to work. The Design Consultant shall determine when the structure is "enclosed". Upon the request of either party, the Design Consultant shall issue a letter certifying to the Owner, with a copy to the Contractor, stating the date the building became enclosed. No change in Contract sum will be authorized because of adjustment of Contract time due to excessive inclement weather; and

8.3.4.2.4 Delays in the issuance of a permit required for construction of the Project, acts of the public enemy, acts of the State, Federal or local government in its sovereign capacity, and acts of another Contractor in the performance of a Contract with the Owner relating to the Project.

8.3.5 If the Contractor shall neglect, fail or refuse to complete the Work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay the Owner the amount specified in the Contract, not as a penalty but as Liquidated Damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the Work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

8.3.6 The Contractor and the Subcontractors shall not be entitled to and hereby expressly waive any extension of time resulting from any condition or cause unless said Claim for extensions of time is made in writing to the Owner within ten (10) days of the first instance of delay for all delays, except excessive inclement weather which shall be made in writing to the Owner within forty-

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five (45) days after the date the structure is enclosed. Circumstances and activities leading to such Claim shall be indicated or referenced in a daily field inspection report for the day(s) affected. In every such written Claim, the Contractor shall provide the following information:

- 8.3.6.1 Nature of the delay;
 - 8.3.6.2 Date (or anticipated date) of commencement of delay;
 - 8.3.6.3 Activities on the progress schedule affected by the delay, and/or new activities created by the delay and their relationship with existing activities;
 - 8.3.6.4 Identification of person(s) or organization(s) or event(s) responsible for the delay;
 - 8.3.6.5 Anticipated extent of the delay; and
 - 8.3.6.6 Recommended action to avoid or minimize the delay.
- 8.3.7 If no schedule or agreement is made stating the dates upon which written interpretations as set forth in Section 2.2 shall be furnished, then no Claim for delay shall be allowed on account of failure to furnish such interpretations until twenty (20) days after request is made for them, and not then unless such Claim is reasonable.
- 8.3.8 No Claim by the Contractor for an extension of time for delays will be considered unless made in strict compliance with the requirements of this Article. All Claims not filed in accordance with this paragraph shall be waived by the Contractor.
- 8.4 RESPONSIBILITY FOR COMPLETION
- 8.4.1 The Contractor shall be responsible for completion in accordance with Paragraph 4.12.1.
 - 8.4.2 The Owner may require the Contractor to submit a recovery schedule demonstrating his program and proposed plan to make up the lag in scheduled progress and to ensure completion of the Work within the Contract Time if the Project is behind schedule by four (4) or more days. If the Owner finds the proposed plan not acceptable, he may require the Contractor to submit a new plan. If the actions taken by the Contractor or the second plan proposed are not satisfactory, the Owner may require the Contractor to take any of the actions set forth in Paragraph 4.12.2 without additional cost to the Owner, to make up the lag in scheduled progress.
 - 8.4.3 Failure of the Contractor to substantially comply with the requirements of this Section 8.4 may be considered grounds for a determination by the Owner, pursuant to Section 14.3, that the Contractor is failing to prosecute the Work with sufficient diligence to ensure its completion within the Contract Time.
- 8.5 LIQUIDATED DAMAGES FOR DELAY
- 8.5.1 Owner and Contractor agree that the damages incurred by the Owner due to the Contractor's failure to achieve Substantial Completion by the date specified in the Supplemental Conditions for Substantial Completion, including any extensions thereof, shall be in the amounts set forth in the Supplemental Conditions, for each consecutive day beyond the date of Substantial Completion that Contractor achieves Substantial Completion, and that the damages incurred by the Owner due to the Contractor's failure to achieve Final Completion by the date specified in the Supplemental Conditions for Final Completion, including any extensions thereof, shall be in the amount set forth in the Supplemental Conditions for each consecutive day beyond the date of Final Completion that Contractor achieves Final Completion. The Liquidated Damages are a reasonable estimate by Contractor and Owner of the damages to be suffered by Owner and

are not to be construed as a penalty, it being recognized by the Owner and the Contractor that the injury to the Owner which could result from a failure of the Contractor to complete on schedule is uncertain and cannot be computed exactly or that it would be unreasonably expensive for Owner to calculate its damages exactly.

- 8.5.2 The amount specified for Substantial Completion is the minimum measure of damages the Owner will sustain due to delay in the completion of the Work, which shall include, but not be limited to the loss of use of the facilities, the relocation of students and services, the cost of the Owner's time and resources, damage to the Owner's reputation, and storage of furniture and other materials. The amount specified for Final Completion is a reasonable and proper measure of the damages the Owner will sustain due to the delay in the completion of remedial work. This amount includes the disruption to the school and the learning environment, the cost of the Owners time and resources, damage to the Owner's reputation, and the inability to fully use the facilities. The inability of the Owner to quantify actual damages shall not prevent the recovery of Liquidated Damages.
- 8.5.3 Notwithstanding any other provisions of these General Conditions, if there is concurrent delay in the completion of the Work, the Contractor shall be liable for Liquidated Damages as specified in the General Conditions and Supplemental Conditions during such period of concurrent delay. For the purpose of this Paragraph, concurrent delay means (a) a delay event caused in part by the Owner or its agent and in part by the Contractor or its agents, Subcontractors or Sub-subcontractors, or (b) one or more delay event caused solely by the Owner, its agents, or the Design Consultant, and one or more delay event caused in part by the Contractor, its agents, Subcontractors or Sub-subcontractors, each of which would have resulted in a delay without the other and which delays run concurrently, or at the same time. In the event that the foregoing provision making the Contractor liable for Liquidated Damages during a period of concurrent delay is found to be unenforceable, then the parties agree that in the event of a concurrent delay, the extent of the delay will be apportioned between the Owner and the Contractor, and the Contractor will be responsible for Liquidated Damages as set forth in the General Conditions and Supplemental Conditions for those portions of the delay which are apportioned to the Contractor, its agent, Subcontractors, Sub-subcontractors, or Material Suppliers.
- 8.5.4 The provisions for Liquidated Damages do not bar or limit Owner's other rights and remedies against Contractor, for damages other than for failure to achieve the Substantial Completion date or the Final Completion date as required. The amount of Liquidated Damages set forth in Section 8.5 shall not include additional legal or design professional costs that may result from the Contractor's default. If such legal or design professional costs are incurred by the Owner, the Contractor shall be liable to the Owner for those costs in addition to the Liquidated Damages amount set forth in Section 8.5.
- 8.5.5 The Liquidated Damages assessed for failure to meet Substantial Completion by the specified date and the Liquidated Damages assessed for failure to meet Final Completion by the specified date shall be assessed cumulatively.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

- 9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Owner a schedule of values allocated to the various portions of the Work and supported by such data to substantiate its accuracy as the Owner may require. This schedule, unless objected to by the Owner, shall be used as a basis for the Contractor's Applications for Payment and only for this purpose. If approved by the Owner, the Contractor may include in his schedule of values a line item for mobilization which shall include a reasonable amount of mobilization for the Contractor and his Subcontractors. The Contractor shall not front-end load his schedule of values.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 Prior to the date for each progress payment established in the Owner-Contractor Agreement, the Contractor shall submit to the Design Consultant an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the Design Consultant and the Owner may require, including but not limited to the Contractor's certification that all work for which payment is requested has been completed in full in accordance with the Contract Documents, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. If requested by the Owner, the Contractor shall also certify that he has paid all due and payable amounts for which previous Applications for Payment were issued and payments received from the Owner, by providing waivers of liens for said payments.

9.3.1.1 The Contractor shall submit with the Application for Payment a list of those Historically Underutilized Businesses (HUB's) Subcontractors whose work is included in the application and the amount due each. In addition, the Historically Underutilized Business (HUB) must itself perform satisfactory work or services or provide supplies under the Contract and not act as a mere conduit.

9.3.2 The Owner will withhold retainage from Contractor on all Applications for Payment to the maximum extent and in the maximum amount allowed by law (currently codified at N.C.G.S. 143-134.1) and in accordance with that statute or applicable successor statute. In the event that N.C.G.S 143-134.1 or applicable successor statute are not in effect or do not apply at the time the Contract is executed, Owner will retain five percent (5%) of the amount of each Application for Payment from the Contractor as retainage, until Contractor achieves Final Completion, whether or not the Owner has occupied any or all of the Project before such time. However, if the Owner, at any time after fifty percent (50%) of the Work has been completed, finds that satisfactory progress is being made, he may authorize payment to the Contractor in full of each Progress Payment for work performed beyond the fifty percent (50%) stage of completion. If a reduction in retainage has been made, the Owner may increase the retainage back to original percentage at any time if the Owner concludes that the Contractor is not progressing with the Work in a timely or satisfactory manner.

9.3.3 Payments may be made by the Owner, at its sole discretion, on account of materials or equipment not incorporated in the work but delivered and suitably stored at the site or in a bonded warehouse by the Contractor. Payments for materials or equipment stored shall only be considered upon submission by the Contractor of satisfactory evidence (for example, releases or paid invoices from the seller) that the Contractor has acquired title to such material, that it will be utilized on the work under this Contract and that it is satisfactorily stored, protected, and insured or that other procedures satisfactory to the Owner that will protect the Owner's interests have been taken. In the event the materials are stored in a bonded warehouse that is not located in the county of the project, the Contractor shall reimburse the travel cost and hourly billing expenses incurred by the Design Consultant for travel to view and assess whether the materials meet the requirements of the Contract Documents. Materials once paid for by the Owner become the property of the Owner and may not be removed from the work site or bonded

warehouse, other than to be delivered from the warehouse to the site, without the Owner's written permission. Responsibility for such stored materials and equipment shall remain with the Contractor regardless of ownership.

9.3.3.1 Owner will not make payment to the Contractor on account of materials or equipment not incorporated in the Work but delivered and stored at the site if the Contractor, in his schedule of values, does not include line items for such delivered and stored materials or equipment.

9.3.3.2 It is specifically understood and agreed that an inspection and approval of the materials by the Owner, the Design Consultant or any agency retained by any of them shall not in any way subject the Owner to pay for the said materials or any portion thereof, even though incorporated in the Work, if said materials shall in fact turn out to be unfit to be used in the Work, nor shall such inspection be considered as any waiver of objection to the Work on account of the unsoundness or imperfection of the material used.

9.3.4 The Contractor warrants that title to all work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

9.3.5 The Contractor shall submit with the Application for Payment a notarized Contractor's Sales Tax Report of N.C. State and County sales taxes paid during the payment period with respect to building materials, supplies, fixtures, and equipment that have become a part of, or annexed to, a building or structure erected, altered or repaired for the Owner. The Sales Tax Report shall include the vendor from whom the property was purchased, the dates and number of invoices covering the purchase, the total amount of the invoices of each vendor, the North Carolina State and County sales and use tax paid thereof, and the cost of the property withdrawn from the warehouse stock and North Carolina sales or use taxes paid thereof. Items that should not be included are: scaffolding, forms for concrete, fuel for operation of machinery and equipment, tools, equipment, equipment repair parts and equipment rentals.

9.3.6 Unless an interest rate is required by law, Owner shall not pay any interest on an amount owed to Contractor. No interest shall accrue on amounts Owner is authorized by law or by the Contract to withhold or backcharge to Contractor.

9.4 CERTIFICATION OF PAYMENT

9.4.1 The Design Consultant will, after receipt of the Contractor's Application for Payment either issue a Certification of Payment to the Owner, with a copy to the Contractor, for such amount as the Design Consultant determines is properly due, or notify the Contractor in writing of their reasons for withholding a Certification as provided in Paragraph 9.6.1.

9.4.2 The submission and approval of the progress schedule and monthly updates thereof as required by the Contract shall be an integral part and basic element of the application upon which progress payment shall be made. The Contractor shall be entitled to progress payments only as determined from the currently approved and updated schedule.

9.4.3 The signing of a Certification of Payment will constitute a representation by the Design Consultant to the Owner, based on their observations at the site pursuant to their agreements with the Owner, and the data comprising the Application for Payment, that the Work has

progressed to the point indicated; that, to the best of their knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in their Certification); and that the Contractor is entitled to payment in the amount certified. However, by signing a Certification of Payment, the Design Consultant shall not thereby be deemed to represent that it has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that it has reviewed the construction means, methods, techniques, sequences, or procedures, or that it has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

9.5.1 After a Certification of Payment has been issued, the Owner shall make payment in the manner and within the time provided in the Contract Documents, unless Contractor is in breach of the Contract or otherwise owes the Owner, in which case Owner may withhold an appropriate amount.

9.5.2 The Contractor shall promptly pay each Subcontractor (including suppliers, laborers, and material-men) performing labor or furnishing material or equipment for the Work, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's work. The Contractor shall, by an appropriate agreement with each Subcontractor, also require each Subcontractor to make payments to his Sub-subcontractors in similar manner. The Owner may at any time require proof of payment to a Subcontractor or Sub-subcontractor for work paid by the Owner. Notwithstanding any other provision of the General Conditions, no Contractor, Subcontractor, Sub-subcontractor or Material Supplier shall have any Claim against the Owner, by virtue of the Contract, under any theory, including breach of contract, or third party beneficiary. The Owner shall not be in privity of any contract with any Subcontractor, Sub-subcontractor or Material Supplier pertaining to the Work, the Project and these General Conditions. Also, neither the Contractor, or any Subcontractor or Sub-subcontractor shall have any right to assert a lien on Owner's real property or on any funds held by Owner.

9.5.3 The Owner may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Design Consultant on account of work done by such Subcontractor.

9.5.4 Neither the Owner nor the Design Consultant shall have any obligation to pay or to see to the payment of any moneys to any Subcontractor except as may otherwise be required by law.

9.5.5 No Certification for a progress payment, nor any progress payment or final payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.5.6 The Contractor agrees to keep the Work and the site of the Project free and clear of all liens related to labor and materials furnished in connection with the Work. Furthermore, pursuant to and in compliance with requirements of Paragraph 9.3.4, the Contractor waives any right he may have to file any type of lien in connection with the Work. Notwithstanding anything to the contrary contained in the Contract Documents, if any such lien is filed or there is evidence to believe that any lien may be filed at any time during the progress of the Work or within the

duration of this Contract, the Owner may refuse to make any payment otherwise due the Contractor or may withhold from any payment due the Contractor a sum sufficient in the opinion of the Owner to pay all obligations and expenses necessary to satisfy such lien or the underlying claim represented by such lien. The Owner may withhold such payment unless or until the Contractor, within ten (10) days after demand thereof by the Owner, shall furnish satisfactory evidence that the indebtedness and any lien in respect thereof has been satisfied, discharged and released of record, or that the Contractor has legally caused such lien to be released of record pending the resolution of any dispute between the Contractor and the person or persons filing such lien. If the Contractor shall fail to furnish such satisfactory evidence within ten (10) days of the demand thereof, the Owner may discharge such indebtedness and deduct the amount thereof, together with any and all losses, costs, damages and attorney's fees suffered or incurred by the Owner from any sum payable to the Contractor under the Contract Documents, including but not limited to final payment and retained percentage. This Paragraph 9.5.6 shall be specifically included in all Subcontracts and purchase orders entered into by the Contractor. Notwithstanding any other provision of the Contract, nothing in the Contract shall affect the rights of Subcontractors, Sub-subcontractors, Material Suppliers and Vendors from enforcing any lien rights they have against parties other than the Owner.

9.6 PAYMENTS WITHHELD

9.6.1 The Design Consultant may decline to certify payment and may withhold their Certification of Payment in whole or in part, to the extent necessary to reasonably protect the Owner, if in the Design Consultant's opinion it is unable to make representations to the Owner as provided in Paragraph 9.4.3. If the Design Consultant is unable to make representations to the Owner as provided in Paragraph 9.4.3 and to certify payment in the amount of the Application for Payment, it will notify the Contractor as provided in Paragraph 9.4.1. If the Contractor and the Design Consultant cannot agree on a revised amount, the Design Consultant will promptly issue a Certification of Payment for the amount for which it is able to make such representations to the Owner. The Design Consultant may also decline to certify payment because of subsequently discovered evidence or subsequent observations that may nullify the whole or any part of any Certification of Payment previously issued to such extent as may be necessary in its opinion to protect the Owner from loss, because of:

- .1 Defective Work not remedied,
- .2 Third party claims filed, whether in court, in arbitration or otherwise, or reasonable evidence indicating probable filing of such claims,
- .3 Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment,
- .4 Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,
- .5 Damage to the Owner or another contractor,
- .6 Reasonable evidence that Contractor will not achieve Substantial Completion and/or Final Completion by the dates specified in the Supplemental Conditions.
- .7 Failure or refusal of the Contractor to carry out the Work in accordance with or to otherwise substantially or materially comply with the Contract Documents,
- .8 Liens filed or reasonable evidence that a lien may be filed for any portion of the Work,
- .9 Failure or refusal of the Contractor to properly schedule and coordinate the Work, to

provide progress schedules, reports and updates, or to provide a recovery schedule when required by the Contract,

- .10 Failure or refusal of the Contractor to fully comply with the provisions of Section 6.2 requiring the Contractor to direct certain Claims to Separate Contractors and to defend and indemnify the Owner and/or the Design Consultant in the event Separate Contractors file certain Claims,
- .11 Failure or refusal of the Contractor to submit the required information on Historically Underutilized Businesses (HUB's),
- .12 Failure or refusal of the Contractor to submit a notarized North Carolina State and County Sales Tax Report,
- .13 Any other breach of the Contract by Contractor which has or is likely to cause monetary damages or loss to Owner, or
- .14 Any other reason authorized by the Contract Documents or by law.

9.6.2 When the above grounds in Paragraph 9.6.1 are removed to the Design Consultant's and Owner's satisfaction, payment shall be made for amounts withheld because of them.

9.7 FAILURE OF PAYMENT

9.7.1 If the Owner does not make payment to the Contractor within the forty-five (45) calendar days after receipt of the Contractor's approved Application for Payment from the Design Consultant through no fault of the Contractor, and the Owner otherwise not being entitled under the Contract Documents or applicable law to withhold payment, then the Contractor may, upon seven (7) additional days' Notice to the Owner, stop the Work until payment of the amount owed according to the Contract Documents has been received. In such event, the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be effected by appropriate Change Order as provided herein.

9.8 SUBSTANTIAL COMPLETION

9.8.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Paragraph 8.1.3, the Contractor shall prepare for submission to the Owner a list of items which in his opinion are to be completed or corrected and shall request in writing that the Design Consultant and the Owner perform a Substantial Completion inspection. The Design Consultant and the Owner shall review the Contractor's list and shall compile a punch list of items to be corrected and completed. The failure to include any items on such list does not alter the responsibility of the Contractor to complete the Work in accordance with the Contract Documents. When the Design Consultant and the Owner on the basis of an inspection jointly determine that the Work or designated portion thereof is substantially complete, they will then prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.8.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by

the Contractor and certification by the Design Consultant, the Owner shall make payment, except retainage held pursuant to Paragraph 9.3.2, for such work or portion thereof, as provided in the Contract Documents unless Contractor is in breach of the Contract in which case Owner may withhold an appropriate amount.

- 9.8.3 The acceptance of Substantial Completion payment shall constitute a waiver of all Claims by the Contractor and its Subcontractors and Sub-subcontractors except those previously made in writing and identified by the Contractor as unsettled at the time the Contractor submits the Application for Payment for Substantial Completion, and except for the retainage sums due at Final Completion. The Contractor shall indemnify and hold the Owner harmless against any Claims by its Subcontractors and Sub-subcontractors that are waived because they were not made in writing and identified by the Contractor as unsettled when the Contractor submitted the Application for Payment for Substantial Completion.
- 9.8.4 The Owner shall have the option to correct or conclude any and all punch list items not completed by the Contractor to the satisfaction of the Design Consultant and the Owner within thirty (30) days from the actual date of Substantial Completion by utilizing its own forces or by hiring others. The cost of such correction of remaining punch list items by the Owner or others shall be deducted from the final payment to the Contractor. If Contractor does not complete certain punch list items within this time period, specified in Paragraph 9.8.4, all warranties and guarantees for such incomplete punch list items shall become effective upon issuance of final payment for the Project. Paragraph 9.8.4 does not limit the Liquidated Damages provisions related to failure to reach Final Completion by the date stipulated in the Contract Documents.
- 9.8.5 The issuance of the Certificate of Substantial Completion does not indicate final acceptance of the Project by the Owner, and the Contractor is not relieved of any responsibility for the Project except as specifically stated in the Certificate of Substantial Completion.
- 9.8.6 Should the Design Consultant and the Owner determine that the Work or a designated portion thereof is not substantially complete, they shall inform the Contractor in writing stating why the Project or designated portion is not substantially complete. The Contractor shall expeditiously complete the Work and shall re-request in writing that the Design Consultant and the Owner perform a Substantial Completion inspection. Costs, if any, associated with such inspection shall be assessed to the Contractor.
- 9.8.7 Certificate of Substantial Completion will not be issued until the following is completed by Contractor:
- .1 Submit Contractor's list of work not yet complete with proposed time for completion signed by Contractor's project superintendent;
 - .2 Submit Certificate of Occupancy;
 - .3 Submit record drawings, maintenance manuals, final project photos, property surveys;
 - .4 Deliver tools, spare parts, extra stock and similar items;
 - .5 Submit warranties, bonds, maintenance agreements and final certifications;
 - .6 Complete start-up testing of all systems and instruction of the Owner's personnel;
 - .7 Coordinate and complete final changeover of permanent locks and transmit keys to Owner;
 - .8 Discontinue and remove temporary facilities from the site;

- .9 Complete final cleaning;
 - .10 Advise the Owner of pending insurance changeover requirements;
 - .11 Coordinate and complete changeover of security, telephone, cable and other services; and
 - .12 Submit pay application showing 100% complete for work claimed to be substantially complete.
- 9.8.8 The Contractor acknowledges that the Design Consultant and its consultants are only required to conduct up to two (2) comprehensive substantial completion inspections as part of its basic services. If more than two (2) substantial completion inspections are required through no fault of the Design Consultant, the cost of the additional inspections shall be paid by the Contractor.
- 9.9 FINAL COMPLETION AND FINAL PAYMENT
- 9.9.1 Upon receipt of the documentation required by Section 9.8, and of written Notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Design Consultant and the Owner will promptly make such inspection and, when they find the Work acceptable under the Contract Documents and the Contract fully performed, the Design Consultant shall issue a final Certification of Payment stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents. The final Certification of Payment will constitute that the conditions precedent to the Contractor's being entitled to final payment as set forth in Section 9.8 have been fulfilled. Payment shall be made to the Contractor in the amount certified by the Design Consultant within forty five (45) calendar days after receipt by the Owner of the final Certification of Payment except for any Work for which the Owner is entitled a credit under the Contract Documents.
- 9.9.1.1 The Contractor acknowledges that the Design Consultant and its consultants are only required to conduct up to two (2) comprehensive final completion inspections as part of its basic services. If more than two (2) final completion inspections are required through no fault of the Design Consultant, the cost of the additional inspections shall be paid by the Contractor.
- 9.9.2 Neither the final payment nor the remaining retained percentage shall become due until the Work is free and clear of any and all liens and the Contractor submits to the Owner:
- .1 An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied;
 - .2 Consent of Surety to final payment;
 - .3 If required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner; and
 - .4 A written certification that:
 - .1 The Contractor has reviewed the requirements of the Contract Documents,
 - .2 The Work has been inspected by the Contractor for compliance with all requirements of the Contract Documents,

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- .3 Pursuant to this inspection, the Contractor certifies and represents that the Work complies in all respects with the requirements of the Contract Documents,
- .4 The Contractor further certifies and represents that all equipment and systems have been installed in accordance with the Contract Documents and have been tested in accordance with the Specification requirements and are operational, and
- .5 The Contractor hereby certifies and represents that the Work is complete in all respects and ready for final inspection.

9.9.3 If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any loss. If any such lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien or claims, including all costs and reasonable attorney's fees. The Owner may withhold from the final payment any sum that the Owner has reason to believe may be needed to satisfy any lien, claim or threat of lien arising from the Work. The Owner may deduct from the final payment an amount equal to any costs, expenses and attorney's fees incurred by the Owner in removing or discharging any liens or claim arising from the Work.

9.9.4 If, after Substantial Completion of the Work, Final Completion thereof is materially delayed through no fault of the Contractor or by the issuance of Change Orders affecting Final Completion, and the Owner so confirms, the Owner shall, upon application by the Contractor and certification by the Design Consultant, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for the portion of the Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Section 7.4, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Design Consultant prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

9.9.5 The making of final payment shall constitute a waiver of all Claims by the Owner against the Contractor except those arising from:

- .1 Unsettled liens, and claims against the Owner or the Design Consultant, or their employees, agents, or representatives;
- .2 Faulty, defective or non-conforming Work;
- .3 Failure of the Work to comply with the requirements of the Contract Documents;
- .4 Terms of any warranties contained in or required by the Contract Documents;
- .5 Damages incurred by the Owner resulting from lawsuits brought against the Owner, the Design Consultant, or their agents, employees or representatives because of failures or actions on the part of the Contractor, his Subcontractors, Sub-subcontractors, or any of their employees, agents or representatives;
- .6 Fraud or bad faith committed by the Contractor or any Subcontractor or supplier during performance of the Work but discovered by Owner after final payment; or
- .7 Claims about which Owner did not have actual knowledge or which increase in scope or amount at the time of final payment.

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- 9.9.6 The acceptance of final payment shall constitute a waiver of all Claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.
- 9.9.6.1 Notwithstanding any other provision of the Contract, Owner may withhold from Contractor payment otherwise due, as a result of any losses, expenses costs or damages suffered or anticipated to be suffered by Owner as a result of Contractor's breach of any provision of the Contract, including but not limited to Liquidated Damages or backcharges against Contractor.
- 9.10 **OWNER'S RIGHT TO OCCUPY INCOMPLETE WORK**
- 9.10.1 Should the Project, or any portion thereof, be incomplete for Substantial or Final Completion at the scheduled date or dates, the Owner shall have the right to occupy any portion of the Project. In such an event, the Contractor shall not be entitled to any extra compensation on account of said occupancy by the Owner or by the Owner's use of the Project, nor shall the Contractor interfere in any way with said use of the Project. Further, in such an event, the Contractor shall not be entitled to any extra compensation on account of the Owner's occupancy and use of the Project, nor shall the Contractor be relieved of any responsibilities of the Contract including the required times of completion. Such occupancy by the Owner shall not, in itself, constitute Substantial or Final Completion.
- 9.10.2 If the Owner exercises his rights under the foregoing and occupies the full Project, then there shall be no Liquidated Damages on account of failure on the Contractor's part to reach Substantial Completion from that date forward. This provision does not affect, however, any Liquidated Damages that would be assessed for any period of time between the contractual date of Substantial Completion and the date of any such occupancy. Further, this provision would have no effect on Liquidated Damages assessed on account of late Final Completion.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

- 10.1 **SAFETY PRECAUTIONS AND PROGRAMS**
- 10.1.1 The Owner, the Design Consultant, or their agents, employees or representatives are not responsible for the means, methods, techniques, sequences or procedures utilized by the Contractor, or for safety precautions and programs in connection with the Work. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. This requirement applies continuously throughout the Contract performance, until final payment is made and all punch list and warranty work is performed properly, and is not limited to regular working hours.
- 10.2 **SAFETY OF PERSONS AND PROPERTY**
- 10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:
- .1 All employees on the Work and all other persons who may be affected thereby;
 - .2 All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors, machinery, equipment and all hazards shall be guarded or eliminated in accordance with all applicable safety regulations; and

- .3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and overhead or underground utilities not designated for removal, relocation or replacement in the course of construction.
- 10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, permits, rules, regulations and lawful orders of any public authority bearing on the safety or persons or property or their protection from damage, injury or loss.
 - 10.2.2.1 The Contractor shall at all times safely guard the Owner's property from injury or losses in connection with the Contract. He shall at all times safely guard and protect his own work and adjacent property as provided by law and the Contract Documents, from damage. All passageways, guard fences, lights and other facilities required for protection by applicable safety regulations must be provided and maintained.
- 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.
- 10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.
- 10.2.5 The Contractor shall promptly remedy at his own cost and expense all damage or loss to any property referred to in Subparagraphs 10.2.1.2 and 10.2.1.3 caused by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Subparagraphs 10.2.1.2 and 10.2.1.3, except damage or loss attributable solely to the acts or omissions of the Owner or Design Consultant or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to his obligations under Section 4.21. The Contractor shall perform such restoration by underpinning, repairing, rebuilding, replanting, or otherwise restoring as may be required or directed by the Owner, or shall make good such damage in a satisfactory and acceptable manner. In case of failure on the part of the Contractor to promptly restore such property or make good such damage, the Owner may, upon two (2) calendar days Notice, proceed to repair, rebuild or otherwise restore such property as may be necessary and the cost thereof, or a sum sufficient in the judgment of the Owner to reimburse the owners of property so damaged, will be deducted from any monies due or to become due the Contractor under the Contract.
- 10.2.6 The Contractor is responsible for the proper packing, shipping, handling and storage (including but not limited to shipment or storage at the proper temperature and humidity) of materials to be incorporated in the Work, so as to insure the preservation of the quality and fitness of the material for proper installation and incorporation in the Work, as required by the Contract Documents. For example, but not by way of limitation, Contractor shall, when necessary, place material on wooden platforms or other hard and clean surfaces and not on the ground and/or place such material under cover in any appropriate shelter or facility. Stored materials or equipment shall be located so as to facilitate proper inspection. Material and equipment which is delivered crated shall remain crated until ready for installation. Lawns, grass plots or other private property shall not be used for storage purposes without the written permission of the Owner or lessee unless otherwise within the terms of the easements obtained by the Owner.
 - 10.2.6.1 It shall be the responsibility of the Contractor in his preparation of phasing schedule of work operations after consulting with the other Prime Contractors to designate areas in which each

Prime Contractor may store materials. Areas designed shall meet with the approval of the Design Consultant.

- 10.2.7 The Contractor shall give notice in writing at least forty eight (48) hours before breaking ground, to all persons, public utility companies, owners of property having structures or improvements in proximity to site of the Work, superintendents, inspectors, or those otherwise in charge of property, streets, water pipes, gas pipes, sewer pipes, telephone cables, electric cables, railroads or otherwise, who may be affected by the Contractor's operation, in order that they may remove any obstruction for which they are responsible and have representative on site to see that their property is properly protected. Such notice does not relieve the Contractor of responsibility for all damages, claims, or defense or indemnification of all actions against Owner resulting from performance of such work in connection with or arising out of Contract.
- 10.2.8 The Contractor shall investigate, locate, mark and protect all utilities encountered or to be encountered while performing the Work, whether indicated on the Drawings or not. The Contractor shall maintain utilities in service until moved or abandoned. The Contractor shall exercise due care when excavating around utilities and shall restore any damaged utilities to the same condition or better as existed prior to starting the Work, at no cost to the Owner. The Contractor shall maintain operating utilities or other services, even if they are shown to be abandoned on the Contract Drawings, in service until new facilities are provided, tested and ready for use.
- 10.2.9 The Contractor shall return all improvements on or about the site and adjacent property which are not shown to be altered, removed or otherwise changed to conditions which existed prior to starting the Work. The Contractor shall video record all areas or otherwise document the conditions existing at the site and in and around existing buildings prior to starting the Work. Submit documentation to the Design Consultant prior to beginning the Work.
- 10.2.10 The Contractor shall protect the Work, including but not limited to, the site, stored materials and equipment, excavations, and excavated or stockpiled soil or other material, intended for use in the Work, and shall take all necessary precautions to prevent or minimize damage to same or detrimental effect upon his performance or that of his Subcontractors, caused by or due to rain, snow, ice, run-off, floods, temperature, wind, dust, sand and flying debris; for example, but not by way of limitation, Contractor shall, when necessary, utilize temporary dikes, channels or pumping to carry-off divert or drain water, and shall as necessary tie-down or otherwise secure the Work and employ appropriate covers and screens.
- 10.2.11 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents and the protection of material, equipment and property. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner.
- 10.2.12 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.
- 10.2.13 Notification to the Contractor by the Owner or the Design Consultant of a safety violation will in no way relieve the Contractor of sole and complete responsibility for the correctness of said violation or of sole liability for the consequences of said violation.

10.3 EMERGENCIES

- 10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. The Contractor shall notify the Owner of the situation and all actions taken immediately thereafter. If, in the opinion of the Contractor, immediate action is not required, the Contractor shall notify the Owner of the emergency

situation and proceed in accordance with the Owner's instructions. Provided, however, if any loss, damage, injury or death occurs that could have been prevented by the Contractor's prompt and immediate action, the Contractor shall be fully liable for all costs, damages, claims, actions, suits, attorney's fees and all other expenses arising therefrom or relating thereto.

ARTICLE 11

INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase and maintain in companies properly licensed by the Insurance Department of the State of North Carolina and acceptable to the Owner such insurance as will protect him, the Owner, and the Owner's agents, representatives, and employees from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts (with Workmen's Compensation and Employer's Liability Insurance in amounts not less than those necessary to meet the statutory requirements of the state(s) having jurisdiction over any portion of the Work);
- .2 Claims for damages because of bodily injury, sickness or disease, or death of his employees; the Contractor will require his Subcontractors to similarly provide Workmen's Compensation Insurance for all of the latter's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;
- .4 Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and
- .6 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

11.1.2 The insurance required by Paragraph 11.1.1 shall be primary and non-contributing to any insurance possessed or procured by the Owner, and limits of liability shall be not less than those set forth in these General Conditions of the Contract or required by law, whichever is greater.

11.1.3 The insurance required by the Contract shall include contractual liability insurance applicable to the Contractor's obligations under the Contract

11.1.4 Without limiting the above during the term of the Contract, the Contractor and each Subcontractor shall, at their own expense, purchase and maintain the following insurance with companies properly licensed by the Insurance Department of the State of North Carolina and satisfactory to the Owner.

- .1 Worker's Compensation including Occupational Disease and Employer's Liability Insurance.

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- .1 Statutory - Amount and coverage as required by State of North Carolina Worker's Compensation laws.
- .2 Employer's Liability
 - \$1,000,000 Each Accident
 - \$1,000,000 Policy Limit
 - \$1,000,000 Each Employee
- .2 Commercial General Liability (Occurrence Form) - The Contractor shall provide during the life of the Contract such Commercial General Liability (Occurrence Form) Insurance as shall protect him and any Subcontractor performing work under the Contract from claims for damages for Bodily Injury including accidental death, as well as from claims for Property Damage which may arise from operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them. This insurance shall be on the Standard Insurance Services Office, Inc. (ISO) Commercial Liability Occurrence Form or other form reasonable acceptable to Owner. The Contractor shall procure insurance coverage for direct operations, sublet work, elevators, contractual liability and completed operations with limits not less than those stated below:
 - .1 A Combined Single Limit for Bodily Injury, Property Damage and Personal Injury of:
 - Limits of Insurance
 - \$2,000,000 General Aggregate (except Products – Completed Operations) Limit
 - \$2,000,000 Products – Completed Operations Aggregate Limit
 - \$1,000,000 Personal and Advertising Injury Limit
 - \$1,000,000 Each Occurrence Limit
 - .3 Property Damages, including Broad Form Property Damage and Explosion, Collapse, Underground property damage coverages, and blasting, where necessary;
 - .4 Completed Operations Liability: Continuous coverage in force for one year after completion of the Work;
 - .5 Commercial Automobile Insurance, including coverage for owned, non-owned and hired vehicles - with limits not less than those stated below:
 - .1 A Combined Single Limit for Bodily Injury and Property Damage of \$1,000,000.
 - .6 Umbrella Liability Insurance: Policy to "pay on behalf of the Insured"
 - Limits of Liability:
 - .1 Contract Amount: \$1,000,000-\$2,000,000:
 - Requires Umbrella Liability Insurance Limit of \$1,000,000.
 - .2 Contract Amount: \$2,000,000 and above:
 - Requires Umbrella Liability Insurance Limit of \$2,000,000.

11.1.5 The insurance required by Section 11.1 shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater.

11.1.6 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least thirty (30) days' prior written Notice has been given to the Owner. Failure to provide such Notice shall not limit the liability of the Insurer, its agents or representatives.

- 11.1.7 All insurance policies required in this Article, except Worker's Compensation and Commercial Automobile, shall name the Owner as additional named insured for the insurance.
- 11.1.8 The Contractor shall not commence the Work under the Contract until he has obtained all the insurance required hereunder and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been so obtained and approved. Approval of the insurance by the Owner shall not relieve or decrease the liability of the Contractor hereunder.
- 11.1.9 The Commercial General Liability and Workers Compensation Policies provided by the Contractor shall have endorsements waiving subrogation against the Owner.
- 11.2 PROPERTY INSURANCE
- 11.2.1 The Contractor shall purchase and at all times maintain such insurance as will protect the Contractor, the Owner, Subcontractors and Sub-subcontractors from loss or damage to the Work or property in the course of construction, including all machinery, materials and supplies on the premises or in transit thereto and intended to become a part of the finished Work until Final Completion. This insurance shall be in the form of "Builders Risk Covered Cause of Loss Form", or equivalent form, to include but not limited to theft, collapse, earth movement, flood, and portions of the Work stored on site, off site and in transit. Any deductible provision in such insurance shall not exceed ten thousand dollars (\$10,000). Notwithstanding any such deductible provision, the Contractor shall remain solely liable for the full amount of any item covered by such insurance. Such insurance shall be in the initial Contract Sum and shall be increased at Contractor's expense in the amount of all additions to the Contract Sum. Such insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.
- 11.2.2 Any loss insured under Paragraph 11.2.1 is to be adjusted with the Owner and made payable to the Owner as trustee for the insureds, as their interests may appear, subject to the requirements of Paragraph 11.2.4. The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require each Subcontractor to make payments to his Sub-subcontractors in similar manner.
- 11.2.3 The Owner and Contractor waive all rights against each other for damages caused by fire or other perils to the extent their Claims are covered by insurance obtained pursuant to this Section 11.2, or any other property insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance. The Contractor shall require, by appropriate agreement, written where legally required for validity, similar waivers in favor of the Owner and the Contractor by Subcontractors and Sub-subcontractors. With respect to the waiver of rights of recovery, the term Owner shall be deemed to include, to the extent covered by property insurance applicable thereto, his consultants, employees, and agents and representatives. The Contractor waives as against any Separate Contractor described in Article 6, all rights for damages caused by fire or other perils in the same manner as is provided above as against the Owner. The Owner shall require, by appropriate agreement, written where legally required for validity, similar waivers in favor of the Contractor by any Separate Contractor and his subcontractors and sub-subcontractors.
- 11.2.4 The Owner as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within five (5) days after the occurrence of loss to the Owner's exercise of this power, and if such objection is made, the matter shall be decided by a court of competent jurisdiction or as the parties in interest otherwise agree. The Owner as trustee shall, in that case, make settlement with the insurers in accordance with the

orders of the court or as otherwise agreed by the parties in interest.

11.2.5 If the Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion thereof, such occupancy or use shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance have consented by endorsement to the policy or policies. This insurance shall not be canceled or lapsed on account of such partial occupancy or use. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

11.2.6 The Contractor bears the risk of loss or damage to the Work, the Project, materials stored on site or off site, and Owner's improvements and property under Contractor's control, both during construction and prior to Substantial Completion.

11.3 EFFECT OF SUBMISSION OF CERTIFICATES

11.3.1 The Owner shall be under no obligation to review any Certificates of Insurance provided by the Contractor or to check or verify the Contractor's compliance with any and all requirements regarding insurance imposed by the Contract Documents. The Contractor is fully liable for the amounts and types of insurance required herein and is not excused should any policy or certificate of insurance provided by the Contractor not comply with any and all requirements regarding insurance imposed by the Contract Documents.

11.4 FAILURE OF COMPLIANCE

11.4.1 Should the Contractor fail to provide and maintain in force any and all insurance, or insurance coverage required by the Contract Documents or by law, or should a dispute arise between Owner and any insurance company of Contractor over policy coverage or limits of liability as required herein, the Owner shall be entitled to recover from the Contractor all amounts payable, as a matter of law, to Owner or any other parties, had the required insurance or insurance coverage been in force. Said recovery shall include, but is not limited to interest for the loss of use of such amounts of money, plus all attorney's fees, costs and expenses incurred in securing such determination and any other consequential damages arising out of the failure of the Contractor or insurance company to comply with the provisions of the Contract Documents, or any policy required hereby, or any other requirements regarding insurance imposed by law. Nothing herein shall limit any damages for which Contractor is responsible as a matter of law.

11.5 OWNER'S INSURANCE

11.5.1 Property Insurance: The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused.

11.5.2 Commercial Public Liability Insurance: The Owner, at his option, may purchase and maintain insurance which will insure and protect him against claims involving bodily injury and property damage to the public. The Owner does not request his insurer to waive any right of subrogation against the Contractor from claims under this coverage.

11.6 LICENSED INSURANCE COMPANIES

11.6.1 All insurance companies providing the above insurance shall be licensed by the Insurance Department of the State of North Carolina and have a minimum AM Best "A" rating or similar rating from another rating agency reasonably acceptable to Owner.

ARTICLE 12

CHANGES IN THE WORK

12.1 GENERAL PROVISIONS RELATED TO CHANGES

12.1.1 A Construction Change Directive is a document issued pursuant to this Paragraph 12.1.1. The Owner may, at any time, without the agreement of the Contractor, by written order signed by the Owner and Design Consultant designated or indicated to be a Construction Change Directive, make any Changes in the Work or add to or subtract from the Work within the general scope of the Contract. A Change in the Work is defined as changes within the general scope of the Contract, including, but not limited to changes:

- .1 In the Specifications or Drawings;
- .2 In the sequence, method or manner of performance of the Work;
- .3 In the Owner-furnished facilities, equipment, materials, services or site; or
- .4 Directing acceleration in the performance of the Work.

12.1.2 A Change Order is a document executed pursuant to this Paragraph 12.1.2. The Owner and Contractor may agree to Changes in the Work, the Contract Sum, the Contract Time and any other change in the Contract by written agreement signed by Owner, Contractor and Design Consultant designated or indicated to be a Change Order. If the Contractor, subsequent to the issuance of a Construction Change Directive, agrees to its terms including any applicable adjustment to the Contract Sum and Contract Time, Contractor shall sign it and it shall become a Change Order.

12.1.3 The Contractor shall not be entitled to any amount for indirect costs, damages or expenses of any nature, including, but not limited to, so-called "impact" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the Proposal is based and to which the parties have agreed pursuant to the provisions of Article 12, and which the Contractor, its Subcontractors or Sub-subcontractors or any other person may incur as a result of delays, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all Changes in the Work performed pursuant to this Article 12, unless the delay is caused solely by the Owner or its agent. It is understood and agreed that the Contractor's sole and exclusive remedy in the event the delay is caused solely by the Owner or its agent shall be recovery of his direct costs as compensable hereunder and an extension of the Contract Time, but only in accordance with the provisions of the Contract Documents. The phrase "Owner or its agent" as used in the Contract, does not include the Prime Contractors or their Subcontractors.

12.1.4 No Claim by the Contractor shall be allowed if asserted after final payment under this Contract. No Claim relating to or flowing from a particular change shall be allowed after execution of the Change Order relating to that change or commencement of the change by the Contractor except as specifically provided in Paragraph 12.2.4.

12.1.5 If any dispute should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a Change in the Work, the Contractor shall not suspend performance of a Change in the Work or the Work itself unless otherwise so ordered by the Owner in writing. The Owner shall, however, pay to the Contractor up to the Owner's reasonable estimated value of the Change in the Work, regardless of the dispute, if said Change in the Work will result in an increase in the Contract Sum; and the Owner shall have the right to withhold payment from the Contractor in an amount

up to the Owner's reasonable estimated value of the Change in the Work, regardless of the dispute, if said Change in the Work will result in a decrease in the Contract Sum.

12.1.6 No Change in the Work shall be performed without a fully executed Change Order to the Contract a fully executed Construction Change Directive or other Modification to the Contract.

12.1.7 If the Contractor intends to assert a Claim under this Article, he must, within ten (10) days after receipt of a Construction Change Directive, Notify the Owner by written statement setting forth the specific nature and cost of such Claim, unless this period is extended by the Owner. The statement of Claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any. The Contractor and its Subcontractors shall not be entitled to reimbursement for any Claims that are not submitted in strict conformance with the Contract. The Contractor shall indemnify and hold the Owner harmless against any Claims by Subcontractors that are waived because they are not submitted in strict conformance with the Contract.

12.2 OWNER DIRECTED CHANGES REQUIRING AN INCREASE IN CONTRACT SUM.
(For decreases in Contract Sum, refer to Section 12.6)

12.2.1 If the Change in the Work will result in an increase in the Contract Sum, the Owner shall have the right to require the performance thereof on a lump sum basis, a unit price basis or a time and material basis, all as hereinafter more particularly described (the right of the Owner as aforesaid shall apply with respect to each such Change in the Work).

If the Owner elects to have the Change in the Work performed on a lump sum basis, its election shall be based on a lump sum Proposal which shall be submitted by the Contractor to the Owner within ten (10) days of the Contractor's receipt of a request therefore (but the Owner's request for a lump sum Proposal shall not be deemed an election by the Owner to have the Change in the Work performed on a lump sum basis). The Contractor's Proposal shall be itemized and segregated by labor and materials for the various components of the Change in the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed Proposals of any Subcontractors who will perform any portion of the Change in the Work and of any persons who will furnish materials or equipment for incorporation therein. The Proposal shall also include the Contractor's estimate of the time required to perform said changes. The Contractor shall provide any documentation that may be requested by the Owner or Architect to support the change proposal, including but not limited to payroll records, insurance rates, material quotes, and rental quotes.

The portion of the Proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, may include reasonably anticipated gross wages of job site labor, including foremen, who will be directly involved in the Change in the Work (for such time as they will be so involved), plus payroll costs (including premium costs of overtime time, if overtime is anticipated, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor) and up to fifteen percent (15%) of such anticipated gross wages, but not payroll costs, as overhead and profit for the Contractor or any such Subcontractor, as applicable (said overhead and profit to include all supervision except foremen). Payroll costs are limited to 39% of the net pay of the worker.

The portion of the Proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its Subcontractors of materials to be purchased for incorporation in the Change in the Work, plus transportation and applicable sales and use taxes and up to fifteen percent (15%) of said direct material costs as overhead and profit for the Contractor or any such Subcontractor (said overhead and profit to include all small tools), and may further include the Contractor's and any of its Subcontractor's reasonably anticipated rental

costs in connection with the Change in the Work (either actual or discounted local published rates), plus up to eight percent (8%) thereof as overhead and profit for the Contractor or any such Subcontractors, as applicable. The Contractor shall provide an itemized breakdown of all transportation and shipping costs, including receipts documenting the expenses. Notwithstanding the above, overhead and profit shall not be applied to any sales tax paid for any purpose or to any transportation or shipping costs incurred by the Contractor or any subcontractor. If any of the items included in the lump sum Proposal are covered by unit prices contained in the Contract Documents, the Owner may, if it requires the Change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum Proposal, in which event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

The lump sum Proposal may include up to eight percent (8%) of the amount which the Contractor will pay to any of its Subcontractors for Changes in the Work as overhead and profit for the Contractor. The Contractor shall not be reimbursed for the costs of the Subcontractors' Payment and Performance Bonds, as such bonding is not required by the Owner.

12.2.2 In the event that the Contractor fails to submit his Proposal within the designated period, the Owner may order the Contractor to proceed with the Change to the Work and the Contractor shall so proceed. The Owner shall unilaterally determine the reasonable cost and time to perform the Work in question, which determination shall be final and binding upon the Contractor. The Contractor may dispute such action in accordance with the Article 15.

12.2.3 In the event that the parties are unable to agree as to the reasonable cost and time to perform the Change in the Work based upon the Contractor's Proposal and the Owner does not elect to have the Change in the Work performed on a time and material basis, the Owner may choose to make a determination of the reasonable cost and time to perform the Change in the Work, based upon its own estimates, the Contractor's submission or a combination thereof. A Construction Change Directive shall be issued in this case for the amounts of cost and time determined by the Owner and shall become final and binding upon the Contractor, subject to Contractor's right to dispute such action in accordance with Article 15. Owner has the right to direct by Construction Change Directive a Change in the Work, which is the subject of such Change Order. Failure of the parties to reach agreement regarding the cost and time of the performing the Construction Change Directive, shall not relieve the Contractor from performing the Change in the Work promptly and expeditiously.

12.2.3.1 The Owner reserves the right to reject the Contractor's Proposal for a Change in the Work and to elect to perform said Work using a Separate Contractor. Under such circumstances, all provisions of Article 6 shall be in force.

12.2.4 If the Owner elects to have the Change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, at actual cost to the entity performing the Change in the Work (without any charge for administration, clerical expense, supervision or superintendence of any nature whatsoever, including foremen, or the cost, use or rental of tools or plant), plus fifteen percent (15%) thereof as the total overhead and profit (except that said fifteen percent (15%) shall not be applied against any payroll costs, as set forth in Paragraph 12.2.1.) The Contractor shall submit to the Owner daily time and material tickets, on a daily basis to include the identification number assigned to the Change in the Work, the location and description of the Change in the Work, the classification of labor employed (and names and social security numbers), the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such,

constitute a waiver by the Contractor of any Claim for the cost of that portion of the Change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgment by the Owner that the items thereon were reasonably required for the Change in the Work.

12.2.5 No overhead and profit will be paid by the Owner on account of a Change in the Work except as specifically provided in Section 12.2. Overhead and profit, as allowed under Section 12.2, shall be deemed to include all costs and expenses which the Contractor or any of its Subcontractors may incur in the performance of a Change in the Work and which are not otherwise specifically recoverable by them pursuant to Section 12.2.

12.3 CONTRACTOR NOTICE OF CHANGE

12.3.1 If the Contractor or any of its Subcontractors asserts that any event or occurrence has caused a Change in the Work which change causes an increase or decrease in the Contractor's or its Subcontractors cost or the time required for the performance of any part of the Work under the Contract, including Work not affected directly by the change, the Contractor shall, within ten (10) days of such event, give the Owner written Notice as herein required. Said Notice shall include the instructions or circumstances that are the basis of the Claim and the Contractor's best estimate of the cost and time involved.

12.4 MINOR CHANGES IN THE WORK

12.4.1 The Owner shall have authority to order minor Changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

12.4.2 The Contractor shall not perform any Changes in the Work unless authorized in writing by the Design Consultant or Owner.

12.5 DIFFERING SITE CONDITIONS

12.5.1 Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the Drawings or indicated in the Specifications or differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, or different from that shown on surveys or tests provided in the bid materials at the time the Owner solicited bids from the construction of the Project, he shall immediately give Notice to the Owner of such conditions before they are disturbed. The Owner and the Design Consultant shall thereupon promptly investigate the conditions and if they find that they materially differ from those shown on the Drawings or indicated in the Specifications, they shall at once make such changes in the Drawings and/or Specifications as they may find necessary. Any increase or decrease of cost resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional work and changes. However, neither the Owner nor the Design Consultant shall be liable or responsible for additional work, costs or Changes to the Work due to material differences between actual conditions and any geotechnical, soils and other reports, surveys and analyses made available for the Contractor's review at the time the Owner solicited bids for the construction of the Project.

12.6 OWNER DIRECTED CHANGES REQUIRING A DECREASE IN CONTRACT SUM.

12.6.1 If the Change in the Work will result in a decrease in the Contract Sum, the Owner may request a quotation by the Contractor of the amount of such decrease. The following provisions shall apply:

The portion of the Proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, shall include reasonably anticipated gross wages of job site labor, including foremen, who would have been directly involved in the Work that has been deleted from the Contract, (for such time as they would have been so involved), plus payroll costs (including premium costs of overtime time, if overtime was anticipated, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor) and seven percent (7%) of such anticipated gross wages, but not payroll costs, as overhead and profit not incurred or earned by the Contractor or any such Subcontractor, as applicable (said overhead and profit to include all supervision except foremen).

The portion of the Proposal relating to materials shall include the reasonably anticipated direct costs which would have been incurred by the Contractor or to any of its Subcontractors of materials which would have been purchased for incorporation in the Work but which has been deleted from the Contract, plus transportation and applicable sales and use taxes which will be avoided and seven percent (7%) of said direct material costs as overhead and profit not incurred or earned by the Contractor or any such Subcontractor (said overhead and profit to include all small tools), and shall further include the Contractor's and any of its Subcontractor's reasonably anticipated rental costs which will be avoided (either actual or discounted local published rates), plus five percent (5%) thereof as overhead and profit not incurred or earned by the Contractor

or any such Subcontractors, as applicable. If any of the items included in the lump sum Proposal are covered by unit prices contained in the Contract Documents, the Owner may elect to use these unit prices in determining the amount of reduction to the Contract Sum as a result of a deletion of Work from the Contract. No overhead and profit shall be applied to any unit prices for purposes of calculation such reduction in the Contract Sum.

The lump sum Proposal for Work which would have been performed by any Subcontractors shall include four percent (4%) of that amount as an estimate of the Contractor's overhead and profit that will not be earned by Contractor due to the decrease in the Contract Sum.

The Contractor's quotation shall be forwarded to the Owner within ten (10) days of the Owner's request and, if acceptable to the Owner, shall be incorporated in the Change Order. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a lump sum properly itemized, on unit prices stated in the Contract Documents and/or on such other basis as the parties may mutually determine. If the parties are unable to so agree, the amount of such decrease shall be the total of the estimated reduction in actual cost of the Work, as determined by the Owner in its reasonable judgment, plus overhead and profits stated above. This shall become final and binding upon the Contractor, subject to Contractor's right to dispute such action in accordance with the Article 15.

ARTICLE 13

UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING OF WORK

13.1.1 If any portion of the Work is covered contrary to the request of the Owner or the Design Consultant or to requirements specifically expressed in the Contract Documents or to requirements of applicable construction permits, it must, if required in writing by the Owner, be uncovered for his observation and shall be replaced at the Contractor's expense.

13.1.2 If any other portion of the Work has been covered which the Design Consultant or the Owner has not specifically requested to observe prior to being covered, either may request to see such portion of the Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it is found that this condition was caused by the Owner, in which event the Owner shall be responsible for the payment of such costs. If such condition was caused by a Separate Contractor, Contractor may proceed against and only against, said Separate Contractor as provided in Article 6. Any costs to the Owner pursuant to this Paragraph shall be determined in accordance with the provisions of Article 12.

13.2 CORRECTION OF WORK

13.2.1 The Contractor shall promptly reconstruct, replace or correct portions of the Work rejected by the Design Consultant or Owner as defective or as failing to conform to the Contract Documents or as not in accordance with the guarantees and warranties specified in the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected portions of the Work, including compensation for the Design Consultant's and the Owner's additional construction management services made necessary thereby.

13.2.2 The Contractor, unless removal is waived by the Owner, shall remove from the site all portions of the Work which are defective or non-conforming, or if permitted or required, he shall correct

such portions of the Work in place at his own expense promptly after receipt of Notice, and such rejected Work shall not thereafter be tendered for acceptance unless the former rejection or requirement for correction is disclosed.

13.2.3 If the Contractor does not proceed with the correction of such defective or non-conforming portions of the Work within a reasonable time fixed by written Notice from the Owner or Design Consultant, the Owner may either (1) by separate contract or otherwise replace or correct such portions of the Work and charge the Contractor the cost incurred by the Owner thereby and remove and store the materials or equipment at the expense of the Contractor, or (2) terminate this Contract for default as provided in Section 14.3, or both, or take any other measure allowed by law.

13.2.4 The Contractor shall bear the cost of making good all work of the Owner or Separate Contractors destroyed or damaged by such correction or removal.

13.2.5 Nothing contained in this Section 13.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Section 4.6 hereof. The establishment of the time period of one year after the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations.

13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable, or the Owner may elect to accept payment in materials or services, in lieu of a reduction in the Contract Sum. If the amount of a reduction is determined after final payment, it shall be paid to the Owner by the Contractor.

ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 If the Work is stopped for a period of one hundred twenty (120) days by the Owner or under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, and through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon seven (7) additional days' written Notice to the Owner and the Design Consultant, terminate the Contract and recover from the Owner payment on a quantum merit basis, for all Work executed for which Contractor has not previously been paid, less any amounts Contractor may owe Owner under the Contract Documents and less any amounts Owner is entitled to withhold from Contractor or backcharge to the Contractor under the Contract Documents or pursuant to law. The Contractor shall not be entitled to collect and hereby expressly waives any overhead or profit on Work not performed and any damages related to that portion of the Contract which has been terminated.

14.2 TERMINATION FOR CONVENIENCE OF THE OWNER

14.2.1 The Owner may, at any time upon ten (10) days written Notice to the Contractor and to the Contractor's Surety, which Notice shall specify that portion of the Work to be terminated and the date said termination is to take effect, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the Work for the convenience of the Owner. The Contractor's sole remedy, in the event of such termination, will be the allowable termination costs permitted by Section 14.4. Contractor shall include termination clauses identical to Article 14 in each of his subcontracts.

14.3 DEFAULT TERMINATION

14.3.1 Ten (10) days after written Notice is mailed to the Contractor and to the Contractor's Surety, the Owner may terminate (without prejudice to any right or remedy of the Owner or any subsequent buyer of any portion of the Work) the employment of the Contractor and his right to proceed either as to the whole or any portion of the Work required by the Contract Documents and may take possession of the Work and complete the Work by contract or otherwise in any one of the following circumstances:

- .1 If the Contractor or its Surety refuses or fails to prosecute the Work or any separable part thereof with such diligence as will ensure the Substantial and Final Completion of the Work by the dates specified in the Supplemental Conditions for Substantial and Final Completion or fails to complete the Work or remedy a default within said period;
- .2 If the Contractor is in material default in carrying out any provisions of the Contract;
- .3 If the Contractor fails to supply a sufficient number of properly skilled workers or proper equipment or materials;
- .4 If the Contractor fails to make prompt payment to Subcontractors or for materials or labor, unless he otherwise provides the Owner satisfactory evidence that payment is not legally due;
- .5 If the Contractor disregards laws, permits, ordinances, rules, regulations or orders of any public authority having jurisdiction, or fails to follow the instructions of the Owner;
- .6 If the Contractor substantially violates any provisions of the Contract Documents; or
- .7 If the Contractor refuses or fails to properly schedule, plan, coordinate and execute the Work, as specified herein, so as to perform the Work within the specified Completion Dates, or to provide scheduling or related information, revisions and updates as required by the Contract Documents.

14.3.2 The right of the Contractor to proceed shall not be so terminated under this Section 14.3 if the delays in the completion of the Work are due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor or his Subcontractors as specifically set forth in Section 8.3 hereof.

14.3.3 If, after the Contractor has been terminated for default pursuant to Section 14.3, it is determined that none of the circumstances set forth in Paragraph 14.3.1 exist, then such termination shall be considered a termination for convenience pursuant to Section 14.2. In such case, the Contractor's sole remedy will be the costs permitted by Section 14.4.

14.3.4 If the Owner so terminates the employment of the Contractor due to the Contractor's default, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the compensation to be paid to the Contractor hereunder shall exceed the expense of so completing the Work (including compensation for additional managerial,

administrative, consultant and inspection services, attorney's fees and any damages for delay) such excess shall be paid to the Contractor.

14.3.5 If such expenses referenced in Paragraph 14.3.1, shall exceed the unpaid balance, the Contractor and his sureties shall be liable to the Owner for such excess. If the right of the Contractor to proceed with the Work is partially or fully terminated, the Owner may take possession of and utilize in completing the Work such materials, appliances, supplies, plant and equipment as may be on the site of the terminated portion of the Work and necessary for the completion of the Work. If the Owner does not fully terminate the right of the Contractor to proceed, the Contractor shall continue to perform the part of the Work that is not terminated.

14.3.6 If the Owner terminates the whole or any part of the Work pursuant to Section 14.3, the Owner may procure, upon such terms and in such manner as the Owner may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the Owner for any excess costs for such similar supplies or services. The Contractor shall continue the performance of the Contract to the extent not terminated hereunder.

14.4 ALLOWABLE TERMINATION COSTS

14.4.1 If the Owner terminates the whole or any portion of the Work pursuant to Section 14.2, then the Owner shall only be liable to the Contractor for those costs reimbursable to the Contractor in accordance with Paragraph 14.4.2, plus a markup of ten percent (10%) for profit and overhead on the actual fully accounted costs specified under Paragraph 14.4.2; provided however, that if there is evidence that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit or overhead shall be included or allowed hereunder for the Work performed and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss. Under no circumstances shall the Contractor be entitled to any loss profit on the Work terminated pursuant to Section 14.2.

14.4.1.1 After receipt of a Notice of Termination, the Contractor shall submit to the Owner his termination Claim, in the form and with certification prescribed by the Owner. Such Claim shall be submitted promptly but in no event later than three (3) months from the effective date of termination, unless one or more extensions in writing are granted by the Owner upon request of the Contractor made in writing within such three (3) month period or authorized extension thereof. However, if the Owner determines that the facts justify such action, he may receive and evaluate any such termination Claim at any time after such three (3) month period or any extension thereof. Upon failure of the Contractor to submit his termination Claim within the time allowed, the Owner may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and such termination shall be final and binding on the Contractor.

14.4.2 If the Owner terminates the whole or any portion of the Work pursuant to Section 14.2, the Owner shall pay the Contractor an amount for supplies, services, or property accepted by the Owner, and which is in accordance with the Contract Documents, in an amount as if the Contract had not been terminated. In addition, in such event, the Owner shall pay to Contractor an amount representing Contractor's actual cost, excluding any overhead and profit for the items and things specified in Subparagraph 14.5.1.6 and not heretofore paid for, appropriately adjusted for any saving of freight or other charges. Under no circumstances shall the Contractor be entitled to any loss profit on the Work terminated pursuant to Section 14.2.

14.4.2.1 The Contractor agrees that neither the Owner nor the Design Consultant will be liable for payments to Contractors or Subcontractors pursuant to Section 14.4.2 unless each contract and subcontract contains termination provisions identical to those set forth in this Article 14. The Owner and the Design Consultant will not be liable to the Contractor or any of the Subcontractors for any costs associated with termination if the contract or subcontract of the party involved does not include the required termination language.

14.4.3 In arriving at any amount due the Contractor pursuant to Section 14.4, there shall be deducted the following:

- .1 All unliquidated advance or other payments on account theretofore made to the Contractor applicable to the terminated portion of the Contract;
- .2 Any Claim which the Owner may have against the Contractor;
- .3 Such amount as the Owner determines to be necessary to protect the Owner against loss because of outstanding or potential liens or claims; and
- .4 The agreed price for, or the proceeds of sale of, any materials, supplies or other things acquired by the Contractor sold, pursuant to the provisions of Subparagraph 14.5.1.7, and not otherwise recovered by or credited to the Owner, or returned for a refund by the Contractor.
- .5 All other amounts the Owner is entitled to withhold from the Contractor or charge to the Contractor pursuant to the Contract or as allowed by applicable law.

14.4.4 The total sum to be paid to the Contractor under Section 14.4 shall not exceed the Contract Sum as reduced by the amount of payments otherwise made or to be made for Work not terminated and as otherwise permitted by the Contract. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor, as provided in Paragraph 14.4.2, the fair value, as determined by the Owner, of property which is destroyed, lost, stolen or damaged so as to become undeliverable to the Owner, or to a buyer pursuant to Subparagraph 14.5.1.7.

14.5 GENERAL TERMINATION PROVISIONS

14.5.1 After receipt of a Notice of termination from the Owner, pursuant to Section 14.2 or 14.3, and except as otherwise directed by the Owner, the Contractor shall:

- .1 Stop work under the Contract on the date and to the extent specified in the Notice of termination;
- .2 Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the Work under the Contract as is not terminated;
- .3 Terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by the Notice of termination;
- .4 At the option of the Owner, and in lieu of terminating such orders and subcontracts, assign to the Owner in the manner, at the times and to the extent directed by the Owner in writing, all of the rights in the such orders and subcontracts,
- .5 Settle all outstanding liabilities and all Claims arising out of such termination or orders and subcontracts, with the approval or ratification of the Owner in writing, to the extent he may require, which approval or ratification shall be final for all the purposes of this Article;
- .6 Transfer title and deliver to the entity or entities designated by the Owner, in the manner, at the times and to the extent directed by the Owner to the extent specifically produced or specifically acquired by the Contractor for the performance of such portion of the Work as had been terminated, the following:

- (1) The fabricated or unfabricated parts, Work in process, partially completed supplies and equipment, materials, parts, tools, dies, jigs and other fixtures, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated by the Notice of termination; and
 - (2) The completed or partially completed plans, drawings, information, releases, manuals and other property related to the Work and which, if the Contract had been completed, would have been required to be furnished to the Owner;
- .7 Use his best efforts to return for a refund or sell, in the manner, at the times, to the extent and at the price or prices directed or authorized by the Owner, any property of the types referred to in Subparagraph 14.5.1.6; provided, however, that the Contractor:
- (1) Shall not be required to extend credit to any buyer, and
 - (2) May acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner in writing; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under the Contract or shall otherwise be credited to the Contract Sum covered by the Contract or paid in such other manner as the Owner may direct;
- .8 Complete performance of such part of the Work as shall not have been terminated by the Notice of termination;
- .9 Take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to the Contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest; and
- .10 Otherwise mitigate any damages Contractor claims to suffer as a result of a termination.
- 14.5.2 The Contractor shall, from the effective date of termination until the expiration of three (3) years after final settlement under the Contract, preserve and make available to the Owner, at all reasonable times at the office of the Contractor, but without direct charge to the Owner, all his books, records, documents and other evidence bearing on the costs and expenses of the Contractor under the Contract and relating to the Work terminated hereunder, or, to the extent approved by the Owner, photographs, micro-photographs or other authentic reproductions thereof.
- 14.5.3 If the termination, pursuant to Section 14.2, be partial, the Contractor may file with the Owner a Claim for an equitable adjustment of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the Notice of termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any Claim by the Contractor for an equitable adjustment under this Paragraph must be asserted within thirty (30) days from the effective date of the Notice of termination.
- 14.5.4 The Contractor shall refund to the Owner any amounts paid by the Owner to the Contractor in excess of costs reimbursable under Section 14.4.
- 14.5.5 The Contractor shall be entitled to only those damages and that relief from termination by the Owner as specifically provided in Article 14.

ARTICLE 15

DISPUTE RESOLUTION

15.1 INITIATING CLAIMS

15.1.1 Claims must be initiated by written Notice to the Owner and to the party against whom the Claim is made with a copy to the Design Consultant. The responsibility to substantiate Claims shall rest with the party making the Claim.

15.1.2 Nothing in the Contract shall be construed as meaning that the Owner's assessment of Liquidated Damages is a Claim as defined herein, or that the Owner has the burden of proof to assess Liquidated Damages. Should the Owner assess Liquidated Damages, the burden of proving that such damages should not have been assessed shall rest upon the Contractor.

15.2 RESOLUTION OF CLAIMS AND DISPUTES BETWEEN CONTRACTOR AND OWNER

15.2.1 Claims by Contractor against Owner and by Owner against Contractor, including those alleging an error or omission by the Design Consultant shall be subject to the process set forth in this Section 15.2. Such Claims shall be referred initially to the Design Consultant for a decision. A final decision by the Design Consultant, or the failure of the Design Consultant to issue a final decision shall be required as a condition precedent to mediation or litigation of all such Claims arising prior to the date final payment is due. The Design Consultant will initially decide disputes between Owner and Contractor.

15.2.2 The Design Consultant will review Claims by Contractor and Owner against each other and within twenty (20) days of the receipt of the written Claim and take one or more of the following actions:

- .1 Request additional supporting data from the claimant or a response with supporting data from the other party;
- .2 Reject the Claim in whole or in part;
- .3 Approve the Claim;
- .4 Suggest a compromise; or
- .5 Advise the parties that the Design Consultant is unable to resolve the Claim if the Design Consultant lacks sufficient information to evaluate the merits of the Claim or if the Design Consultant concludes that it would be inappropriate for the Design Consultant to resolve the Claim.

15.2.3 In evaluating Claims made under this Section 15.2, the Design Consultant may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who assist the Design Consultant in rendering a decision.

15.2.4 If the Design Consultant requests a party to provide a response to a Claim under this Section 15.2, or to furnish additional supporting data, such party shall respond, within ten (10) days after receipt of such request, and shall within such time period, either provide a response to the requested supporting data, advise the Design Consultant when the response or supporting data will be furnished, or advise the Design Consultant that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Design Consultant will either reject or approve the Claim in whole or in part.

15.2.5 The Design Consultant will approve or reject Claims under this Section 15.2 by written decision, which shall state the reason thereof and which shall notify the parties of any change in the

Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Design Consultant under this Section 15.2 shall be final and binding on the parties but subject to mediation and litigation.

- 15.2.6 When a written decision of the Design Consultant under this Section 15.2 states that the decision is final but subject to mediation, then a demand for mediation of a Claim covered by such decision must be made within thirty (30) days after the date on which the party making the demand receives the final written decision. Any failure to demand mediation within said thirty (30) days' period shall result in the Design Consultant's decision becoming final and binding to all parties. Claims not resolved in mediation shall be subject to litigation if in accordance with the applicable statutes of limitation and repose.
- 15.2.7 Upon receipt of a Claim under Section 15.2 against the Contractor or at any time thereafter, the Design Consultant or the Owner may, but is not obligated to, notify the Surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Design Consultant or the Owner may, but are not obligated to, notify the Surety and request the Surety's assistance in resolving the controversy.
- 15.2.8 If the Design Consultant deems that a Claim under this Section 15.2 is valid, the Design Consultant shall require all parties to the dispute to share the cost of the Design Consultant's review equitably. If the Design Consultant deems that a Claim under this Section 15.2 is invalid, the Design Consultant shall require the complaining party to bear the cost of the Design Consultant's review. In any event, the Design Consultant may require the complaining party to submit a deposit equivalent to the Design Consultant's hourly rate multiplied by the amount of time the Design Consultant estimates, in the Design Consultant sole discretion, that will be necessary to review the Claim. The Design Consultant shall return any unused portion of this initial deposit to the complaining party following the Design Consultant's completion of the Design Consultant's review of the Claim. Nothing in these procedures shall entitle the Design Consultant to compensation for additional services from the Owner that is not authorized pursuant to the terms and conditions of the Agreement for Design Consultant Services.

15.3 TIME LIMITS ON CLAIMS

- 15.3.1 Unless a shorter time is provided in the Contract Documents, Claims by Contractor or any party except Owner must be initiated within twenty (20) days after occurrence of the event giving rise to such Claim or within twenty (20) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims against the Owner shall be initiated in strict conformance with the Contract Documents. Nothing in these procedures shall extend the period within or the manner in which Claims against the Owner must be submitted. Claims must be initiated by written Notice to the Owner and written notice to the other party and to the Design Consultant. Any Claim against the Owner that is not initiated within the applicable time period is waived. Claims by Owner may be made at any time within the applicable statute of limitations and repose.

15.4 CONTINUING CONTRACT PERFORMANCE

- 15.4.1 Pending final resolution of a Claim, the Contractor shall proceed diligently with the performance of the Contract, unless instructed otherwise in writing by the Owner.

15.5 MEDIATION

- 15.5.1 As required by N.C.G.S 143-128 (f1), any Claim as defined herein, which exceeds fifteen thousand dollars(\$15,000.00), and which concerns a party involved in the Project, including the Owner, Contractor, Design Consultant, any construction manager, Separate Contractors, or first and lower tier Subcontractors and which arise out of the Contract or the construction process,

except those waived Claims shall, be subject to mediation as a condition precedent to the institution of legal proceedings by any party, except that any party may institute legal proceedings or perfect any mechanic's or materialmen's lien in order to meet any applicable statute of limitations or similar deadline prior to engaging in mediation.

- 15.5.2 The parties shall endeavor to resolve their Claims under this Section 15.5 by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the rules established by the Owner.
- 15.5.3 The parties shall share cost of the mediation equally except that if the Owner is a party to the dispute, the Owner shall pay at least one third of the cost of the mediation.
- 15.5.4 The mediation shall be held in a place where the Project is located, unless another location is mutually agreed upon.
- 15.5.5 Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

ARTICLE 16

FEDERALLY FUNDED PROJECTS

The Contractor is notified that this project will be financed with federal funds. The Contractor shall ensure that all subcontracts and other contracts for goods and services for this project have the below provisions of this section their contracts. Contractor agrees to comply with the following provisions. Failure to comply with any and all provisions herein may be cause for the Owner to issue a cancellation notice to the Contractor.

16.1 REMEDIES FOR BREACH.

The Owner reserves all rights and privileges under the applicable laws and regulations with respect to this Agreement in the event of breach of contract by either party.

16.2 TERMINATION FOR CAUSE AND FOR CONVENIENCE BY OWNER.

The Owner reserves the right to immediately terminate this Agreement in the event of a breach or default of the agreement by Contractor, in the event Contractor fails to: (1) meet schedules, deadlines, and/or delivery dates within the time specified by this Agreement and/or an IPPA; (2) make any payments owed; or (3) otherwise perform in accordance with the Agreement and/or the IPPA. The Owner also reserves the right to terminate the Agreement immediately, with written notice to Contractor, for convenience, if the Owner believes, in its sole discretion that it is in the best interest of the Owner to do so. The Contractor will be compensated for work performed and accepted and goods accepted by the Owner as of the termination date if the Agreement is terminated for convenience of the Owner. The award of this Agreement is not exclusive and the Owner reserves the right to purchase goods and services from other vendors when it is in the best interest of the Owner.

16.3 EQUAL EMPLOYMENT OPPORTUNITY.

Except as otherwise provided under 41 CFR Part 60, when funds will be expended by the Owner pursuant to this Agreement that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3, Contractor certifies it will comply with the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment

Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”

16.4 DAVIS-BACON ACT, AS AMENDED (40 U.S.C. 3141-3148).

During the term of this Agreement, including any IPPAs issued pursuant to this Agreement, the Contractor certifies it will be in compliance with all applicable Davis-Bacon Act provisions. In accordance with the statute, Contractor shall pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, the Contractor shall pay wages not less than once a week, unless employees voluntarily agree to a different schedule. The Owner will report all suspected or reported violations to the Federal awarding agency. Contractor certifies it will comply with the Copeland “Anti-Kickback” Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each vendor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The Owner will report all suspected or reported violations to the Federal awarding agency.

16.5 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (40 U.S.C. 3701-3708).

The Contractor certifies that during the term of an award for all contracts in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor will be in compliance with all applicable provisions of the Contract Work Hours and Safety Standards Act. Under 40 U.S.C. 3702 of the Act, each vendor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

16.6 RIGHTS TO INVENTIONS MADE UNDER A CONTRACT OR AGREEMENT.

If the Federal award meets the definition of “funding agreement” under 37 CFR §401.2 (a) and Contractor wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” Contractor agrees to comply with the requirements of 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.

16.7 CLEAN AIR ACT (42 U.S.C. 7401-7671Q.) AND THE FEDERAL WATER POLLUTION CONTROL ACT (33 U.S.C. 1251-1387) COMPLIANCE.

The Contractor certifies that during the term of an award for all contracts by the Owner associated with this Agreement in excess of \$150,000, the Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251- 1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

16.8 DEBARMENT AND SUSPENSION.

Contractor certifies that during the term of an award for all contracts by the Owner associated with this Agreement, the Contractor certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation by any federal department or agency.

16.9 COMPLIANCE WITH BYRD ANTI-LOBBYING AMENDMENT (31 U.S.C. 1352).

When federal funds are expended by the Owner for a contract exceeding \$100,000, the Contractor certifies that during the term and after the awarded term of all contracts by the Owner associated with this Agreement, the Contractor certifies that it is in compliance with all applicable provisions of the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). The Contractor further certifies that:

- (1) No Federal appropriated funds have been paid or will be paid for on behalf of the Contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with the awarding of a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.
- (3) The Contractor shall require that the language of this certification be included in the award documents for all covered sub-awards exceeding \$100,000 in Federal funds at all appropriate tiers and that all subrecipients shall certify and disclose accordingly.

16.10 COMPLIANCE WITH SOLID WASTE DISPOSAL ACT.

In the event the Agreement involves the purchase of more than \$10,000 in items designed by guidelines of the Environmental Protection Agency at 40 C.F.R. Part 247, Contractor agrees to comply with the requirements of section 6002 of the Solid Waste Disposal Act. In particular, the Contractor certifies that the percentage of recovered materials to be used in the performance of the Agreement will be at least the amount required by applicable specifications or other contractual requirements.

16.11 PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT.

As detailed in 2 CFR § 200.216, Contractor certifies that any equipment, services, or systems provided through this Agreement shall not use covered telecommunications equipment or services as a substantial or essential component of a system or as part of any system.

16.12 DOMESTIC PREFERENCE.

As detailed in 2 CFR § 200.322, as appropriate and to the extent consistent with law, Contractor certifies that, to the greatest extent practicable, the goods, products, or materials furnished through this award will be produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

16.13 RECORDS RETENTION REQUIREMENTS.

The Contractor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.334. The Contractor further certifies that Contractor will retain all records as required by 2 CFR § 200.334 for a period of three years after grantees or subgrantees submit final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed.

16.14 CERTIFICATION OF NON-COLLUSION STATEMENT.

Contractor certifies under penalty of perjury that its response to this procurement solicitation is in all respects bona fide, fair, and made without collusion or fraud with any person, joint venture, partnership, corporation or other business or legal entity.

16.15 PROHIBITION ON GIFTS.

Contractor certifies that it will comply with the prohibition against giving gifts, gratuities, favors or anything of monetary value to an officer, employee or agent of the School System. Contractor understands and agrees that violation of these standards will result in termination of the Agreement and may result in ineligibility for future contract awards.

END OF GENERAL CONDITIONS

SECTION 00 73 00
SUPPLEMENTAL CONDITIONS

GENERAL CONDITIONS

Document GC, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, constitutes the General Conditions of this Contract, and is hereinafter called "General Conditions." The General Conditions are further revised and supplemented by the provisions of these Supplementary Conditions. The General Conditions and the Supplementary Conditions are applicable to all of the Work under this contract and shall apply to the Contractor and all Subcontractors and Sub-subcontractors.

SUPPLEMENTS:

The following supplements modify, change, delete, or add to the General Conditions. Where any article of the General Conditions is modified or any paragraph deleted, subparagraph or clause thereof is modified, or deleted by these supplements, the unaltered provisions of such article, paragraph, subparagraph or clause shall remain in effect. If there is a discrepancy between the General Conditions and these Supplementary Conditions, the Supplementary Conditions shall control.

ARTICLE 1 - CONTRACT DOCUMENTS

ADD THE FOLLOWING TO 1.3.1:

- 1.3.1.1 The Contractor will be furnished with one electronic set drawings and specifications that can be used to reproduce hard copies as needed.

ARTICLE 4 - CONTRACTOR

ADD THE FOLLOWING TO PARAGRAPH 4.10

- 4.10.3 The superintendent shall not be designated as foreman or engage in the specific activities normally associated with the foreman's position. His duties are designated with the project administration of the Project.
- 4.10.4 The Contractor shall employ, and have approved by the Owner, a competent foreman who shall be in attendance at the Project site during the progress of the Work not less than eight (8) hours per day, five (5) days per week, unless the job is closed down due to conditions beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. The foreman shall direct the day-to-day construction operations of the Project and supervise the sub-contractors to the Contractor. He shall not be employed on any other project for or by Contractor or any other entity during the course of the Work.

ARTICLE 8 - TIME

ADD THE FOLLOWING TO PARAGRAPH 8.2:

- 8.2.4 The schedule below contains certain specific dates in addition to date of Notice to Proceed and Time for Completion. These dates shall be adhered to and are the last acceptable dates unless modified by mutual agreement between the Contractor and the Owner. All dates indicate midnight unless otherwise stipulated. The only exceptions to this schedule are defined in the

General Conditions and Supplementary Conditions under Paragraph 8.3 DELAYS AND EXTENSIONS OF TIME.

The bidder proposes and agrees to commence work on a date to be specified in a written Notice to Proceed, estimated to be on or about March 12, 2024. The bidder further proposes and agrees to return the Owner & Contractor Agreement within 10 days for receipt of said contract. The bidder agrees and shall be Substantially Complete with the work by August 7, 2024. The bidder also agrees to achieve Final Completion and completion of all Commissioning within 30 days from the date of Substantial Completion. The Contractor shall not be granted addition time due to its failure to return the executed contract and required attachments within 10 days.

- 8.2.4.1 The Owner reserves the right to withhold the issuance of Notice to Proceed by up to Ninety (90) days. For each day that Notice to Proceed is withheld pursuant to this Subparagraph, the dates established for Substantial Completion and Final Completion shall be adjusted. The contractor shall not be entitled to additional compensation if the owner withholds the issuance of Notice to Proceed pursuant to this Subparagraph.

ARTICLE 9 - PAYMENTS AND COMPLETION

ADD THE FOLLOWING TO PARAGRAPH 9.6:

- 9.6.3 Dispute resolution services by the Design Consultant shall be paid by the Contractor at the Engineer's current billing rates.
- 9.6.4 Additional services by the Design Consultant due to the Contractor's failure to achieve Substantial Completion by the specified date or time frame shall be paid by the Contractor to the Owner at the Engineer's current billing rates. The Design Consultant shall submit costs of all time expended past the contractual date of Substantial Completion attributable to the Owner and Contractor for compensation on a monthly basis.

ADD THE FOLLOWING TO PARAGRAPH 9.10:

- 9.10.1.1 Substantial Completion Liquidated Damages shall be the sum of Five hundred dollars (500.00) per calendar day, and this amount shall be assessed in accordance with Subparagraph 9.10.1 of the General Conditions.
- 9.10.2.1 Final Completion Liquidated Damages shall be the sum of Two hundred fifty dollars (\$250.00) per calendar day, and this amount shall be assessed in accordance with Subparagraph 9.10.2 of the General Conditions.

ARTICLE 15 – DISPUTE RESOLUTION

ADD THE FOLLOWING NEW PARAGRAPH 15.6:

- 15.6 The Owner's Dispute Resolution Policy required by N.C.G.S. § 143-128(f1) is contained in Policy 7517 (<https://boardpolicyonline.com/b=moore>). The Dispute Resolution Policy is also included in the bid and contract documents.

END OF SUPPLEMENTAL CONDITIONS

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Contract description.
 - 2. Work by Owner or others.
 - 3. Owner-furnished products.
 - 4. Contractor's use of site and premises.
- B. Specification Conventions:
 - 1. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall," or "shall be," or "shall comply with," depending on context, are included by inference where a colon (:) is used within sentences or phrases.
 - 2. The word "provide" where used on the drawings or in specifications shall mean to furnish to the project site, properly install, setup and adjust for safe and efficient operation.
 - 3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

1.3 CONTRACT DESCRIPTION

- A. Work of the Project includes construction of the project identified in the Contract Documents.
- B. Perform Work of Contract under contract with the Owner for:
 - 1. Stipulated Sum Contract.
- C. The Contract Documents require Work to be performed at the following Work Site.
 - 1. Work Site Name:
 - a. Pinckney Academy
- D. Coordinate Work with utilities of Owner, and utilities of public and private agencies.
- E. Permits: Acquire and furnish all necessary permits for the Work.
- F. Contract Work Includes:
 - 1. Work as indicated in the Project Manual, on Drawings and all other Contract Documents.
 - 2. Selective Demolition of Existing Construction.
 - 3. Removal of Existing equipment.
 - 4. Renovation work complying with EPA's Renovation, Repair, and Painting Program as related to lead-containing materials.

1.4 WORK BY OWNER OR OTHERS

- A. Coordinate Work with work provided by Owner to facilitate work sequencing and scheduling to include, but not limited to, Owner provided inspection services and utilities of Owner and public or private agencies.
- B. NIC (Not in Contract): Items noted NIC (Not in Contract), will be furnished and installed by Owner after substantial completion or prior to substantial completion when Work sequence requires or allows such coordination between Contractor and Owner.
- C. Asbestos Abatement work will be performed by a separate contractor under contract to Owner. Coordinate with Abatement Contractor for sequencing and execution of work as it relates to the access and removal of asbestos containing materials on the building interior and exterior. In particular coordinate demolition activities to provide access and to maintain weathertightness and security of the building after demolition activities have occurred and new building components of the building envelope are installed.

1.5 OWNER-FURNISHED PRODUCTS

- A. Toilet Accessories including:
 - 1. Toilet paper holders.
 - 2. Paper towel dispensers.
 - 3. Soap dispensers.
- B. Owner's Responsibilities:
 - 1. Owner's suppliers will coordinate to install accessories after all finishes are complete and the toilets have been final-cleaned. Owner will notify suppliers of schedule requirements

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Access to Work Area of Site: Limited to Contractors, Owner, Authorities Having Jurisdiction, Emergency Response Entities, Engineer, and Consultants.
- B. Tobacco and Related Products Restriction:
 - 1. Smoking is not permitted on the property.
 - 2. Use of any form of tobacco and related product is not permitted on the construction site or any school property.
- C. Electronic Smoking Devices Restriction: Use of electronic smoking and vapor devices are not permitted on the construction site or any school property.
- D. Firearms Restriction: Firearms are prohibited on the construction site. As minimum, signs indicating restriction are to be posted at entrances to construction site and at contractor's onsite office site trailer.
- E. Restriction Signage: As minimum, signs indicating all site restrictions are to be posted at entrances to construction site and at contractor's onsite office site trailer. Comply with other site signage requirements as may be indicated.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by Allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Allowance Types include the following:
 - 1. Stipulated Sum Allowances
 - 2. Quantity Allowances.
 - 3. Contingency Allowances.
- C. Related Requirements:
 - 1. Division 01 Section "Unit Prices" for requirements related to Unit Prices.
 - 2. Division 01 Section "Alternates" for requirements related to Alternates.
 - 3. Division 01 Section "Contract Modification Procedures".
 - 4. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspection.
 - 5. Divisions 03 through 33 Sections for items of work covered by allowances.

1.3 ALLOWANCES - CONTRACT SUM

- A. Include in the Contract Sum all Allowances stated in the Contract Documents.

1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Engineer of the date when final selection and purchase of each product and system described by an allowance must be completed to avoid delaying the Work.
- B. At Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the work.
- C. Purchase products and systems selected by Engineer from the designated supplier and perform allowance work requirements.

1.5 ACTION SUBMITTALS

- A. Submit proposals for allowance work requirements included in allowances. Refer to Section 01 26 00 - Contract Modification Procedures.
 - 1. Include product data (if applicable), shop drawing, and sample submittals for allowance items in same manner as for other portions of the Work.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices and delivery slips to show actual costs, and actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for services, and installation costs of allowance items that include installation as part of the allowance.

1.7 COORDINATION

- A. Contractor:
1. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.
 2. Include each allowance as separate line item in the Schedule of Values.
 3. Assist Engineer in selection of products, suppliers, and installers.
 4. Obtain suppliers' and installers' cost data. Submit lump sum cost proposals for the work to Engineer and offer recommendations. Refer to Section 01 26 00 - Contract Modifications: Proposal procedures.
 - a. Include itemized explanation and documentation of proposed costs.
 - b. Cost is to be based upon completing the work within the Contract Time.
 5. Owner written approval is required prior to allowance work and use of allowance funds.
 - a. Progress payments for allowance work are not to be requested until Owner has provided written approval of the Contractor's proposal for the allowance work.
 6. Upon Engineer's notification of Owner approval, execute purchase agreement with designated supplier and installer.
 7. Obtain and process shop drawings, product data, and samples.
 8. Provide for delivery and, upon delivery, promptly inspect products for completeness, damage, and defects. Submit claims for transportation damage to supplier and delivery service.
- B. Engineer:
1. Consult with Contractor regarding consideration and selection of products, suppliers, and installers.
 2. Consult with Owner to acquire Owner decisions and transmit decisions to Contractor.
 3. Prepare approval notification indicating the appropriate allowance and the amount authorized to be used with attached approved proposals and work descriptions. Distribute for authorization by Contractor and Owner.

1.8 UNUSED MATERIALS

- A. After allowance work has been completed and accepted, return unused materials purchased to supplier for credit to Owner and document the credit back to the allowance line item on the next Application for Payment.
1. If requested by Owner, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed by Owner.

1.9 CHANGES TO ALLOWANCES

- A. Remaining allowance amounts will be credited to Owner by Change Order at closeout of Contract.
1. Owner may choose to require credit for remaining amount, or portion thereof, prior to closeout of Contract.
- B. Change to an Allowance Amount:
1. In the event of a variance between an allowance amount and the approved actual cost, submit a Change Order proposal requesting a change in the Contract Sum.
 - a. Stipulated Sum Allowances: Change amount is to be the difference between the stipulated sum and the approved actual cost.
 - b. Quantity Allowances: Change amount is to be the actual quantity difference multiplied by the apportioned unit cost that was included in the Contract Sum.
 - 1) Exception: Contractor provided bid unit prices for Division 01 Section "Unit Prices" will be the multiplier for quantities greater or less than the allowance quantity when such corresponding work is indicated in "Unit Prices".
 - c. Contingency Allowances: Change amount is to be the difference between the allowance sum and the approved actual costs.
- C. Include itemized explanation and documentation to substantiate changes.

- D. No change to Contractor's indirect expense is permitted for selection of higher- or lower-cost materials or systems of the same scope and nature as originally indicated.
- E. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- F. Change in Allowance Scope:
 - 1. Submit documentation of a claim for change in scope of allowance work described in the Contract Documents.
 - 2. Do not include Contractor's or subcontractor's indirect expense in the Change Order proposal cost amount unless you have clearly documented that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

1.10 CONTINGENCY ALLOWANCES (CA)

- A. Included in Contingency Allowances:
 - 1. All costs to Contractor including purchase of materials and equipment, delivery to site, taxes, handling, unloading, storage, protection, services, installation and finishing, overhead, profit, bonding, insurance, payroll taxes, rental equipment, incidentals, and other expenses required to complete the installation.
- B. Schedule of Contingency Allowances indicated in Part 3 of this Section.

1.11 STIPULATED SUM ALLOWANCES (SSA)

- A. Included in Stipulated Sum Allowance:
 - 1. All costs to Contractor including purchase of materials and equipment, delivery to site, taxes, handling, unloading, storage, protection, services, installation and finishing, overhead, profit, bonding, insurance, payroll taxes, rental equipment, incidentals, and other expenses required to complete the installation.
- B. Schedule of Stipulated Sum Allowances indicated in Part 3 of this Section.

1.12 QUANTITY ALLOWANCES (QA)

- A. Included in Quantity Allowance:
 - 1. All costs to Contractor including purchase of materials and equipment, delivery to site, taxes, handling, unloading, storage, protection, services, installation and finishing, overhead, profit, bonding, insurance, payroll taxes, rental equipment, incidentals, and other expenses required to complete the installation.
- B. Schedule of Quantity Allowances indicated in Part 3 of this Section.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

- A. Allowance work requirements to be same as similar work type requirements indicated in the Contract Documents unless indicated otherwise.

3.2 SCHEDULE - CONTINGENCY ALLOWANCES (CA)

- A. **CA-1: General Contingency Allowance.**
 - 1. Allowance amount: **\$40,000.00.**
 - 2. Include the allowance amount for use as directed by Owner.
- B. **CA-2: Electric Service Contingency Allowance**
 - 1. Allowance amount: **\$25,000.00.**

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2. Include the allowance amount to pay for applicable power company fees for new electrical service.

3.3 SCHEDULE - STIPULATED SUM ALLOWANCES (SSA)

- A. None scheduled.

3.4 SCHEDULE – QUANTITY ALLOWANCES (QA)

- A. None Scheduled.

END OF SECTION

SECTION 01 22 00

UNIT PRICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Unit price requirements for use in preparing Bids.
 - 2. Measurement and payment criteria applicable to Work performed under a unit price payment method and associated Bid requirements.
 - 3. Defect assessment and non-payment for rejected Work.
 - 4. Schedule of Unit Prices.
- B. Related Requirements:
 - 1. Bidding Documents and Forms: Instructions for preparation of pricing for Unit Prices.
 - 2. Drawing and Specification requirements related to the work type indicate by the items listed in this Section under the Schedule of Unit Prices.

1.3 COSTS INCLUDED IN UNIT PRICES

- A. Unit Prices included on the Bid Form shall include full compensation per unit of Work including, but not limited to, all required labor, overhead, profit, products, tools, equipment, plant fees, excavation, disposal fees, loading, transportation, services, incidentals, erection, application, and installation of a unit of the Work.

1.4 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the bidding documents and forms are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.5 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification Sections complement the criteria of this Section. In the event of conflict, the requirements of the individual specification Section govern.
 - 1. Measurement for replacement fill of authorized excavated voids shall be based on volume of void to be filled with compacted fill.
 - 2. Measurement for fabric and sheet products installed horizontally, is not to include excess and/or overlaps.
 - 3. Measurement for other types of Work is indicated within the individual Unit Price requirement in the Schedule of Unit Prices at the end of this Section.
- B. Take all measurements and compute quantities. Maintain records.
 - 1. Measurements and quantities will be verified by a soils and materials engineer employed by the Owner.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Measurement Devices:
 - 1. Weigh Scales: Inspected, tested, and certified by the applicable State department within the past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle. Certified by the applicable State department within the past year.

3. Metering Devices: Inspected, tested, and certified by the applicable State department within the past year.
- E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- F. Measurement by Volume: Measured by cubic dimension using mean length, width, and height or thickness.
- G. Measurement by Area: Measured by square dimension using mean length and width or radius.
- H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.6 PAYMENT

- A. Payment for Work governed by unit prices will be made based on the actual measurements and quantities of Work that is incorporated into or made necessary by the Work.
- B. Maintain a daily log showing dates, location, and exact quantities of unit price work. Copies of logs and appropriate change order forms shall be submitted with each request for payment for unit price work
- C. Payment will not be made for any of the following:
 1. Products wasted or disposed of in a manner that is not acceptable.
 2. Products determined as unacceptable before or after placement.
 3. Products not completely unloaded from the transporting vehicle.
 4. Products placed beyond the lines and levels of the required Work.
 5. Products remaining on hand after completion of the Work.
 6. Loading, hauling, and disposing of rejected Products.

1.7 DEFECT ASSESSMENT

- A. Replace Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct remedies as follows:
 1. The defective Work will remain or be partially repaired to the instruction of the Owner, and at the discretion of the Owner, the unit price will be adjusted as follows:
 - a. Reduced to a new unit price.
 2. The authority of Owner to assess the defect, direct remedies, and establish adjustment in unit price and payment is final.
- C. The Contract, General Conditions of the Contract, Supplementary General Conditions, or individual specification Sections may modify these options or may identify a specific formula or percentage price reduction.

1.8 DOCUMENTATION

- A. Section 01 32 00 - Construction Progress Documentation: Reports.
- B. Maintain record of delivery tickets for replacement fill materials delivered to the jobsite. Indicate date, time, origin location, hauler, material description, quantities, and weight.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF UNIT PRICES

3.2 Provide unit prices for the following Work in compliance with the Contract Documents for similar Work and as directed by Architect.

1. Refer to "Costs Included in Unit Prices" article in this Section.
 2. Purpose:
 3. To adjust the contract sum if the Owner requires construction in addition to that indicated in the Contract Documents.
 4. To adjust the contract sum for approved variance in quantities indicated for the Quantity Allowances as indicated in Division 01 Section "Allowances".
- A. Unit Price No. 1: Add Exterior Service Receptacle.
1. Unit Price: Provide bid price per each to provide ground fault circuit interrupter protected device in surface mounted WP box with WP in use cover and wired with 100' of ½"C w/(2)#12, #12G (copper THHN/THHW copper conductors) connected to a local circuit or existing 20amp circuit breaker.
- B. Unit Price No. 2: Add 60 Amp circuit with Fused Disconnect.
1. Provide bid price per each to provide a 240V/3P/60A/N3R/60AFU heavy duty pad-lockable disconnect switch mounted to wall and wired with 100' of 1-1/4"C w/(4)#6, #10G (copper THHN conductors) connected to an existing overcurrent device.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Alternates.
 - 2. Schedule of Alternates.
- B. Related Requirements:
 - 1. Bidding Documents and Forms: Instructions for preparation of pricing for Alternates.
 - 2. Drawing and Specification requirements related to the work type indicate by the items listed in this Section under the Schedule of Alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, manufacturer, or installation methods described in the Contract Documents.
 - 1. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Agreement.
 - 2. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 3. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule of Alternates:
 - 1. Schedule of Alternates included in Part 3 of this Section.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1:** Provide Owner Preferred KMC brand BMS controls system integrated by Systems Contractors, Inc. of Greensboro.
1. This alternate is for the additional cost (if any) to use the Owner Preferred controls equipment for the BMS system and the Owner-Preferred vendor for integrating the BMS system Note that this alternate is for an Owner Preferred system integrator.
 2. Do not list the price for the BMS controls system for this alternate. The BMS controls system and integration by an integrator of the Bidders choice is to be included in the Base Bid.
 3. If the Bidder carries the price for the Owner-Preferred controls brand and integrator in his bid, then the price for this alternate would be \$-0-.

END OF SECTION

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 PROPOSAL REQUESTS

- A. Owner Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 15 days after receipt of Proposal Request, submit a quotation indicating the net cost and net time adjustments to the Contract Sum and the Contract Time necessary to execute the change. The terms "net cost" and "net time" as used herein shall mean the difference between the additions and deductions of all properly applied cost and time.
 - a. Document each quotation for change in net cost or net time with sufficient data to allow evaluation of quotation.
 - b. Include a list of quantities and prices of products and materials required or eliminated, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - c. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - d. Include costs of labor and supervision directly attributable to the change.
 - e. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.
 - 1. Include a statement outlining reasons for the proposed change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. The terms "net cost" and "net time" as used herein shall mean the difference between the additions and deductions of all properly applied cost and time.
 - a. Document each quotation for change in net cost or net time with sufficient data to allow evaluation of quotation.
 - b. Include a list of quantities and prices of products and materials required or eliminated, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - c. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- d. Include costs of labor and supervision directly attributable to the change.
- e. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- f. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.4 MINOR CHANGES IN THE WORK

- A. Engineer will issue to Contractor supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 Architect's Supplemental Instructions or similar form entitled "Engineer's Supplemental Instructions".

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents.
- B. Contractor is responsible for informing others in Contractor's employ, subcontractors, and suppliers of approved changes to the Work.
- C. Stipulated Sum Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Owner and Engineer.
- D. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs and quantities of units of work which are not pre-determined, execute Work under Construction Change Directive.
- E. Construction Change Directive: Engineer may issue directive, on AIA Form G714 Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining and change in Contract Sum or Contract Time. Promptly execute change.
- F. Execution of Change Orders: Engineer will issue Change Orders on AIA Document G701 for signatures by parties as provided in Conditions of the Contract.
- G. Correlation of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum.
 - 2. Promptly revise construction schedule to reflect changes in the work and its effect on other items of work affected by the changes, and resubmit.
 - 3. Promptly enter changes in Project Record Documents.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Engineer may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

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1. Construction Change Directive contains a description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of directed change, submit an itemized accounting and supporting data necessary to substantiate cost and time adjustments to the Contract. Approved changes to the Contract will be authorized by Change Order.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Administrative and procedural requirements.
 - 1. Schedule of Values.
 - 2. Applications for Payment.
- B. Related Requirements:
 - 1. Division 01 Section "Allowances" for procedural requirements governing the handling and processing of Allowances.
 - 2. Division 01 Section "Unit Prices" for administrative requirements governing the use of Unit Prices.
 - 3. Division 01 Section "Alternates" for administrative requirements governing the Alternates.
 - 4. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 5. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Contract Start Date: The date of Commencement of the Work as established by the provisions of the Contract.
- B. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values in duplicate to Engineer within fifteen (15) days after Contract Start Date.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Engineer.
 - c. Engineer's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 - b. Include the following costs as separate line items:
 - 1) Site mobilization.
 - 2) Bonds.
 - 3) Insurance.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
6. Divide each part of the Work into separate line items in the schedule of values that indicate the following for individual parts of the Work:
 - a. Cost of materials.
 - b. Cost of installation.
7. Allowances:
 - a. Provide a separate line item in the schedule of values for each allowance.
 - b. For unit cost allowances, show line item value as a product of the unit cost, multiplied by bid quantity. Use information indicated in the Contract Documents to determine bid quantities.
8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. For each application for payment period, add line items to the schedule of value indicating change orders approved after the previous period.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid by Owner.
- B. Payment Period: Submit at monthly intervals or as otherwise stipulated in the Agreement.
 1. Submit draft copy of Application for Payment seven (7) days prior to due date for review by Engineer.
- C. Application for Payment Forms:
 1. AIA Document G702, "Application and Certificate for Payment".
 2. AIA Document G703, "Continuation Sheet for G702".
 3. MWBE Appendix E "Payments to MWBE Sub Contractors" (See Section 00 43 39 Guidelines for Recruitment and Selection of Minority Businesses for Participation in Construction Contracts for the form).
 4. Other forms required at appropriate times include the following. Forms for the same purpose indicated here may be superseded by other forms if indicated otherwise in the Contract:
 - a. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims".
 - b. AIA Document G706A, "Contractor's Affidavit of Release of Liens".
 - c. AIA Document G707, "Consent of Surety to Final Payment".

- d. AIA Document G707A, "Consent of Surety to Reduction in or Partial Release of Retainage".
- D. Application Preparation: Complete every entry on form. Certification of Application to be by a person authorized to sign legal documents on behalf of Contractor. Certification to be Notarized. Engineer will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of approved Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Include retainage requirements indicated in the Contract Documents.
- E. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question.
- F. MWBE Appendix E: Include notarized MWBE Appendix E with each application. If no payments were made to MWBE subcontractors the form must still be submitted - enter "-0-" for each.
- G. Payroll Reports: Submit data for projects requiring compliance with or reporting for the following:
 - 1. Davis Bacon Act, as Amended.
 - 2. Government Grant funding programs.
- H. Stored Materials: Provisions for progress payment for stored materials are indicated in the General Conditions of the Contract. Such provisions are subject to modifications that may be indicated in the Owner/Contractor Agreement or Supplementary General Conditions. Additional provisions are as follows:
 - 1. Provide a summary report documenting stored materials indicating the following:
 - a. Differentiate between items stored on-site and items stored off-site.
 - b. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - c. Value of previously stored materials installed as part of the Work after date of previous Application for Payment and on or before date of current Application for Payment.
 - d. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
 - e. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 2. Materials Stored Off-Site: When approvals are granted by Owner and other required parties, approvals are to be acquired by Contractor in writing prior to inclusion in next Application for Payment and such written approvals are to be included with the Application for Payment. Payment requests are to match the written approvals. The written approvals are to include all supporting documentation that was submitted for review to gain approval. Such supporting documentation may include, but not be limited to, certificates of insurance, bonds, paid invoices and consent of surety to payment.
- I. Transmittal: Submit four signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
 - 2. Submit with transmittal letter as specified for Submittals in Section 01 33 00 - Submittal Procedures.
- J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from Contractor, subcontractors, sub-subcontractors, suppliers of materials

and equipment, and all performers of Work, labor or services for construction period covered by the previous application.

1. Include AIA Document G706A, "Contractor's Affidavit of Release of Liens" with supporting documentation referenced as attached thereto.
 2. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 3. When an application shows completion of an item, submit conditional final or full waivers.
 4. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 5. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
- K. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule requirements.
 4. Products list requirements.
 5. Schedule of unit prices.
 6. Submittal schedule requirements.
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
- L. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work certified as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- M. Final Payment Application: After completing all Project Work and Closeout Requirements, submit final Application for Payment with required releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final Documentation for Minority Business Enterprise (MWBE Appendix E).
 9. Final liquidated damages settlement statement.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. General Coordination Procedures.
 - 2. Coordination Drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project Meetings.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entities performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including Contractor's Project Manager, On-Site Superintendent, and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary tele-phone. Always maintain list as current.

1.4 GENERAL COORDINATION PROCEDURES

- A. Electronic Document Management Service (EDMS): Comply with Section 01 31 26 - Electronic Communication Protocols. Provide an internet-based EDMS for electronic construction management document control, processing, review actions, reporting, communications, and other project documentation.
- B. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.

3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Project meetings.
 6. Startup and adjustment of systems.
 7. Project closeout activities and requirements.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordination Meetings: In addition to other meetings specified in this Section, Contractor is to conduct coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- E. Coordinate work as to conceal pipes, ducts, electrical conduit and wiring within construction and in a manner as to not be seen. Exceptions are mechanical rooms and electrical rooms and as otherwise approved in writing by Engineer.
- F. Coordinate locations of fixtures, outlets, and electrical and data devices with finish elements.
- G. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.
- H. After Owner occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

3.2 COORDINATION DRAWINGS

- A. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.

3.3 REQUESTS FOR INFORMATION (RFIs)

- A. Requests for Information are to be submitted by the Contractor for Designer's action via the Contractor's Electronic Document Management Service (EDMS).

- B. Definition: An RFI is a request seeking one of the following:
 - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, assembly, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
 - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- C. Whenever timely and possible, request clarifications at the next appropriate project progress meeting, with response recorded in meeting minutes, rendering unnecessary the submittal of an RFI.
- D. Acceptable Uses for RFIs: Contractor good faith effort to determine resolution from Contract Documents.
 - 1. Prior to submitting an RFI, carefully study all Contract Documents to confirm that sufficient information for interpretation is not included in Contract Documents.
- E. Unacceptable Uses for RFIs: Engineer will return unacceptable RFIs without review action. Unacceptable RFIs include the following:
 - 1. Request for approval of submittals (see Section 01 33 00 - Submittal Procedures).
 - 2. Request for approval of substitutions (see Section 01 60 00 - Product Requirements).
 - 3. Request for approval of Contractor means and methods (Contractor's responsibility).
 - 4. Requests for coordination information already indicated in the Contract Documents.
 - 5. Changes in the Work requirements, Contract Time, or Contract Sum (see Section 01 26 00 - Contract Modification Procedures).
 - 6. Request from other entities controlled by Contractor. Do not forward requests which solely require internal coordination between Contractor its contract entities.
 - 7. Improper RFIs: Requests not prepared in conformance to requirements of this section, and/or missing key information required to render an actionable response.
 - 8. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Engineer, and any of its consultants, due to processing of such RFIs.
- F. Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. RFI Form: AIA Document G716 with supporting attachments; combined into single PDF format electronic file.
 - 2. Coordinate and submit RFIs in a prompt manner as to avoid delays in the Work. Failure to submit an RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
- G. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name and Engineer's Project Number.
 - 2. Date.
 - 3. Name of Contractor.
 - 4. Name of Engineer.
 - 5. RFI number, numbered sequentially.
 - 6. RFI subject.
 - 7. Specification Section number and title and related paragraphs, as appropriate.
 - 8. Drawing number and detail references, as appropriate.
 - 9. Field dimensions and conditions, as appropriate.
 - 10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 11. Contractor's certification signature attesting to Contractor's good faith effort to determine from the Contract Documents information requiring interpretation.

12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- H. Engineer's Action: Allow seven (7) working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. on a working day will be considered as received the following working day.
 1. Content of Engineer's response to RFIs will not constitute, in any manner, a directive or authorization to perform extra work or delay the project. If Contractor believes the Engineer's response is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Proposal (see Section 01 26 00 - Contract Modification Procedures).
 2. Engineer's action may include a request for additional information from Contractor, in which case Engineer's time for response will date from time of receipt of additional information.
- I. RFI Log: Maintain current status of RFI's via the Contractor provided Electronic Document Management Service (EDMS) if EDMS is required or utilized for the project. If EDMS is not utilized, a organized listing of currently open RFI's shall be furnished to Engineer whenever a new RFI is assigned, when the status of an existing RFI is updated or when an RFI is amended with supplemental information. Current RFI log shall be maintained on the job site, an electronic copy shall be furnished to Engineer, and a hard copy shall be made available at each project meeting.
- J. Promptly review Engineer's response action and provide direction to the affected parties.
 1. If an additional or corrected response is required, notify Engineer within seven (7) calendar days of the Engineer's response action, by submitting to Engineer an amended version of the original RFI, identified as specified above.

3.4 PROJECT MEETINGS - GENERAL

- A. Contractor is to schedule and conduct meetings and conferences at Project site unless otherwise indicated or agreed upon by Contractor, Owner and Engineer.
- B. Attendees: Inform participants and others involved, and individuals whose presence is required, of the date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
- C. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
- D. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to relevant parties, including Owner and Engineer, within three (3) days of the meeting.
- E. Project meetings include, but are not limited to, the following and are indicated with more detail further in this Section.
 1. Preconstruction Meeting.
 2. Site Mobilization Meeting.
 3. Progress Meetings.
 4. Pre-Installation Meetings.
 5. Closeout Meeting.

3.5 PRECONSTRUCTION MEETING

- A. Contractor is to schedule and conduct a Preconstruction Meeting before starting construction, at a time convenient to Owner and Engineer, but no later than fifteen (15) days after execution of the Agreement.
- B. Attendees: Participants are to be familiar with the project and authorized to conduct matters related to the Work and project. Attendees include representatives of the following:
 1. Owner and others that may be designated by Owner.

2. Engineer.
 3. Engineer's Consultants.
 4. Contractor Project Manager and On-Site Superintendent.
 5. Major Subcontractors.
 6. Major Suppliers.
 7. Commissioning Authority (if commissioning is required for project).
 8. Relevant Utility Providers.
 9. Relevant Regulatory Agencies Having Jurisdiction.
- C. Agenda: Discuss items of significance that could affect progress and quality of the Work, including the following:
1. Designation of key personnel and their duties.
 2. Identification of Contractor's Safety Officer.
 3. Lines of communications.
 4. Status of Owner-Contractor Agreement, Bonds and Insurance Certificates.
 5. Status of Building Permits.
 6. Distribution of the Contract Documents.
 7. Owner's occupancy requirements.
 8. Limits of construction areas and restrictions for environmentally protected areas.
 9. Restrictions regarding on-site presence of firearms and use of tobacco products.
 10. Working restrictions.
 11. Working hours.
 12. Tentative construction schedule, including Contract Start Date, Contract Milestones and Contract Completion Date.
 13. Procedures for processing field decisions and Change Orders.
 14. Procedures for RFIs.
 15. Procedures for testing and inspecting.
 16. Commissioning activities (if commissioning is required for project).
 17. Procedures for processing Applications for Payment.
 18. Submittal schedule and procedures.
 19. Critical work sequencing and long-lead items.
 20. Responsibility for temporary facilities and controls.
 21. Procedures for moisture and mold control.
 22. Construction waste management and recycling.
 23. Office, work, parking, staging and storage areas.
 24. Equipment deliveries and priorities.
 25. On-Site and Site Access Traffic Control.
 26. Protocol for emergency events and first aid.
 27. Security.
 28. Progress cleaning.
 29. Procedures for maintaining Contractor as-built drawings and specifications documentation.
 30. Project closeout and submission of closeout items and record documents.

3.6 SITE MOBILIZATION MEETING

- A. Contractor is to schedule and conduct a Site Mobilization Meeting before Contractor occupancy of site. If Owner and Contractor agree, meeting may be conducted jointly within the Preconstruction Meeting.
- B. Attendees: Participants are to be familiar with the project and authorized to conduct matters related to the Work and project. Attendees include representatives of the following:
1. Owner and others that may be designated by Owner.
 2. Engineer.
 3. Contractor Project Manager and On-Site Superintendent.
 4. Major Subcontractors.
 5. Commissioning Authority (if commissioning is required for project).
 6. Relevant Utility Providers, (if services required during mobilization).
 7. Relevant Regulatory Agencies Having Jurisdiction.

- C. Agenda: Discuss items of significance and including the following:
 - 1. Mobilization schedule.
 - 2. Use of premises by Owner and Contractor.
 - 3. Owner requirements.
 - 4. Site access.
 - 5. Erosion control including measures at site entrances.
 - 6. Construction facilities and controls.
 - 7. Temporary utilities.
 - 8. Survey and building layout.
 - 9. Security and housekeeping procedures.
 - 10. Procedures for testing.
 - 11. Procedures for maintaining Contractor as-built (record) drawings and specifications documentation.
 - 12. Requirements for start-up of equipment.
 - 13. Inspection and acceptance of equipment put into service during construction period.

3.7 PROGRESS MEETINGS

- A. Contractor is to schedule and conduct Progress Meetings throughout progress of the Work at regularly scheduled interval as follows:
 - 1. Once monthly.
- B. Attendees: Participants are to be familiar with the project and authorized to conduct matters related to the Work and project. Attendees include representatives of the following:
 - 1. Owner and others that may be designated by Owner.
 - 2. Engineer.
 - 3. Engineer's Consultants.
 - 4. Contractor's Project Manager and On-Site Superintendent.
 - 5. Other relevant parties involved or concerned with current Work progress, or involved in planning, coordination, or performance of future activities. Depending on scheduled activities and phase of Work types, such parties may include the following:
 - a. Major Subcontractors.
 - b. Major Suppliers.
 - c. Commissioning Authority (if commissioning is required for project).
 - d. Relevant Utility Providers.
 - e. Relevant Regulatory Agencies Having Jurisdiction.
- C. Agenda: Include topics for discussion as appropriate to status of Project.
 - 1. Review and correct or approve minutes of previous progress meeting.
 - 2. Review of Work progress.
 - a. Review pertinent videos/photographs of the Work.
 - b. Review construction schedule and completion.
 - c. Review corrective action planned to recover activities that are behind schedule.
 - d. Review planned progress during succeeding work period.
 - e. Coordination of projected progress.
 - 3. Review Owner provided work and items.
 - 4. Field observation reports.
 - 5. Status of corrections to deficient Work.
 - 6. Progress cleaning.
 - 7. Identification of problems that impede, or will impede, planned progress.
 - 8. Review status of submittals, requests for information, supplemental information, change proposals, change orders and pending claims/disputes.
 - 9. Maintenance of quality and work standards.
 - 10. Effect of proposed changes on construction schedule and coordination.
 - 11. Other contract related activities.

3.8 PRE-INSTALLATION MEETINGS

- A. Contractor is to schedule and conduct pre-installation meetings at project site prior to commencing Work of specific section. Work requiring pre-installation meeting is indicated in individual specification sections.
- B. Require attendance of parties directly affecting, or affected by, Work of specific section.
- C. Notify Owner and Engineer seven (7) days in advance of meeting date.
- D. Prepare agenda and conduct meeting:
 - 1. Review conditions for installation, preparation, and installation procedures.
 - 2. Review coordination with related and adjacent work.

3.9 CLOSEOUT MEETING

- A. Contractor is to schedule and conduct Project Closeout Meeting sufficiently advanced in time to prepare for requesting Substantial Completion Inspection.
- B. Attendees: Participants are to be familiar with the project and authorized to conduct matters related to the Work and project. Attendees include representatives of the following:
 - 1. Owner and others that may be designated by Owner.
 - 2. Engineer.
 - 3. Engineer's Consultants.
 - 4. Contractor Project Manager and On-Site Superintendent.
 - 5. Commissioning Authority (if commissioning is required for project).
 - 6. Others appropriate to closeout matters.
- C. Agenda: Items to review include, but are not limited to, the following:
 - 1. Review Section 01 77 00 - Closeout Procedures.
 - 2. Contractor's inspection of Work.
 - 3. Start-up of facilities and systems.
 - 4. Commissioning of Work and systems (if commissioning is required for project).
 - 5. Testing, adjusting, and balancing.
 - 6. System demonstration and training for Owner.
 - 7. Inspections by authorities having jurisdiction.
 - 8. Final surveys.
 - 9. Certificate of Occupancy from Authority Having Jurisdiction.
 - 10. Transfer of insurance responsibilities.
 - 11. Final cleaning.
 - 12. Closeout Submittals: Including, but not limited to, the following:
 - a. Project Record Documents.
 - b. Engineer's and Owner's disposition regrading approved physical samples.
 - c. Operating and Maintenance Manuals.
 - d. Warranties Manual.
 - e. Spare parts, special tools, operating, maintenance, and extra stock materials.
 - f. Keys.
 - g. Affidavits.
 - 13. Contractor preparation and distribution of Contractor's comprehensive punch list.
 - 14. Procedure to request Engineer inspection to determine date of Substantial Completion.
 - 15. Completion time for correcting deficiencies.
 - 16. Partial release of retainage.
 - 17. Preparation for final inspection.
 - 18. Final Application for Payment package components including affidavits and other require documents.
 - 19. Contractor's demobilization from Site.
 - 20. Maintenance.

END OF SECTION

SECTION 01 31 26
ELECTRONIC COMMUNICATION PROTOCOLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Electronic Document Management Service (EDMS).

1.3 DEFINITIONS

- A. EDMS: Electronic Document Management Service. EDMS is a system for electronic document management, control, and communications between the Contractor, Owner, Engineer, Engineer's consultants, and other project-related consultants approved by the Owner.
- B. PDF: Portable Document Format electronic file.
- C. Post: To transmit, upload or submit, data or documents to the EDMS for the purposes of review, review actions, record maintenance, logging, documentation, or other reasons for making the information available for remote access electronically.

1.4 SUBMITTALS

- A. Product Data: A minimum of five (5) days prior to the Preconstruction Meeting, submit data describing the EDMS. Include information regarding the navigation dashboard and various logs; notification features; procedures regarding upload of files, data, and review actions; log types; accessibility; archive download procedures and navigation functionality of the archive product; video illustrating basic features and usage; and user instruction manual.

1.5 CLOSEOUT SUBMITTALS

- A. After project acceptance and prior to final payment, submit a digital archive of the EDMS in accordance with requirements indicated in the DIGITAL ARCHIVE article in this Section.

1.6 COORDINATION

- A. At the Preconstruction Meeting, Contractor is to provide to Owner and Engineer a list of persons (users) Contractor will be providing access to and usage of the EDMS. List is to include user's name, company name, trade, email address, phone number and purpose for providing user access to EDMS. At minimum, this will include the Contractor's Project Manager, Superintendent(s) and other technical staff as required. These personnel shall have sufficient computer skills required to access, use, and troubleshoot the Contractor provided EDMS. Within the list, identify the Contractor's primary and secondary persons that users are to contact with questions and requests regarding the EDMS.
 - 1. Owner and Engineer will follow-up by providing Contractor with list of persons and consultants whose rolls will require access to and usage of the EDMS.

PART 2 PRODUCTS

2.1 ELECTRONIC DOCUMENT MANAGEMENT SERVICE (EDMS)

- A. "PROCORE" project management software application.

- B. Other project management software application that provides similar functionality.
 - 1. "Submittal Exchange" project management software application.
 - a. Requires alternative Drawings software application:
 - 1) "PlanGrid" drawing software application.

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT MANAGEMENT SERVICE (EDMS)

- A. The Contractor is to provide an Electronic Document Management Service (EDMS) for electronic construction management document control and communications between the Contractor, Owner, Engineer, and other project-related consultants. Unless otherwise designated by the Owner, the system will be maintained and owned by the Contractor, but operated collaboratively by the approved users. The EDMS that the Contractor provides must be approved by the Owner and Engineer. The Contractor is responsible for providing training for all approved users on how to use the EDMS at no additional costs to the Contract.
- B. The Contractor is to work collaboratively with the Engineer to set up and configure the EDMS system to set up project folders and access consistent with the Engineer's desired project management structure.
- C. The Contractor is responsible for the scanning, uploading, and logging of all electronic documents for the project.
- D. The Contractor is to provide sufficient personnel and equipment as required by its staff, subcontractors, suppliers, etc., to electronically submit and upload all necessary documents. This requirement includes personnel and equipment as required for field/jobsite execution.
- E. Project Management Software Application(s):
 - 1. Provide web-based EDMS for digital access to current project management information associated with the project, including, but not limited to, the following:
 - a. Submittals, Shop Drawings, and Samples.
 - b. Requests for Information.
 - c. Designer Supplemental Instructions.
 - d. Requests for Proposals.
 - e. Change Proposals.
 - f. Change Orders and Allowance Disbursement Documentation.
 - g. Meeting Reports.
 - h. Agency Reports.
 - i. Safety Logs.
 - j. Applications for Payment.
 - k. Monthly Weather Reports.
 - l. Deficiency Reports.
 - m. Designer Field Observation Reports.
 - n. Punch Lists.
 - o. Construction Documents.
 - p. Specifications.
 - q. Project Drawings.
 - r. Progress Schedules.
 - s. Project Photographs and Videos.
 - t. Other documentation as may be required by Engineer or Owner.
 - u. Other pertinent information associated with the Contract Documents.
 - v. Project Closeout Documents: Digital version (duplication) of required closeout documentation. This digital version archive does not relieve Contractor from providing all physical paper copy and manual submissions of closeout documentation indicated in the Contract Documents.
 - 2. The Contractor shall provide adequate programming expertise to organize and manage the EDMS program and contents.

- F. Documents posted are to be in PDF format and posted to EDMS that receives, logs and stores documents; provides for review processing and markup actions; electronic action stamping and signatures; and provides email notifications to responsible parties of posted documents available and requiring actions of responsible parties in the work-flow sequence.
1. Establish the types and categories of documentation (logs) that will be maintained on the web-based submittal service. Logs will include those indicated in this Section and other logs may be added as may be required by the Engineer or Owner.
 2. It is Contractor's responsibility to submit documents in PDF format.
 3. Contractor, Subcontractors, Suppliers, Owner, Engineer and Engineer's consultants are to be permitted to use the submittal service at no extra charge.
 4. Users of the project management software need an email address, internet access, and PDF review software that includes ability to mark-up and apply electronic action stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the submittal service provider.
 5. Submitted paper documents and emailed documents will not be reviewed unless Engineer has pre-approved, in writing, that select and specific submittals are to be submitted in a manner other than the EDMS. In such case of Engineer's written approval, the submitted documents and review results are still to be documented by Contractor in proper sequence within the EDMS as a matter of record.
 6. In the case of submissions of physical samples for product characteristic selections (e.g. colors, finishes and other characteristics), the items are to be physically shipped to the required recipient and, on the same day, Contractor is to upload a detailed description of the items and Contractor's review actions to the appropriate EDMS log for tracking and documentation purposes. Same-day EDMS logging and physical shipping is important for accuracy of tracking.
 7. Cost: The cost of the EDMS is to be paid by Contractor.
 - a. Contractor to pay all licensing and access fees, and distribute the required software for individual access to the following:
 - 1) Owner's Representatives (3 persons).
 - 2) Engineer (3 persons).
 - 3) Engineer's Structural Consultant (2 persons).
 - 4) Engineer's MEP/FP Consultant (4 persons).
 - 5) Engineer's Civil/Site Consultant (2 persons).
 - 6) Technology Consultant (2 persons).
 - 7) Engineer's Kitchen Equipment Consultant (1 person).
 - 8) Commissioning Authority (1 person).
 - 9) Others that may be required by Engineer or Owner (3 persons).
 - b. Contractor to acquire email addresses from proposed users for the purpose of establishing user access and usability.
 8. Training: Contractor to provide, schedule and participate in a two (2) hour, web-based training session for all users; further training is the responsibility of the individual user of the service.

3.2 DIGITAL ARCHIVE

- A. After Project Completion and prior to Final Payment, submit a digital archive of the historical documentation maintained on the EDMS to Owner and Engineer for their separate records.
1. Prior to digital archive download process:
 - a. Verify that logs are complete with all final documents and reviews having been uploaded.
 - b. Coordinate with the Engineer and Owner to verify that the documentation is ready for archiving process.
 - c. Do not terminate the Owner's and Engineer's user access to the EDMS until verification that both have received the fully operational digital archive.
 2. Coordinate with EDMS technical support to acquire comprehensive download of digital archive files, logs and navigational portal (dashboard).
 3. Submission Format: USB flash drive or other larger capacity digital archive storage device acceptable to Owner.

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- a. Label disk to include Owner name, project name, Owner's project number, Contractor's name and contact information, Engineer company name, EDMS company name and contact information, date and time the archive was downloaded, and list of logs included on disk.
 - b. Digital archive shall include a HTML file that provides a navigation portal (dashboard) that operates and appears the same as did the web-based service user portal. The navigation portal shall include a hyperlinked list of all logs for Activity Summary view and Full Log view and shall include hyperlinks to view the Project Team view and Event History view. The views for each of the logs shall include viewing windows, with hyperlinks to the documentation files, as it appeared in the respective log views on the web-based service.
 - c. Digital archive shall include all documentation, data, hyperlinks, and navigational portal to operate on a PC based system and without additional applications, software, or internet access.
4. Submit the digital archive to the Owner and Engineer and verify that each digital archive is operating properly prior to termination of the EDMS. Acquire written approval from Owner for termination of the EDMS.

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - a. Startup Construction Schedule.
 - b. Contractor's Construction Schedule.
 - c. Schedule Updating.
 - d. Daily Construction Reports.
 - e. Site Condition Reports.
- B. Related Requirements:
 - 1. Division 01 Section "Administrative Requirements".

1.3 DEFINITIONS

- A. Activity: A distinct part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Contract Start Date: The date of Commencement of the Work as established by the provisions of the Contract.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.4 INFORMATIONAL SUBMITTALS

- A. All schedules, reports, and submittals to be uploaded to the Contractor provided Electronic Documents Management Service (EDMS) at times indicated.
 - 1. Refer to Division 01 Sections "Administrative Requirements" and "Electronic Communication Protocols" regarding EDMS.

- B. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF electronic file.
 - 3. Color paper copy where hard copy indicated.
- C. Startup Construction Schedule.
 - 1. For scheduling that requires cost-loaded activities, the Startup Construction Schedule will not constitute approval of schedule of values for cost-loaded activities.
- D. Contractor's Construction Schedule: Submit as indicated in the CONSTRUCTION SCHEDULE article of this Section.
- E. Construction Schedule Updating Reports: Submit as indicated in the CONSTRUCTION SCHEDULE article of this Section.
- F. Daily Construction Reports: Maintain on site; to be submitted upon request from Owner or Architect.
- G. Site Condition Reports: Submit at time of discovery of differing site conditions.

1.5 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or consultant specializing in CPM scheduling with five (5) years minimum experience in scheduling construction work of complexity comparable to this Project and having use of computer facilities capable of delivering detailed graphic printout and electronic upload within 48 hours of request.
- B. Contractor's Administrative Personnel: Two years minimum experience in using and monitoring CPM schedules on comparable projects.

1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.7 SCHEDULING REQUIREMENTS

- A. Time Frame:
 - 1. Extend schedule from Contract Start Date to Date of Substantial Completion.
 - a. Further extend schedule to indicate activities required from Substantial Completion to Final Completion.
 - b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Network Analysis Diagrams: Prepare diagrams using activity-on-node (AON) format.
- C. Use "one day" as the unit of time for individual activities. Indicate nonworking days and holidays scheduled within the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Prepare a network analysis diagram to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include, without limitation, the following activities with estimated time durations:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.

- f. Utility interruptions.
 - g. Installation.
 - 1) Installation durations exceeding 21 days are to be divided into multiple activities as logical construction portions of installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 - 1) Provide sufficient duration for testing and certification of commissioning requirements to be completed prior to Substantial Completion.
 - j. Inspections by Authorities Having Jurisdiction.
 - k. Certificate of Occupancy.
 - l. Closeout Activities.
 - m. Preparation and submittal of closeout and record documents.
 - n. Substantial Completion Inspection.
 - o. Certification of Substantial Completion.
 - p. Completion of incomplete Work and deficiencies.
 - q. Final Inspection.
- 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start - total float". Identify critical activities. Prepare tabulated reports showing the following:
- 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediately preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in days.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with revising the schedule, prepare tabulated reports showing the following:
- 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in days.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 STARTUP CONSTRUCTION SCHEDULE

- A. Within ten (10) days of the Contract Start Date, Contractor is to prepare and submit Startup Construction Schedule, including network diagram. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
 - 1. Submit updated startup construction schedule with each Application for Payment.
 - 2. Submit number of opaque reproductions Contractor requires, plus two copies Architect will retain.

3.2 CONSTRUCTION SCHEDULE

- A. Prepare and submit Contractor's Construction Schedule, including a time-scaled CPM network analysis diagram for the Work.
- B. Within thirty (30) days of the Contract Start Date, prepare and submit a draft of proposed Contractor's Construction Schedule for review. Include written certification that major subcontractors have reviewed and accepted proposed schedule.
 - 1. Submit number of paper color reproductions Contractor requires, plus two copies Architect will retain.
- C. Within fifty (50) days of the Contract Start Date, prepare and submit the final Contractor's Construction Schedule including completed network analysis consisting of network diagrams and mathematical analysis. Include written certification that major subcontractors have reviewed and accepted proposed schedule.
 - 1. Submit number of paper color reproductions Contractor requires, plus two copies Architect will retain.
- D. Failure to include any work item required for performance of the Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's or Owner's review of the schedule.
- E. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
- F. Establish procedures for monitoring, recording progress and updating Contractor's Construction Schedule.
- G. Construction Schedule Updating Reports: At monthly intervals, update schedule to reflect actual construction progress and activities. Submit updated schedule one week before each project Progress Meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Submit updated schedule concurrently with the report of each such meeting and include updated schedule in submittal of each Application for Payment.
 - 2. As the Work progresses, indicate final completion percentage for each activity.
- H. Distribution:
 - 1. Submit approved schedule to parties requiring schedule information and to Owner, Architect, testing and inspecting agencies, and other parties identified by Owner.
 - 2. Post paper color copies in project meeting room(s) and temporary field offices.
 - 3. When revisions are made, submit updated schedules to the same parties and post in the same locations referenced above.
 - 4. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.3 REPORTS

- A. Maintain and submit as indicated in this Section.
- B. Daily Construction Reports: Prepare and maintain on site a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. Approximate count of personnel at Project site.
 - 3. Equipment at Project site.
 - 4. Material deliveries.
 - 5. High and low temperatures, general weather conditions and precipitation amounts.
 - 6. Accidents.
 - 7. Meetings and significant decisions.
 - 8. Unusual events.
 - 9. Stoppages, delays, shortages, and losses.
 - 10. Emergency procedures.
 - 11. Orders and requests of authorities having jurisdiction.
 - 12. Testing scheduled; indicate results and cancelations.
 - 13. Inspections scheduled; indicated results and cancelations.
 - 14. Change Orders received and implemented.
 - 15. Construction Change Directives received and implemented.
 - 16. Utility services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial completions and occupancies.
 - 19. Substantial Completion certification.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit as a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative, procedural, and other requirements that include:
 - 1. Submittal Schedule.
 - 2. Submittal Administrative Requirements.
 - 3. Submittal Procedures.
 - 4. Types of Submittals.
 - 5. Delegated Design Services.
- B. Related Requirements:
 - 1. Division 01 Section "Electronic Communication Protocols".
 - 2. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including project construction schedule.
 - 4. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 6. Division 01 Section "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. Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is for the Contractor to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals.
 - 1. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and one of the following written authorizations:
 - a. The Architect has given written approval to the specific deviation as a minor change in the Work.
 - b. A Change Order or Construction Change Directive has been issued authorizing the deviation.

2. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Architect's approval thereof.
- D. Contract Start Date: The date of Commencement of the Work as established by the provisions of the Contract.
- E. 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 can access files.
- F. Portable Document Format (PDF): An open standard file format used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL SCHEDULE

- A. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 1. Coordinate Submittal Schedule with list of subcontracts, the schedule of values, and construction schedule.
 2. Initial Submittal: Submit concurrently with submittal of the Startup Construction Schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the submittal of Contractor's Construction Schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor and/or supplier.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Progress Schedule construction activity description and number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with 01 31 26 - Electronic Communication Protocols regarding electronic submission requirements for submittals indicated in this Section.
- B. Transmit/post each submittal with Architect accepted form.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of 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.
 5. All submittals requiring color and finish selections will not receive Architect's review action until all such submittals (e.g. material, color, finishes samples and other related requested information) have been received by the Architect.
 - a. Architect will assemble final color board(s) for Owner's approval of exterior and interior materials and color schemes prior to Architect's issuance of review action to Contractor.
- D. Processing Time: Allow time for submittal review, including time for resubmittals. 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. Single Reviewer: Allow 15 days for each review of each submittal, and each resubmittal. 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. Sequential Reviewers: Allow 21 days for each review of each submittal, and each resubmittal when sequential review of submittals by Architect's consultants, Owner, or other parties is required.
 3. Submittals Requiring Color Selection: Coordinate and provide timely submission of all submittals requiring color selection for the project's exterior and interior. Architect's review of such submittal will not be completed until all such submittals are received. The purpose is to promote a fully coordinated color/finish scheme for the overall project. Where color selection charts are allowable for Initial Selection, such materials shall be manufacturer's original printed material.
 4. In submittal log, provide review action column for each required reviewer such as Architect's consultants and other parties. Position the Architect's consultant review action columns in the log prior to the Architect's review action column, reflecting the sequence of reviews.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed/bookmarked file incorporating submittal requirements of a single Specification Section and transmittal form 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 abbreviated project identifier; hyphen and Specification Section number; hyphen and two-digit sequential number; hyphen and two-digit resubmittal sequential number. (e.g. MBMS-013300-01-00).
 3. Apply Contractor review action stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work, Contract Documents, and the Submittal requirements.
 4. Provide means for insertion to permanently record review and approval markings of Contractor and action taken by Architect.
 5. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.

- i. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Related physical samples submitted directly.
 - m. Transmittal number, numbered consecutively.
 - n. Submittal and transmittal distribution record.
 - o. Other necessary identification.
 - p. Remarks.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations: Conspicuously mark deviations, including minor variations and limitations, from the Contract Documents to include an itemization number. On an attached separate sheet, prepared on Contractor's letterhead, record each deviation itemization number and provide an explanation for each deviation and its impact on the Work and the Contract Documents.
- H. 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.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval action stamp from Contractor and Architect.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- 1. Upload/post electronic submittals as PDF electronic files directly to the Contractor provided internet-based submittal service 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. 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.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- 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 for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. 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.
 - 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.
 - D. Samples: Submit actual physical Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects requiring electronic submittals, provide (upload) corresponding electronic version of the physical submittal that is transmitted to Architect. This purpose is to provide continuity and completeness of the electronic recording and tracking of project submittals. The electronic upload is to include digital image files of all materials and data (including copy of the transmittal) as was transmitted to Architect. Include digital images of the physical items submitted and the identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 5. Samples for Initial Selection: Submit manufacturer's color charts or samples consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected and retain one sample for record.
 - b. Finish Characteristics Options: Options include ranges of colors, textures, patterns, and other finish appearance characteristics. Contract sum is to include Architect or Owner selections from ranges indicated to be submitted.
 - 1) Full Range: Includes all finish characteristics available except Custom options. Full range includes Standard and Premium finish characteristics.
 - 2) Custom Options: All finish characteristics available and includes Custom finishes.
 6. Samples for Verification: Submit samples of the Architect's initial selection action for the Architect to make final selection action. Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in

manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: Partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned to Contractor.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- F. Comply with requirements indicated in the Contract Documents regarding the following:
 1. Coordination Drawing Submittals.
 2. Contractor's Construction Schedule.
 3. Application for Payment and Schedule of Values.
 4. Test and Inspection Reports and Schedule of Tests and Inspections Submittals.
 5. Closeout Submittals and Maintenance Material Submittals.
 6. Maintenance Data.
 7. LEED and/or Other Sustainable Design Submittals.
- G. 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.
- H. 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 AWS forms. Include names of firms and personnel certified.
- I. 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.
- J. 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.
- K. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- L. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- M. 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.
- N. Product Test Reports: Submit written reports indicating that 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.

- O. 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.
- 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.
- 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 written 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. 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.
- T. Other Submittal Requirements: Include requirements indicated in specific Sections.

2.2 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
 - 2. The responsible design professional shall be licensed to provide the related design services in the State in which the project is located.

PART 3 EXECUTION

3.1 REVIEW AND ACTION

- A. Contractor's Review:

1. 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. For submittals that are compliant with the contract requirements, mark with approval stamp before submitting to Architect.
 - a. If project is being constructed by Construction Manager delivery, contractors and subcontractors are to submit submittals to Construction Manager. Construction Manager is to complete its review approval prior to submitting to Architect.
 2. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 - General Requirements regarding project closeout and maintenance material submittals.
 3. 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 indicating and certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- B. Architect Review:
1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action. The Architect will review and approve, or take other appropriate action upon, submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the submittals shall not relieve the Contractor of compliance with the requirements of the Contract Documents. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
 2. Informational Submittals: Architect will review each submittal and will not return it; or, will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
 3. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Submittals that are not marked as approved by the Contractor are incomplete submittals.
 4. Submittals not required by the Contract Documents may be returned by the Architect without action.
 5. Architect requires all exterior and interior material color samples to be submitted prior to final approval of color choices on the project. Exterior color samples will be reviewed and approved separately from interior color samples. Contractor must review all color sample submittal format and requirements to avoid resubmittals. Delays due to the failure to procure and submit color samples is the responsibility of the Contractor.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to 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 quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Division 01 Section "Allowances" for testing and inspecting allowances.
 - 2. Divisions 03 through 33 Sections for specific test and inspection requirements.

1.3 REFERENCES

- A. Referenced Standards: For products or workmanship specified by reference to a document or documents not included in the Project Manual, comply with requirements of the standard, except when more rigid and/or stringent requirements are specified or are required by applicable codes. Such specified exceptions and applicable codes do not nullify requirement for compliance with other requirements within the referenced standard. Documents referred to are product or workmanship standards established by and published by Associations, Trades, Organizations, or other groups that establish consensus quality standards.
- B. Issuance Date of Reference Standards: Comply with reference standard by date of issue current on date of Contract Documents, except where specific date is established by applicable code. Issuance date is also known as edition date or version date.
 - 1. Reapproved and Reapproval Dates: Comply with all the changes, amendments, modifications, and other such requirements established as part of the reapproved Reference Standard.
- C. When specified reference standard conflicts with Contract Documents, request clarification from Architect before proceeding.
- D. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in reference standard documents.

1.4 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.

1.5 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum number (as indicated in individual specification sections) of previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 - 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- G. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- H. Source Quality Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- I. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

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

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality Control Plan: For quality assurance and quality control activities and responsibilities.
- B. Qualification Data: For Contractor's quality control personnel.
- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 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.

1.7 QUALITY CONTROL PLAN

- A. Contractor's Quality Control Plan: Submit quality control plan within 10 days of Notice to Proceed, and not less than five 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: Engage qualified full-time personnel trained and experienced in managing and executing quality assurance and quality control procedures similar in nature and extent to those required for Project.
 - 1. Project quality control manager shall not have other Project responsibilities.
- 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: In quality control plan, include 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 and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- 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 work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 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.
 - 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.
- 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.

1.9 TESTING AND INSPECTION SERVICES

- A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection unless noted otherwise.
- B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Owner or Architect.
 - 1. Laboratory: Authorized to operate at Project location.
 - 2. Laboratory Staff: Maintain full time registered Engineer on staff to review services.
 - 3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

- C. Testing, inspections, and source quality control may occur on or off project site. Perform off-site testing as required by Owner or Architect.
- D. Reports will be submitted by independent firm to Owner, Contractor and Architect in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents. Also, independent firm will submit reports to Authorities Having Jurisdiction (AHJ) when required by AHJ's.
 - 1. Submit final report indicating correction of Work previously reported as non-compliant.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Architect and independent firm 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and test required for Contractor's use.
- F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements on Contract Documents.
- G. Contractor is to monitor costs incurred for testing and inspections services by the Owner's hired third-party entity(s). When project Work is 75 percent complete, provide written notification to Owner and Architect indicating the following:
 - 1. Percentage of project Work completed.
 - 2. Total amount Owner has incurred for testing and inspection services to date.
 - 3. List of additional testing and inspections Contractor expects to be required, along with estimated costs, for completion of the project Work.
- H. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Owner or Architect. Payment for re-testing or re-inspections will be charged to Contractor by deducting testing charges, and other costs directly related to re-testing or re-inspection, from Contractor's Contract Sum/Price.
- I. Agency Responsibilities:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Owner, Architect and Contractor of observed irregularities or non-conformance of Work products.
 - 6. Perform additional tests required by Owner or Architect.
 - 7. Attend preconstruction meetings and progress meetings.
- J. Agency Reports: After each test or inspection, promptly submit reports by way of electronic or hard-copy transmission to Owner, Contractor and Architect. Also, submit reports to Authorities Having Jurisdiction (AHJ's) when required by AHJ's. Reports are to include the following:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product, specifications section and other related Contract requirements.
 - 6. Location in Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of test.
 - 10. Conformance with Contract Documents.

11. When requested by Owner or Architect, provide a more detailed interpretation of test or inspection results.
- K. Limits On Testing Authority:
1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency or laboratory may not approve or accept any portion of the Work.
 3. Agency of laboratory may not assume duties of Contractor.
 4. Agency or laboratory has no authority to stop the Work.

1.10 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 in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections may 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 E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- 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 inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Labeling: Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
 1. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
 - a. Model number.
 - b. Serial number.
 - c. Performance characteristics.

- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
 2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven (7) days for initial review and each re-review of each mockup.
 6. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Where mockup has been accepted by Architect and is specified in product specification sections to be removed; remove mockup and clear area when directed to do so by Architect.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where explicitly indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform quality control services including, but not limited to, tests and inspections.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Where not explicitly indicated as Owner's responsibility, Contractor will engage a qualified testing agency to perform quality control services including, but not limited to, tests and inspections. Also, Contractor is to 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 not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 48 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.
- C. 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 Division 01 Section "Submittal Procedures."
- D. 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.

- E. Re-testing/Re-inspecting: 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.
- F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Owner, Architect, Commissioning Authority, 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.
- G. Tolerances: Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
 - 1. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
 - 2. Adjust products to appropriate dimensions; position before securing products in place.
- H. Quality Control of Work and Installation: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
 - 1. Comply with manufacturers' instructions, including each step, in sequence.
 - 2. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
 - 3. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
 - 4. Perform Work by persons qualified to produce required and specified quality.
 - 5. Verify field measurements prior to fabrication of products.
 - 6. Verify field measurements are as required prior to beginning installation of Work.
 - 7. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- I. 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.
- J. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare and maintain a record of tests and inspections that includes the following:
 - 1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.
 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 revisions as they occur. Provide access to test and inspection log for Owner's and 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. Cutting and patching requirements are to comply with the Contract Documents.
- 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.

3.3 SCHEDULE OF MOCKUPS

- A. Exterior Wall Mockup:
1. Provide mockup as indicated on Drawings. Mockup construction is to be separate from project final construction and is to be removed from project site after Contractor acquires approval for removal from Architect.
- B. Interior Room Mockup:
1. Provide mockup of the following room:
 - a. Room: Typical Classroom.
 2. Final schedule and progressive installation of work and finishes for approval to be coordinated between the Architect, Owner, and Contractor. It is not expected that the entire mockup be completed prior to review and approval. The intent is to allow for an incremental assessment of the intended level of workmanship and compliance prior to the overall project installation of the products and finishes as deemed necessary by the Architect.
 3. Mockup requirements are to be installed and approved by the Owner and Architect. Work completed in the room mockup shall be incorporated into the final work upon approval.
 4. Room Mockup Scope:
 - a. All work requirements within the room are to be installed as part of the mockup.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Temporary Utilities.
 - 2. Construction Facilities.
 - 3. Temporary Controls.
 - 4. Moisture and Mold Control.
 - 5. Operation, Termination and Removal.

1.3 GENERAL

- A. Use Charges:
 - 1. Installation, use charges, maintenance of and removal of temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities for construction operations without cost, including, but not limited to, Engineer, testing agencies, separate contractors and authorities having jurisdiction.
- B. Informational Submittals:
 - 1. Erosion and Sedimentation Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 - 2. Moisture Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - a. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - b. Indicate procedures for discarding water damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
 - c. Indicate sequencing of work that requires water, such as sprayed fire resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Dust and HVAC Control Plan: Submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - a. Locations of dust control partitions at each phase of work.
 - b. HVAC system isolation schematic drawing.
 - c. Location of proposed air-filtration system discharge.
 - d. Waste handling procedures.
 - e. Provide positive means to prevent air-borne dust and debris from entering the HVAC air distribution systems, louvers, ductwork, and pathways.
 - f. Other dust control measures.
- C. Quality Assurance:
 - 1. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

2. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- D. Temporary Use of Permanent Facilities: Architect and Owner must approve the use of permanent equipment for temporary uses. Approval does not designate acceptance of the system. Prior to operation of permanent equipment for temporary purposes, verify installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
1. In the case of permanent equipment installed by a separate contractor, and prior to requesting approval of Architect and Owner, engage separate contractor and acquire written approval for each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- E. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."
- F. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

1.4 TEMPORARY UTILITIES

- A. Temporary Electricity:
1. Provide power service required from utility source as needed for construction operation.
 2. Complement existing power service capacity and characteristics as required for construction operations.
 3. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.
 4. Permanent convenience receptacles may not be utilized during construction.
- B. Temporary Lighting For Construction Purposes:
1. Provide and maintain lighting for construction operations to achieve minimum lighting level of 2 watt/sq ft.
 2. Provide and maintain minimum 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
 3. Provide and maintain minimum 0.25 watt/sq ft HID lighting to interior work areas after dark for security purposes.
 4. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.
 5. Maintain lighting and provide routine repairs.
 6. Permanent building lighting may be utilized during construction.
- C. Temporary Heating:
1. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
 2. Enclose building prior to activating temporary heat in accordance with Enclosures article in this section.

3. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise for specific activities and products.
- D. Temporary Cooling:
1. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
 2. Enclose building prior to activating temporary cooling in accordance with Enclosures article in this section.
 3. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise for specific activities and products.
- E. Temporary Ventilation:
1. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Temporary Communication Services:
1. Internet Service and Wi-Fi Access: Provide and maintain, broadband internet service in field office as part of a functioning field office. Provide desktop computer with Microsoft operating system, Microsoft Office 365 software suite, modem, copier, and printer. Provide access and functionality for Owner, Architect, and Architect's consultants.
- G. Temporary Water Service:
1. Provide suitable quality water service as needed to maintain specified conditions for construction operations.
 2. Extend branch piping with outlets located so water is available by hoses with threaded connections.
- H. Temporary Sanitary Facilities:
1. Provide and maintain required facilities and enclosures. Use of New facility is not permitted. Provide facilities at time of project mobilization.

1.5 CONSTRUCTION FACILITIES

- A. Field Offices and Storage Buildings: Provide with the following minimum requirements.
1. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings and project construction.
 2. Locations: Locate structures minimum distance of 30 feet from existing and new structures.
 3. Construction: Structurally sound, secure, weather tight enclosures, and maintained during project construction.
 - a. Exterior Envelope:
 - 1) Thermal properties to be appropriate to occupancy and storage requirements.
 - 2) Weather resistant materials and finishes.
 4. Removal: At completion of Work, remove buildings, foundations, utility services, and debris. Construct and finish areas in accordance with the Contract Documents.
 - a. If areas are not indicated to receive new construction, restore areas to pre-construction condition.
 5. Relocating field office functions to a part of the new construction requires Owner's written agreement.
- B. Storage Buildings: Sized for project related material storage requirements, allowing for access and orderly provision for maintenance and inspection of products in accordance with Section 01 60 00 - Product Requirements.
1. Interior finishes to be as required to provide specified conditions for storage of products.
 2. Heating and ventilation to be as required to maintain products in accordance with Contract Documents.
 3. Lighting to be as required for maintenance and inspection of products.
 4. Maintain storage buildings and surrounding areas.

- C. Field Office: Weather tight, modular type buildings constructed with floors raised above ground, securely anchored to foundations, steps, landings, and ramps as required for occupant entry/egress.
 - 1. Install and make ready for occupancy within 15 days after Notice to Proceed.
 - 2. Overall Size: Minimum overall dimensions.
 - a. 64 x 24 feet.
 - 3. Spaces separate from each other as follows:
 - a. Office(s) for Contractor staff and functions.
 - b. Meeting room for project meetings:
 - 1) Tables and chairs to accommodate 16 persons.
 - 2) Minimum 55 inch LED television/monitor mounted on wall for viewing during meetings; equipped with multiple HDMI connections and wireless connectivity.
 - c. Designated space for As-Built drawings to be maintained for the duration of the construction.
 - d. Toilet facilities; fully functioning; continuously stocked with toilet paper, paper towels and hand cleansing products.
 - 4. Interior Finishes: Sheet type materials for walls and ceilings, pre-finished or painted; resilient flooring and base.
 - 5. Electrical outlets to be distributed throughout spaces for easy access.
 - 6. Lighting: Interior lighting to be 50 foot candles at desk top height; exterior lighting at entry/egress doors.
 - 7. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions of 76 degrees F in summer and 68 degrees F in winter.
 - 8. Furnishings to be sturdy construction; include hanging rack for drawings and drawings review table.
 - 9. Parking: Gravel surfaced parking and walk travel ways to office entries. Maintain walk travel ways free of debris, overgrowth, mud, water, and snow.
 - 10. Maintenance and Cleaning: Provide services as needed and as follows.
 - a. Weekly janitorial services for common areas, meeting room, and toilets; bi-weekly cleaning and maintenance for offices.
 - 11. Employee Residential Occupancy: Not allowed on Owner's property.
- D. Vehicular Access:
 - 1. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.
 - 2. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
 - 3. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.
 - 4. Locations as indicated on Drawings.
 - 5. Provide unimpeded access for emergency vehicles. Maintain 20 feet wide driveways with turning space between and around combustible materials.
 - 6. Provide and maintain access to fire hydrants free of obstructions.
 - 7. Provide means of removing mud from vehicle wheels before entering streets.
 - 8. Do not use existing on-site paved surfaces for construction traffic.
- E. Parking:
 - 1. Construct temporary gravel surface parking areas to accommodate construction personnel.
 - 2. When site space is not adequate, provide additional off-site parking.
 - 3. Use of existing parking facilities used by construction personnel is not permitted.
 - 4. Do not allow heavy vehicles or construction equipment in parking areas.
 - 5. Do not allow vehicle parking on existing pavement.
 - 6. Permanent Pavements and Parking Facilities:
 - a. Bases for permanent roads and parking areas may be used for construction traffic.

- b. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
 - c. Use of permanent parking structures is permitted.
 - 7. Maintenance:
 - a. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
 - b. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
 - 8. Removal, Repair:
 - a. Remove temporary materials and construction when permanent paving is usable.
 - b. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.
 - c. Repair permanent facilities damaged by use, to original condition.
 - 9. Mud from Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.
- F. Progress Cleaning and Waste Removal:
- 1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
 - 2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.
 - 3. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
 - 4. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.
 - 5. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- G. Project Identification:
- 1. Project Identification Sign:
 - a. One painted sign at each site of construction, design, and content shown on Drawings, location as designated by Architect and Owner.
 - 2. Project Informational Signs:
 - a. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering for legibility at 100 feet distance.
 - b. Provide sign at each field offices and storage buildings.
 - c. Provide state traffic agency directional traffic signs to direct traffic into and within site. Relocated as Work progress requires.
 - d. No other signs are allowed except those required by law.
 - 3. Sign Painter: Experienced as professional sign painter for minimum three years.
 - 4. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
 - 5. Sign Materials:
 - a. Structure and Framing: New, wood, structurally adequate.
 - b. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inches thick, painted both sides, standard large sizes to minimize joints.
 - c. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
 - d. Lettering: Exterior quality paint, colors as selected.
 - 6. Installation:
 - a. Install project identification sign within 15 days after Notice to Proceed.
 - b. Erect at designated location.
 - c. Erect supports and framing on secure foundation, rigidly braced, and framed to resist wind loadings.
 - d. Install sign surface plumb and level. Anchor securely.
 - e. Paint exposed surfaces of sign, supports, and framing.
 - 7. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

8. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.
- H. Traffic Regulation:
1. Provide temporary signs, signals, devices, flag persons, flares and lights as required by codes or local authorities.
 2. Signs, Signals and Devices:
 - a. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
 - b. Automatic Traffic Control Signals: If required by and as approved by local jurisdictions.
 - c. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.
 - d. Flag Person Equipment: As required by authority having jurisdiction.
 3. Flag Persons: Provide trained, equipped, and State DOT certified flag persons to regulate traffic when construction operations or traffic encroaches on public roadway.
 4. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
 5. Haul Routes:
 - a. Consult with authority having jurisdiction and establish public thoroughfares to be used for haul routes and site access.
 - b. Confine construction traffic to designated haul routes.
 - c. Provide traffic control as required by authority having jurisdiction and at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.
 6. Traffic Signs and Signals:
 - a. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
 - b. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
 - c. Relocate as Work progresses, to maintain effective traffic control.
 7. Removal:
 - a. Remove equipment and devices when no longer required.
 - b. Remove post settings and foundations entirely.
 - c. Repair damage caused by installation.

1.6 TEMPORARY CONTROLS

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 1. Comply with work restrictions specified in Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site for the duration of Project.

4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
 1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Maintain protected temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 1. For projects where smoking is not entirely prohibited throughout site:
 - a. Prohibit smoking within buildings under construction. Designate area on site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
 - b. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
 5. Portable Fire Extinguishers: Provide UL rated extinguishers appropriate to application needs, capacity, class and extinguishing agent as required by locations and classes of fire exposures. Comply with current requirements of NFPA, OSHA, and local authorities having jurisdiction.
 - a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable exit.
 - b. Provide minimum one fire extinguisher in each field office and storage building and as otherwise required in construction areas.
- K. Barriers:

1. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
 2. Provide protection for plants designated to remain. Replace damaged plants.
 3. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- L. Enclosures and Fencing:
1. Construction: Commercial grade chain link fence.
 2. Provide fence not less than 6 feet high where indicated on the Drawings between the area of Work and existing structures maintaining safe width for circulation.
- M. Security:
1. Security Program:
 - a. Protect Work from theft, vandalism, and unauthorized entry.
 - b. Initiate program at project mobilization.
 - c. Maintain program throughout construction period until Owner occupancy.
 2. Entry Control:
 - a. Restrict entrance of non-construction persons and vehicles into Project site.
 - b. Allow entrance only to authorized persons.
- N. Dust Control:
1. Execute Work by methods to minimize raising dust from construction operations.
 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
 3. Provide positive means to prevent air-borne dust and debris from entering HVAC air distribution systems, louvers, ductwork, and pathways.
- O. Noise Control:
1. Provide methods, means, and facilities to minimize noise produced by construction operations during school (or other facility type) operating hours.

1.7 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to air-borne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure, but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary HVAC systems to control humidity.

3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

1.8 OPERATION, TERMINATION, AND REMOVAL

- A. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary facilities and controls on a daily and 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Owner acceptance of project.
- C. Termination and Removal: Remove each temporary facility when no longer required, when it has been replaced by authorized use of a permanent facility, and no later than Owner acceptance of project. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Prior to inspection for Owner acceptance, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."
 3. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
 4. Remove temporary underground installations entirely. Fill, grade and finish as required by Contract Documents.
 5. Clean and repair damage caused by installation or use of temporary work.
 6. Restore existing conditions and construction to original condition.
 7. Restore new project work construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Product Delivery Requirements.
 - 2. Product Storage and Handling Requirements.
 - 3. Environmental Requirements
 - 4. Product Options.
 - 5. Product Substitution Requests.
 - 6. Equipment Electrical Characteristics and Components.
 - 7. Spare Parts and Maintenance Products.
 - 8. Substitution Request Form (attached at end of this Section).
- B. Related Requirements:
 - 1. Section 01 33 00 - Submittal Procedures.
 - 2. Section 01 40 00 - Quality Requirements: Product quality monitoring.

1.3 DEFINITIONS

- A. Basis of Design Product Specification: A specification in which a specific manufacturer or manufacturer's product is named and accompanied by the words "Basis of Design," and may include make or model number or other designation, to establish significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- B. Provide, Furnish, and Supply:
 - 1. Provide: To furnish and install.
 - 2. Furnish: To supply, deliver, unload, inspect for damage, and store.
 - 3. Supply: Same as Furnish.
- C. Install: To unpack, assemble, erect, apply, place, construct, finish, cure, protect, clean, start up, and make ready for use.
- D. Product: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. Product is material, machinery, components, equipment, fixtures, and systems forming the work result. Product is not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products are new and never before used.
 - 1. All products installed as part of the Work are to be new products, unless otherwise indicated. New products are products that have not been previously incorporated into another project or facility and has not been used. Products salvaged, recycled or re-used from other projects are not considered new products.
 - a. Salvaged, recycled or re-used products are permitted only when specifically indicated as such in the Contract Documents.
 - 2. Named Product: Items identified by manufacturer or manufacturer's product name, and may include 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.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process 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.

- E. Project Manual: The book-sized volume(s) that includes information about procurement requirements (if any), contracting requirements, and specifications for the Work.

1.4 PRODUCT DELIVERY REQUIREMENTS

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.5 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Ambient air temperature and humidity levels to be as required prior to, during and after installation of Work. Minimum requirements to be as recommended by product manufacturer unless requirements indicated in Work specification section are more stringent.

1.7 PRODUCT OPTIONS

- A. Products Specified by Reference Standards and/or by Description Only: Use product complying with the referenced standards and descriptions.
- B. Products Specified by Naming One or More Manufacturers: Use product of one of manufacturers named and complying with specifications.
 - 1. Substitutions allowed only if so stated in the list of manufacturers. Comply with Substitution Request requirements.

2. If Basis of Design manufacturer is indicated, use of Basis of Design product is preferred if other manufacturers are indicated; but, required if no other manufacturer is indicated.

1.8 PRODUCT SUBSTITUTION REQUESTS

- A. Comply with the requirements indicated in the General Conditions of the Contract, the Supplementary General Conditions and as indicated in this Article.
- B. Substitution Requests during the Bidding Period: Architect will consider Requests For Substitutions from Bidder only, and only up to fourteen (14) days before receipt of Bids.
- C. Substitution Requests during the Construction Period: Substitutions may be considered from Contractor only, and only when a product becomes unavailable through no fault of Contractor.
 1. During Construction Period, substitutions will not be considered by Architect or Owner when they are indicated or implied on Shop Drawings, Product Data or other submittal requirements, without separate written and certified Substitution Request.
- D. Substitution Request Submittal Procedure:
 1. Submit two copies of each Substitution Request to Architect for consideration. Use Substitution Request Form located at end of this Section. Limit each request to one proposed Substitution. The requirements for Substitution Request are indicated on the Substitution Request Form and as otherwise indicated in the Contract documents.
 2. During the Bidding Period (when permitted), Architect will notify Contractor of accepted substitutions by issuance of Addendum.
 3. During the Construction Period, Architect will notify Contractor of accepted substitutions in written form. After which, Contractor will provide submittal requirements indicated in the related specification Section.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
- B. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
- C. 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.
- D. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where products are accompanied by the term "as selected," Architect will make selection.
- F. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- G. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with Product Substitution Requests requirements in this Section for proposal of product.
- H. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from submitted samples" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from

manufacturer's product line that includes both standard and premium items; unless indicate otherwise within the Submittals article of specification Section.

2.2 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically permitted or required by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

2.3 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. At minimum, comply with specified requirements and reference standards.
- C. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- D. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- E. Where all other criteria are met, Contractor is to give preference to products that:
 - 1. If used on interior, have lower emissions.
 - 2. If wet-applied, have lower VOC content.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste.
 - 6. Are made of vegetable materials that are rapidly renewable.
 - 7. Are made of recycled materials.
 - 8. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
 - 9. Are Cradle-to-Cradle Certified.
 - 10. Have a published Environmental Product Declaration (EPD).
 - 11. Have a published Health Product Declaration (HPD).
 - 12. Have a published GreenScreen Chemical Hazard Analysis.
- F. Furnish interchangeable components from same manufacturer for components being replaced.

2.4 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.
- B. Cord and Plug: Furnish minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.5 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Coordinate with Owner to deliver and store Spare Parts and Maintenance Products.
- B. Required items are for Owner's future maintenance stock and are in addition to items required to install and complete the Work as indicated in the Drawings and Specifications.
- C. Required items are indicated in the following location(s):
 - 1. In individual Specification Sections in Divisions 01 through 49.
 - 2. In the Drawings.
- D. Items include, but are not limited to, tools, special tools, spare parts, maintenance products, extra materials, and similar items.

- E. Label, Package, and Deliver Items: Coordinate delivery times and locations with Owner for attendance and receiving.
 - 1. Package, label and deliver to Project site and place in location as directed by Owner.
 - a. Label items with legible print indicating manufacturer's name, model, series, and color identification.
 - 2. Receipts of Delivery: Prepare, prior to delivery, an itemized receipt for items required to be delivered, to be signed and dated by Contractor and Owner representatives at time of delivery. The receipt shall indicate the following information for each item delivered:
 - a. Project Identification.
 - b. Date and time of delivery.
 - c. Location of delivery.
 - d. Item Specification Section Number and Title.
 - e. Item Description.
 - f. Quantity/Size/Amount Required (as indicated in specifications).
 - g. Quantity/Size/Amount Delivered.
 - h. Signatures/dates certifying delivery by Contractor and receipt by Owner.
 - 3. Submit receipts as support documentation with the List Of Spare Parts and Maintenance Products.
- F. Closeout Submittal: Submit the List of Spare Parts and Maintenance Products as indicated in Section 01 78 39 - Project Record Documents, article Record Certifications Submittals.
 - 1. Prepare itemized list to include all items and quantities required. List to be columnized with columns indicating information indicated above for the Receipts of Delivery. Behind the list, insert the certified Receipts of Delivery, sorted by delivery dates.

PART 3 EXECUTION

Not Used.

SUBSTITUTION REQUEST FORM

Project: _____ Substitution Request Number: _____

_____ Architect's Project Number: _____

To: _____ From Company: _____

_____ Date: _____

Re: _____ Contract For: _____

Specification Title: _____ Section #: _____

Article/Paragraph _____

Reference: _____

Proposed Substitution: _____

Manufacturer: _____ Phone: _____

Manufacturer Address: _____

Trade Name: _____ Model #: _____

I have attached complete proposed Substitution data substantiating its compliance with the Contract Documents, including:

1. Reference to Article and Paragraph numbers in Specification Section.
2. Manufacturer's name and address, product, trade name, model or catalog number, performance and test data, and reference standards.
3. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, properties, performance, warranties, and other pertinent characteristics.
4. Certified test data to show compliance with performance characteristics specified.
5. Samples, color and finish options, and shop drawings as applicable or requested.
6. Details indicating changes required in other Work.
7. Cost data comparing proposed substitution with specified product, to include net cost difference.
8. Availability of maintenance service and source of replacement parts as applicable.
9. Other information as necessary to assist Architect's evaluation.

I, _____, certify that:

1. I have provided the information required above.
2. I have investigated proposed substitution within context of adjacent materials and construction, I and determined that it meets or exceeds quality and performance levels of specified product.
3. I will coordinate installation of accepted substitution and make approved changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. I waive claims for additional costs or time extension which may subsequently become apparent.
5. I will reimburse Owner and Architect for review or redesign services associated with re-approval requirements by authorities having jurisdiction and redesign services required otherwise.

Certified By: _____ Signature: _____ Date: _____

Contractor Company: _____ Phone: _____

Address: _____

Notary State _____ County of: _____

of _____
Subscribed and sworn to before me _____ day _____ in the
on this _____ of _____ year _____

by: _____

Notary Public _____ My Commission _____

Signature: _____ Expires: _____

Notary Public Printed _____

Name: _____

SECTION 01 73 00

EXECUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Examination.
 - 2. Preparation.
 - 3. Construction Layout.
 - 4. Field Engineering.
 - 5. Installation.
 - 6. Cutting and Patching.
 - 7. Coordination of Owner-Installed Products.
 - 8. Progress Cleaning.
 - 9. Starting and Adjusting.
 - 10. Protection of Installed Construction.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for limits on use of Project site.
 - 2. Division 01 Section "Submittal Procedures".
 - 3. Division 01 Section "Closeout Procedures".
 - 4. Division 01 Section "Project Record Documents" for submitting documentation.
 - 5. Division 07 Section "Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Existing In-Place Materials and Construction: Materials and construction that existed prior to the beginning of Work for this Project and is to remain without compromise after the Work of this Project.
- B. Cutting: Removal of existing in-place materials and construction necessary to permit installation or performance of the Work of this Project.
- C. Patching: Fitting and repair work required to restore existing in-place materials and construction to original conditions after installation of other work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General: Verify that existing conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Existing Site Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate

and verify the existence and location of underground utilities, and other construction affecting or affected by the Work.

1. Verify the locations and invert elevations at points of connection to sanitary sewer, storm sewer, water-service piping, underground electrical and communication services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving project site.
- C. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- D. Examine and verify specific conditions described in individual specification sections.
- E. Verify utility services are available, of correct characteristics, and in correct locations.
- F. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- G. Examine rough-in of mechanical and electrical systems to verify actual and compliant locations for connections before equipment and fixture installation.
- H. Verify compatibility between new Work to be apply and existing substrates upon which new Work is to be applied, including compatibility with existing finishes, sealers, or primers.
- I. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- J. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- K. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- L. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect.
- M. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.
- D. Verify that the required tools, equipment, utilities, products, and materials are available to the area of Work and that all items are in condition as to produce coordinated workflow and compliant Work.
- E. Separator for Dissimilar Materials: Separate dissimilar materials to prevent galvanic, chemical, and other corrosive action by applying a permanent separator material.
1. Separator Material Requirements:
 - a. Permanent type that will remain concealed in the applied location without running, staining, or migrating onto visible finish surfaces.
 - b. Material approved by manufacturers of materials being separated.
 2. Separator material may include the following if it complies with the indicated separator material requirements.

- a. Zinc molybdate alkyd coating, minimum dry film thickness of 15 mil.
 - b. Bituminous coating, minimum dry film thickness of 15 mil.
 - c. Self-adhering rubberized asphalt sheet.
 - d. Other permanent separator material complying with indicated requirements.
- F. Exterior Wood Without Shop Applied Finish: Where field-coated wood materials are indicated, back-prime all concealed surfaces with primer/sealer recommended by coating manufacturer for substrate materials.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a Professional Land Surveyor, registered in the State in which the project is located, to lay out the Work using accepted surveying practices.
- 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner and Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
- 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Final Property Survey:
1. Contractor is to engage the services of a Professional Land Surveyor to prepare a final property survey showing significant features and real property as constructed in accordance with the Contract Documents.
 2. The land surveyor is to be registered in the State in which the project is located.
 3. Survey is to indicate final completed property conditions and features.
 4. Survey is to include land surveyor signed certification that the principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - a. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 5. Contractor is to review the survey documentation to confirm that the survey indicates the Work is compliant with the requirements of the Contract Documents. Noncompliant Work is to be corrected by the Contractor and the correction(s) are to be updated in the survey and certified by surveyor in the survey documentation.
 - a. Contractor is to submit compliant final survey to Owner with Contractor's written letter certifying that the final survey indicates the Work to be compliant with the requirements of the Contract Documents.
 - b. Record the compliant final property survey with the appropriate authorities having jurisdiction as the official "Property Survey".
 - c. Record Documents: Include the following in the project closeout record documents.
 - 1) Copy of the surveyor certified, compliant final property survey.
 - 2) Copy of Contractor's compliance certification.
 - 3) Evidence of official recording of compliant final property survey with the appropriate authorities having jurisdiction.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for in-stalling anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Execute cutting, fitting, and patching to complete Work, and to:
1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and non-conforming Work.
 4. Remove samples of installed Work for testing.
 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- C. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- D. Patching Existing In-Place Materials: Use materials for patching identical to the existing in-place materials. For exposed surfaces, use materials that visually match the existing in-place adjacent surfaces.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual, functional and performance requirements of the existing in-place materials.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, and floor construction. Completely seal voids.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Division 07 of the Specifications, to full thickness of penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to Owner and Architect for decision or remedy.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's separate construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner provided work and separate contractors.
1. Construction Schedule: Incorporate services and work activities of Owner provided work and separate contractors into the project's Construction Schedule.

3.8 PROGRESS CLEANING

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

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 and other Sections related to "Commissioning".
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Testing and Balancing: Test and balance HVAC and controls system to operate at required levels of performance. Record and submit process and final testing and balancing results indicating compliance with project requirements.

- F. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide protection and maintain conditions that ensure installed Work is without damage or deterioration until Owner acceptance of project. Temporarily remove protective measures as required for required inspections, then reapply protective measures until Owner acceptance of project.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative, certification and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Procedures Prior to Substantial Completion.
 - 2. Substantial Completion Procedures.
 - 3. Final Completion Procedures.
 - 4. Final Cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Administrative Requirements".
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 6. Sections indicating specific operation and maintenance manual requirements for the Work in those Sections.
 - 7. Sections indicating specific closeout and special cleaning requirements for the Work in those Sections.
 - 8. Sections indicating Commissioning Requirements for verification and compilation of data into operation and maintenance manuals.

1.3 PROCEDURES PRIOR TO SUBSTANTIAL COMPLETION

- A. Complete the following a minimum of two (2) months prior to execution of Demonstration and Training for Owner.
 - 1. Operation and Maintenance Manuals: Refer to Section 01 78 23 - Operation and Maintenance Data for requirements.
 - a. Submit Initial O&M Manuals two (2) months prior to training for Owner.
- B. Complete the following a minimum of thirty (30) days prior to issuance of Contractor Request for Substantial Completion Inspection.
 - 1. Project Closeout Meeting: Refer to Section 01 30 00 - Administrative Requirements for requirements. Provide notice to indicated attendees a minimum of seven (7) days prior to meeting.
- C. Complete the following a minimum of ten (10) days prior to issuance of Contractor Request for Substantial Completion Inspection.
 - 1. Project Record Documents: Initial Submittals of the Record Documents.
 - a. Refer to Section 01 78 39 - Project Record Documents.
 - b. Complete all Section requirements and submit Initial Submittals indicated.
 - 2. Demonstration and Training: Initial Submittal of the Demonstration and Training Manual.
 - a. Refer to Section 01 79 00 - Demonstration and Training.
 - b. Complete all Section requirements and submit Initial Submittal indicated.

3. Acquire and prepare documentation required as part of the Contractor Request for Substantial Completion Inspection.
4. Submit LEED and other Sustainable Design Submittals required in Division 01 for sustainable design and reporting requirements.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Substantial Completion Inspection: Submit a written request to Architect for inspection for certification of date of Substantial Completion a minimum of thirty (30) days prior to date the work will be completed and ready for final inspection. Include Contractor's List of Incomplete Items (AKA Punch List) as further detailed in the LIST OF INCOMPLETE ITEMS article in this Section.
 1. On receipt and review of request, Architect will either proceed with scheduling inspection or notify Contractor of unfulfilled requirements that preclude certification of Substantial Completion.
 - a. In such case that the Architect provides notification to Contractor of unfulfilled requirements, Contractor will complete the noted and other such incomplete requirements that preclude certification of Substantial Completion. Whereafter, Contractor will issue another written request to Architect of inspection.
 2. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list of incomplete work or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - a. If, during inspection, the Architect determines certification cannot be issued, the Architect will discontinue further inspection and provided notification report to Contractor of such determination.
 - b. In such case that the Architect's inspection report determines that certification cannot be issued, complete the noted and all incomplete work and provide written request for reinspections to include a copy of the Architect's previous report of the failed inspection. Copy of report to include Contractor's certification and date and Contractor initials of completion by each deficient item completed in preparation for reinspections.
 - c. Results of completed inspection will form the basis of requirements for final completion.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 1. Submit final Certificate For Payment according to Division 01 Section "Payment Procedures."
 2. Contractor Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection report and list of items to be completed or corrected (punch list), indicating completion as follows:
 - a. Each item dated and initialed by Contractor's Superintendent as being inspected and complete.
 - b. Certification by Contractor's Project Manager that Punch List and all Work is complete.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Corrected closeout and project documentation that was previously deficient.
 5. Remaining closeout and project documentation not yet submitted.
 6. Submit Final Operation and Maintenance Manuals Submittal as indicated in Section 01 78 23 - Operation and Maintenance Data.
 7. Submit Final Project Record Documents Submittal as indicated in Section 01 78 39 - Project Record Documents.
 8. Submit Final Demonstration and Training Manual: Refer to Section 01 79 00 - Demonstration and Training.

- B. Final Completion Inspection: Submit a written request to Architect for final inspection to determine acceptance a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests.
 - 1. On receipt and review of request, Architect will either proceed with scheduling inspection or notify Contractor of unfulfilled requirements that preclude certification of final Certificate For Payment.
 - a. In such case that the Architect provides notification to Contractor of unfulfilled requirements, Contractor will complete the noted and other such incomplete requirements that preclude certification of final Certificate For Payment. Whereafter, Contractor will issue another written request to Architect of inspection.
 - 2. Architect will process the final Certificate For Payment after inspection or will notify Contractor of incomplete requirements that must be completed or corrected before certificate will be issued.
 - a. If, during inspection, the Architect determines certification cannot be issued, the Architect will discontinue further inspection and provided notification report to Contractor of such determination.
 - b. In such case that the Architect's inspection report determines that certification cannot be issued, complete the noted and all incomplete work and provide written request for reinspections to include a copy of the Architect's previous report of the failed inspection. Copy of report to include Contractor's certification and date and Contractor initials of completion by each deficient item completed in preparation for reinspections.
 - 1) Contractor's written request for reinspections to include an updated final Certificate For Payment and updated Contractor Certified List of Incomplete Items.

1.6 LIST OF INCOMPLETE ITEMS

- A. Time of Submittal: Contractor is to submit along with written request to Architect for inspection to determine Substantial Completion.
- B. Prepare and submit a comprehensive list of contract requirements and work to be completed and corrected (Contractor's Punch List), indicating the value of each item on the list and reasons why the Work is incomplete.
- C. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Also, include at the beginning of the list, incomplete contract requirements (administrative and otherwise) other than construction work.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Contractor's Certification signature and date (First page only).
 - f. Page number "of" Total pages.
 - 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect will return annotated file.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
- C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.

- D. Construction Waste Disposal:
 - 1. Remove construction waste from site and dispose of waste in accordance with regulatory codes, laws, ordinances and requirements of Authority Having Jurisdiction.
 - 2. Comply with waste disposal requirements to include, but not limited to Section 01 73 00 - Execution as related to Progress Cleaning.

3.2 REPAIR OF THE WORK

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

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Emergency, Operation and Maintenance Documentation Directory Manual.
 - 2. Emergency Manual - systems, subsystems and equipment.
 - 3. Operation Manual - systems, subsystems and equipment.
 - 4. Systems and Equipment Maintenance Manual - systems, subsystems and equipment.
 - 5. Product Maintenance Manual.
- B. Related Requirements:
 - 1. Sections indicating Closeout Procedures.
 - 2. Sections indicating Submittal Procedures for submitting copies of submittals for operation and maintenance manuals.
 - 3. Sections indicating Commissioning Requirements for verification and compilation of data into operation and maintenance manuals.
 - 4. Sections indicating specific operation and maintenance manual requirements for the Work in those Sections.
 - 5. Sections indicating Demonstration and Training requirements.

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

- A. Manuals Content: Content is to include pertinent data and data specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Where applicable, clarify and update content of manuals to correspond to revisions and field conditions.
- B. Manuals Format: Format to be as follows and as further detailed in this Section and the Contract Documents:
 - 1. Electronic Copies (PDF electronic file): Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory. Label each digital media disk indicating content name of manual; project identification name and numbers; and names and phone numbers of Owner and Contractor (and Construction Manager, if any).
 - b. Enable inserted reviewer comments on draft submittals.
 - 2. Paper Copies: Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manuals Submittal:
 - 1. Submit at time indicated in Section 01 77 00 - Closeout Procedures.

2. Submit two (2) Electronic Copies of Manuals as described in this Section.
 3. Submit one (1) Paper Copies of Manuals as described in this Section.
- D. Final Manuals Submittal:
1. Correct deficiencies from Initial Submittal.
 2. Submit at time indicated in Section 01 77 00 - Closeout Procedures.
 3. Submit two (2) Electronic Copies of Manuals as described in this Section.
 4. Submit three (3) Paper Copies of Manuals as described in this Section.

1.5 REQUIREMENTS FOR MANUALS

- A. Comply with these requirements for each Manual to be submitted for this Project. Requirements apply to both Paper Copy and Electronic Copy manual formats and for Initial and Final Manual submissions.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- C. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager (if any).
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority (if any).
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manual.
 10. Cross-reference to related systems in other manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. Main headings in table of contents to be Specification Section Number and Title. Inset below each main heading the description of the documentation provided and table of contents reference number in sequence as follows:
 - a. Number prefix to be Section Number (without spaces), followed by two-digit sequence number.
 - b. Examples: 044200-01; 044200-02; etc. 081416-01; 081416-02; etc.
 2. Divider tab insert numbers to match table of content reference numbers.
 3. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Electronic Copies of Manuals: Prepare manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Provide digitally linked bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite

- bookmarked files, then create composite manual, so that resulting book-marks reflect the system, subsystem, and equipment names in a readily navigated file tree.
Configure electronic manual to display bookmark panel on opening file.
3. Submittal Media: Electronic Digital Media Disk. Two copies of disk; labeled with identification information; inserted into sleeve at front of Paper Copies of Manuals.
- G. Paper Copies of Manuals: Prepare manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 x 11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine with printed title of manual type; project name and Owner project number(s); subject matter of contents; and name, address and telephone number of Contractor (and Construction Manager, if any). At the bottom of each binder front and spine, indicate "01 78 23 - O&M Data - Vol 1 of 4" (sequence Volume # by manual type).
 2. Dividers: Heavy-paper dividers with plastic insert tabs for insertion of table of contents reference number.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2 x 11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

PART 2 PRODUCTS

2.1 EMERGENCY, OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

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

2.2 EMERGENCY MANUAL

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.3 OPERATION MANUAL

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

4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as in-stalled.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semi-annual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and tele-phone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.5 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency, Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract

Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of emergency, operation or maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Contract Drawings.
 - 2. Record Shop Drawings.
 - 3. Record Specifications.
 - 4. Record Product Data and Samples.
 - 5. Record Project Warranties.
 - 6. Record Certifications.
- B. Related Requirements:
 - 1. Division 01 Section "Execution" for additional requirements including, but not limited to, Final Property Survey, and Starting and Adjusting equipment.
 - 2. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 03 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 DEFINITIONS

- A. Record Prints: Contractor maintained documents on which the Contractor records approved new information and revisions to the original information thereon. The recording process and result is often referred to as "marked-up" and "as-built" documents.

1.4 RECORDING AND MAINTENANCE

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

1.5 CLOSEOUT SUBMITTALS

- A. General Requirements:
 - 1. Reproductions of photocopy type and electronic scanned type:
 - a. Quality: Reproductions are to accurately depict the colors and information on the Contractor's Record Prints and other documents.
 - b. Size: Reproductions on paper media and as PDF electronic files are to be the same size as the Contractor's Record Prints and other documents.
 - 2. Prior to making submissions, ensure legible reproduction quality.
 - 3. For each submission, include all pages and sheets of the required documentation, whether or not changes and additional information were recorded thereon.

4. Initial Record Submittals:
 - a. Submittal time to be as indicated in Section 01 77 00 - Closeout Procedures.
5. Final Record Submittals:
 - a. Prior to submission, correct deficiencies observed since the Initial Submittal.
 - b. Submittal time to be as indicated in Section 01 77 00 - Closeout Procedures.
- B. Record Contract Drawings Submittal.
 1. Initial Submittal:
 - a. Paper Copy Format: Submit one photocopy of Record Prints.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
 2. Final Submittal:
 - a. Paper Copy Format: Submit final Record Prints and one photocopied sets.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
- C. Record Shop Drawings Submittal.
 1. Initial Submittal:
 - a. Paper Copy Format: Submit one photocopy of Record Prints.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
 2. Final Submittal:
 - a. Paper Copy Format: Submit final Record Prints and one photocopied sets.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
- D. Record Specifications Submittal.
 1. Initial Submittal:
 - a. Paper Copy Format: Submit one photocopy of Record Prints.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
 2. Final Submittal:
 - a. Paper Copy Format: Submit final Record Prints and one photocopied sets.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
- E. Record Product Data and Samples Submittal.
 1. Initial Submittal:
 - a. Paper Copy Format: Submit one photocopy of Record Prints.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
 2. Final Submittal:
 - a. Paper Copy Format: Submit final Record Prints and one photocopied sets.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
 3. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate Record Product Data as a component of manual and in formats as required for O&M manuals submission.
- F. Record Project Warranties Manual Submittal.
 1. Initial Submittal: Documents to be unexecuted with all information filled in except commencement/expiration dates and certification signatures and dates.
 - a. Paper Copy Format: Submit one photocopy of Manual.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
 2. Final Submittal:
 - a. Paper Copy Format: Submit final Manual and one photocopied sets.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
- G. Record Certifications Submittal.

1. Initial Submittal:
 - a. Paper Copy Format: Submit one photocopy of Certifications.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.
2. Final Submittal:
 - a. Paper Copy Format: Submit final Certifications and one photocopied sets.
 - b. Electronic Scanned Files Format: Submit two (2) on read-only digital media disk.

PART 2 PRODUCTS

2.1 RECORD PRINTS - CONTRACT DRAWINGS AND SHOP DRAWINGS

- A. Contractor is to maintain Record Prints as marked-up copies of original Contract Drawings and approved Shop Drawings in two (2) format types. Both formats to be maintained current and to be available for review by Owner and Architect throughout construction progress.
 1. Marked-Up Paper Copies Format.
 2. Electronic Marked-Up (annotated) PDF Format.
 - a. Annotations and associated data to be distinct and viewable by PDF software applications "Bluebeam REVU" and "Adobe Acrobat".
- B. Preparation: Promptly incorporate new and revised drawings, notes, and approved installation variations as modifications are issued. Contractor's personnel to be proficient at recording graphic and electronic information in both format types. During project closeout, both format types will be submitted as the Contractor's Record Prints for the Contract Drawings and the Shop Drawings.
 1. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for Contractor to apply to corresponding marked-up Record Prints.
 2. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 3. Accurately record information in an acceptable drawing technique.
 4. Record data daily after obtaining it.
 5. Record and check the markup before enclosing concealed installations.
 6. Cross-reference Record Prints to corresponding archive photographic documentation.
- C. Content: Types of items requiring marking include, but are not limited to, the following:
 1. Dimensional changes to Drawings.
 2. Revisions to details shown on Drawings.
 3. Depths of foundations below first floor.
 4. Locations and depths of underground utilities.
 5. Revisions to routing of piping and conduits.
 6. Revisions to electrical circuitry.
 7. Actual equipment locations.
 8. Duct size and routing.
 9. Locations of concealed internal utilities.
 10. Changes made by Change Order, Construction Change Directive and Field Orders.
 11. Changes made following Architect's written orders.
 12. Details not on the original Contract Drawings.
 13. Field records for variable and concealed conditions.
 14. Record information on the Work that is shown only schematically.
- D. Mark the Record Prints completely and accurately.
- E. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
- F. Mark important additional information that was either shown schematically or omitted from original Drawings.

- G. Incorporate new drawings received, including but not limited to, drawings received as part of Addenda, Construction Change Directives, Change Orders or Field Orders.
- H. When entire drawing sheet is replaced by a newly issued drawing, indicate with a large red "X" through the entire deleted sheet and note in red the identification of the new drawing sheet (e.g. "This Sheet Replaced By _____; Change Order # ____; Dated _____").
 - 1. Insert the new drawing sheet behind the deleted drawing and similarly identifying it (e.g. "This Sheet Added To Replace _____; Change Order # ____; Dated _____").
- I. Note Construction Change Directive numbers, Alternate numbers, Change Order numbers, Field Order numbers and similar identification, where applicable.

2.2 RECORD CONTRACT DRAWINGS SUBMITTALS

- A. Paper Copy Format:
 - 1. Bind each set of final marked-up Record Prints into volume sets in like manner as the original contract drawings.
 - 2. Annotate in red the following in a prominent and consistent location on each sheet (including sheets with no markups).
 - a. Designation "PROJECT RECORD CONTRACT DRAWINGS".
 - b. Name of Contractor.
 - c. Signature and Date.
- B. Electronic Scanned Files Format:
 - 1. Scan marked-up Record Prints as PDF electronic files.
 - 2. Each drawing sheet to be separate electronic file.
 - 3. Name each file with the sheet identification number and title, and add a 3-digit prefix that sequences the files in the order in which each sheet appeared in the original contract drawings (e.g. "043_A-603 Door and Frame Elevations.pdf").
 - 4. For added drawings, provide sequencing of file name in logical and contextual order similar to original contract drawings.
 - 5. Create digital hyperlinked bookmarks for each sheet that provides a single bookmarked navigation panel for accessing sheets by clicking bookmark (bookmarked table of contents).
 - 6. Identification Information:
 - a. Electronically annotate in red the following in a prominent and consistent location on cover sheet of each drawings set volume:
 - 1) Same information as indicated for Paper Copy Format.
 - 7. Electronically annotate in red the following in a prominent and consistent location on each page (including pages with no mark-ups):
 - a. Designation "PROJECT RECORD CONTRACT DRAWINGS".
 - 8. Label electronic digital media with same information as indicated for Paper Copy Format.

2.3 RECORD SHOP DRAWINGS SUBMITTALS

- A. Paper Copy Format:
 - 1. 3-Ring Binder Format: Drawing sets size 8-1/2 x 11 inches and 17 x 11 inches.
 - a. Bind in 3-ring hard binder. Binder sized to hold 8-1/2 x 11 inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers. For 17 x 11 inch sheets, fold each sheet at 8-1/2 inches and back fold at 12-3/4 inches to facilitate unfolding view of content.
 - b. Organize drawing sets in sequence by Specification Section Number.
 - c. Insert durable divider tab sheet at beginning of each set. Each extended tab to indicate Specification Number. Binder holes to be reinforced to prevent pull-out.
 - d. Insert identification information in cover sleeve and spine sleeve.
 - 1) Designation "PROJECT RECORD SHOP DRAWINGS".
 - 2) Project Name and Number.
 - 3) Name of Contractor.
 - 4) Signature and Date.

- e. First page in each binder is to be the overall record shop drawings directory.
 - 1) Provide overall directory titled "Directory for Project Record Shop Drawings". List each set of shop drawings sequenced by Specification Section Number - Title and Subtitle.
 - 2) Include a column indicating "3-Ring Binders" or "Bound Sets" for each item. The intent is to direct the viewer to the appropriate archived format location.
- 2. Bound Sets Format: Drawing sets larger than indicated for 3-Ring Binder Format.
 - a. Bind each set with durable paper cover sheet and folded heavy paper spine.
 - b. Include identification information on cover sheets:
 - 1) Same information as indicated for 3-Ring Binder Format.
 - 2) Add a copy of the overall record shop drawings directory.
- B. Electronic Scanned Files Format:
 - 1. Scan marked-up Record Prints as PDF electronic files.
 - 2. Each set of shop drawings to be separate electronic file with one or more sheets.
 - 3. Name each file with the corresponding Specification Section Number - Title_Subtitle. (e.g. "07 32 00 - Roofing_Insulation.pdf").
 - 4. Provide a file with overall directory titled "Directory for Project Record Shop Drawings", listing each set of shop drawings sequenced by Specification Section Number - Title_Subtitle. Name of directory file to be "00 00 00 - Directory for Project Record Shop Drawings.pdf". Title at top of directory page to be two lines. First line to indicate project name and number. Second line to be "Directory for Project Record Shop Drawings". Create digital hyperlinked bookmarks for each directory item that is linked to the corresponding shop drawing file.
 - 5. Identification Information:
 - a. Electronically annotate in red the following in a prominent and consistent location of each drawing sheet (including sheets with no mark-ups):
 - 1) Same information as indicated for 3-Ring Binder Format.
 - b. Label electronic digital media with same information as indicated for 3-Ring Binder Format.

2.4 RECORD PRINTS - SPECIFICATIONS (Project Manual)

- A. Maintain one set of marked-up paper copies of the original Specifications, incorporating new and revised drawings and notes as modifications are issued. Contractor's personnel to be proficient at recording graphic information in production of marked-up Record Prints.
- B. Preparation: Mark Record Prints to show the actual product installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for Contractor to apply to corresponding marked-up Record Prints.
 - 1. Give particular attention to information on concealed products and installation that would be difficult to identify and record later.
 - 2. Accurately record information in an acceptable and legible manner.
 - 3. Record data daily after obtaining it.
 - 4. Mark Table of Contents to include deletions, additions and other modification.
 - 5. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options, finishes and colors selected.
 - 6. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
- C. Mark the Record Prints completely and accurately.
- D. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

2.5 RECORD SPECIFICATIONS (Project Manual) SUBMITTALS

- A. Paper Copy Format:

1. Bind each set of marked-up Record Prints into volume sets in like manner as the original specifications.
 2. Include identification information on cover pages.
 - a. Designation "PROJECT RECORD SPECIFICATIONS".
 - b. Name of Contractor.
 - c. Signature and Date.
- B. Electronic Scanned Files Format:
1. Scan marked-up Record Prints as PDF electronic files.
 2. Each specification volume to be separate electronic file.
 3. Name each file "Record Specifications - Volume #.pdf".
 4. Create digital hyperlinked bookmarks for each specification section that matches marked-up Table of Contents.
 5. Identification Information:
 - a. Electronically annotate in red the following in a prominent and consistent location on cover page of each specifications volume:
 - 1) Same information as indicated for Paper Copy Format.
 - b. Electronically annotate in red the following in a prominent and consistent location on each page (including pages with no mark-ups):
 - 1) Designation "PROJECT RECORD SPECIFICATIONS".
 - c. Label electronic digital media with same information as indicated for Paper Copy Format.

2.6 RECORD PRINTS - PRODUCT DATA AND SAMPLES

- A. Maintain one set of marked-up paper copies of the approved Product Data and Samples, incorporating notes and modifications as approved. Contractor's personnel to be proficient at recording graphic information in production of marked-up Record Prints. Record Prints for Samples are paper copies (including photos as needed) of approved submitted Samples for the purpose of documenting approvals and recording changes. Physical samples are to be maintained by Contractor until disposition is confirmed by Contractor with Architect and Owner during required Closeout Meeting.
- B. Preparation: Mark Record Prints to show the actual product installation where installation varies substantially from that shown in approved Product Data and Sample submittals. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for Contractor to apply to corresponding marked-up Record Prints.
 1. Give particular attention to information on concealed products and installation that would be difficult to identify and record later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Accurately record information in an acceptable and legible manner.
 4. Record data daily after obtaining it.
- C. Mark the Record Prints completely and accurately.
- D. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

2.7 RECORD PRODUCT DATA AND SAMPLES SUBMITTALS

- A. Paper Copy Format:
 1. Bind in 3-ring hard binder. Binder sized to hold 8-1/2 x 11 inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers. For 17 x 11 inch sheets, fold each sheet at 8-1/2 inches and back fold at 12-3/4 inches to facilitate unfolding view of content. For oversized sheets, insert heavy-duty 3-ring type clear plastic pocket holders of inserting documents. Use multiple pocket holders in succession to avoid over-stuffing pocket holders.
 2. Organize product data and samples sets in sequence by Specification Section Number.

3. Insert durable divider tab sheet at beginning of each product data set. Each extended tab to indicate Specification Number. Binder holes to be reinforced to prevent pull-out.
 4. Insert identification information in cover sleeve and spine sleeve.
 - a. Designation "PROJECT RECORD PRODUCT DATA AND SAMPLES".
 - b. Project Name and Number.
 - c. Name of Contractor.
 - d. Signature and Date.
 5. First page in each binder to be overall directory titled "Directory for Project Record Product Data and Samples". List each set of product data and samples sequenced by Specification Section Number - Title_Subtitle. Coordinate directory items with divider tab sheets.
- B. Electronic Scanned Files Format:
1. Scan marked-up Record Prints as PDF electronic files.
 2. Each set of product data to be separate electronic file with one or more pages.
 3. Name each file with the corresponding Specification Section Number - Title_Subtitle. (e.g. "07 32 00 - Roofing - Insulation.pdf").
 4. Provide a file with overall directory titled "Directory for Project Record Product Data and Samples", listing each set of product data and samples sequenced by Specification Section Number - Title_Subtitle. Name of directory file to be "00 00 00 - Directory for Project Record Product Data and Samples.pdf". Title at top of directory page to be two lines. First line to indicate project name and number. Second line to be "Directory for Project Record Product Data and Samples". Create digital hyperlinked bookmarks for each directory item that is linked to the corresponding product data file.
 5. Identification Information:
 - a. Electronically annotate in red the following in a prominent and consistent location of each product data and samples page (including pages with no mark-ups):
 - 1) Same information as indicated for 3-Ring Binder Format.
 - b. Label electronic digital media with same information as indicated for 3-Ring Binder Format.

2.8 RECORD PROJECT WARRANTIES MANUAL

- A. Content: All required Warranties, Bonds, Maintenance Service Agreements, Certifications and similar documents.
- B. Paper Copy of Project Warranties Manual:
1. Organize documents into an orderly sequence based on the table of contents of Project Manual and Specification Section Numbers.
 2. Bind content in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 by 11 inch paper. Entire cover and spine to have integral clear plastic sleeve with open top for insertion of printed identification information.
 3. First page to be title page with identification information.
 4. Second page to be Table of Contents listing each document. Main headings in table of contents to be Specification Section Number and Title. Inset below each main heading the identification of the document and number in sequence as follows:
 - a. Number prefix to be Section Number (without spaces), followed by two-digit sequence number.
 - b. Examples: 044200-01; 044200-02; etc. 081416-01; 081416-02; etc.
 - c. Divider tab insert numbers to match table of content numbers.
 5. Provide heavy bond divider tabs with plastic-covered insert tabs for each separate document.
 6. In front of each document, insert a page with the following content:
 - a. Specification Number and Title.
 - b. Description of the product, equipment or construction element to which the document is related.
 - c. Name, address, and telephone number of Installer.
 7. Identify each binder on the front and spine with script as follows:

- a. PROJECT WARRANTIES MANUAL
 - b. Project name and ID number(s).
 - c. Contractor name, address, and telephone number.
8. For Final Submittal of Project Warranties Manual:
- a. Contractor is responsible for acquiring all information and signatures to affect full execution of documents, including from Owner when required, prior to final submittal.
 - b. All commencement dates are to be the Date of Project Acceptance, unless previously agreed upon otherwise in writing by Owner and Contractor. Such written agreement must be included with documentation.
 - c. Documents to be finalized original documents with all information filled in including commencement and expiration dates and certification signatures and dates by all parties.
- C. Electronic Copy of Project Warranties Manual:
1. PDF single file format on digital media disk; labeled with identification information.
 2. Content to be the same and organized in like manner as described for Paper Copy of Project Warranties Manual.
 3. Digital file to include bookmarked panel with digitally hyperlinked bookmarks duplicating the Table of Contents for digital navigation to contents.

2.9 RECORD CERTIFICATIONS SUBMITTALS

- A. Content: Documentation includes, but is not limited to, the following.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Health Department Inspection and Acceptance: Obtain written acceptance for areas of construction receiving or required to receive such inspection.
 3. Fire Marshal Inspection and Acceptance: Obtain written acceptance for areas of construction receiving or required to receive such inspection.
 4. Certificate of Insurance: For continuing coverage. Include documentation of changeover requirements.
 5. Changeover information related to Owner's occupancy, use, operation and maintenance of HVAC and other building systems, and other utilities. Include record of startup, testing and preventative maintenance performed for systems and equipment.
 6. Stairs and Ramps Compliance Certification. Refer to PART 3 - EXECUTION in this Section, article Stairs and Ramps Compliance Certification.
 7. Spare Parts and Maintenance Products Delivery Certification.
 8. Permanent Locks, Keys and Security: Certification signed/dated by both Contractor and Owner indicating completion of final changeover of permanent locks and delivery of keys and pertinent documentation to Owner.
 9. Record of inspection and walkthrough with Owner and local emergency responders.
 - a. Schedule and conduct inspection and walkthrough with Owner and local emergency responders. Provide record of the event.
 10. Record of termination and removal of temporary facilities.
 - a. Terminate and remove temporary facilities from Project site, including mockups, construction equipment, and similar elements.
 11. Record of completion of final cleaning requirements.
 - a. Complete final cleaning requirements, including touchup painting.
 12. Damage or Settlement Surveys.
 13. Final Property Survey.
 14. Testing and Balancing HVAC and Controls.
 15. For projects with LEED or other Sustainable Design requirements, submit LEED and other Sustainable Design Submittals required in Division 01 for sustainable design and reporting requirements.
 16. Miscellaneous Records: Includes submission of required project records, certifications and documentation associated with various construction activities or

indicated in Divisions 01 through 49 Sections that are not related to other named closeout submittal types.

- B. Paper Copy Format:
1. Bind in 3-ring hard binder. Binder sized to hold 8-1/2 x 11 inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers. For 17 x 11 inch sheets, fold each sheet at 8-1/2 inches and back fold at 12-3/4 inches to facilitate unfolding view of content.
 2. Provide multiple volume binders of quantity if data quantity dictates.
 3. Organize categories of documents by numbered logical sequence.
 4. Insert durable divider tab sheet at beginning of each document type. Extended tabs to be type for text insertion. Binder holes to be reinforced to prevent pull-out.
 5. Insert identification information in cover sleeve and spine sleeve.
 - a. Designation "PROJECT RECORD CERTIFICATIONS". Add volume # if more than one volume is needed.
 - b. Project Name and Number.
 - c. Name of Contractor.
 - d. Signature and Date.
 6. First page in each binder to be overall directory titled "Directory for Project Record Certifications". List each document type and sub-document sequentially with title and subtitle. Coordinate directory items with divider tab sheets.
- C. Electronic Scanned Files Format:
1. Scan documents as PDF electronic files.
 2. Each document to be separate electronic file with one or more pages.
 3. Name each file with the corresponding Specification Section Number - Title_Subtitle. (e.g. "31 31 16 - Termite Control - Application Records.pdf").
 4. Provide a file with overall directory titled "Directory for Project Record Certifications", listing document type sequenced by Specification Section Number - Title_Subtitle. Name of directory file to be "00 00 00 - Directory for Project Record Certifications.pdf". Title at top of directory page to be two lines. First line to indicate project name and number. Second line to be "Directory for Project Record Certifications". Create digital hyperlinked bookmarks for each directory item that is linked to the corresponding product data file.
 5. Identification Information: Label electronic digital media with same information as indicated for 3-Ring Binder Format.

PART 3 EXECUTION

3.1 STAIRS AND RAMPS COMPLIANCE CERTIFICATION

- A. Provide survey services to survey and certify that all interior and site constructed stairs and ramps are compliant with current applicable building codes and the Americans With Disabilities Act (ADA). Engage a professional registered surveyor or engineer to conduct survey, document survey data and certify that survey data indicates compliance as indicated.
1. Documentation data is to include drawing indicating locations of stairs and ramps surveyed with locations keyed to survey data.
 2. Surveyor or engineer to be qualified and experienced to provide the required service and is to be registered in the State in which project is located.
 3. Documentation data and compliance certification to be sealed by the professional registered surveyor or engineer.
- B. Correct construction found to be noncompliant with requirements indicated. When complete re-engage professional service provider to complete compliance certification.
- C. Closeout Submittal: Submit the sealed Stairs and Ramps Compliance Certification as indicated in this Section for Records Certifications Submittals.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes Contractor administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and Training Manual - Record of demonstration and training.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products.
 - 2. Attendance List: For each training module, provide list of Owner's intended participants.

1.4 CLOSEOUT SUBMITTALS

- A. General Requirements:
 - 1. Submit records and documentation of required demonstration and training program/modules and actual training events for Owner. Comply with the requirements indicated at end of this Section, article SUBMITTAL - DEMONSTRATION AND TRAINING MANUAL.
- B. Initial Demonstration And Training Manual Submittal:
 - 1. Paper Copy Format: Submit one photocopy of Manual.
 - 2. Electronic Copy Format: Submit two (2) on read-only digital media disk.
 - 3. Submittal time to be as indicated in Section 01 77 00 - Closeout Procedures.
- C. Final Demonstration And Training Manual Submittal:
 - 1. Paper Copy Format: Submit one final Manual and one photocopy Manual.
 - 2. Electronic Copy Format: Submit two (2) on read-only digital media disk.
 - 3. Submittal time to be as indicated in Section 01 77 00 - Closeout Procedures.

1.5 QUALITY ASSURANCE

- A. Pre-Instruction Meeting: A minimum of seven (7) days prior to commencing training sessions, conduct meeting at Project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss work items, locations and facilities requiring instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, facilities needed to avoid delays, and training attendees.
 - 3. Review required content of instruction for training modules.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
 - 5. Review training documentation requirements.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate with Owner to acquire list of Owner's intended participants for each training module.
- C. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- D. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.
- E. Do not submit instruction program until operation and maintenance data has been submitted, reviewed and approved by Architect. Refer to Section 01 78 23 - Operation and Maintenance Data.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each Training Module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor has delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.

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

3.2 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module information. Assemble training modules into a training manual to be provided to the training attendees.
- B. Prior to time established to begin instruction, set up instructional equipment at instruction location.

3.3 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.4 SUBMITTAL - DEMONSTRATION AND TRAINING MANUAL

- A. Content: Records and documentation of required demonstration and training programs/modules and actual training events for Owner.
- B. Paper Copy of Demonstration And Training Manual:
 - 1. Organize documents into an orderly sequence based on each Training Module and in order of the subject matter Specification Section Numbers.
 - 2. Bind content in 8-1/2 by 11 inch heavy-duty, three-ring, vinyl-covered, loose-leaf binders(s); thickness as necessary to accommodate contents; and clear plastic sleeved DVD ring binder storage page(s) for DVD content inclusion. Entire cover and spine to have integral clear plastic sleeve with open top for insertion of printed Manual identification information.
 - 3. Manual first page to be title page with identification information.
 - a. Manual Title: DEMONSTRATION AND TRAINING MANUAL.
 - b. Name of Project and Project Number.
 - c. Name of Architect.
 - d. Name of Construction Manager (if any).
 - e. Name of Contractor.
 - f. Name of Subcontractor.
 - 4. Manual second page to be Table of Contents listing each Training Module. Main headings in table of contents to be Specification Section Number and Title. Inset below each main heading the identification of each Training Module.
 - 5. Manual second page to be Table of Contents listing each Training Module. Main headings in table of contents to be Specification Section Number and Title. Inset below each main heading the identification of each Training Module.
 - a. INSTRUCTION PROGRAM - OVERVIEW
 - 1) (Subheading to follow, if any)
 - 2) (Subheading to follow, if any)
 - b. TRAINING MODULE - (Section Number and Title for each module)
 - 1) (Subheading to follow, if any)
 - 2) (Subheading to follow, if any)
 - 6. Provide heavy bond divider tabs with plastic-covered insert tabs for each separate Training Module set of records.
 - 7. Individual Training Module records: Order of insertion to be as indicated.
 - a. In front of each Training Module, insert a page with the following content:
 - 1) Specification Section Number and Title.
 - 2) Description of the Training Module and bullet list of product, equipment or construction element to which the documentation is related.
 - 3) Name, address, and telephone number of Installer and Instructor.
 - b. Documentation of Owner attendees that attended training session.
 - c. Documentation of Training Module developed as part of the Instructional Program.
 - d. Documentation of actual training session, including additional information disseminated or generated during training session.
 - e. If training video(s) was viewed during the training session, indicate so by video title(s) and include the labeled DVD disk.
 - f. If video record of the training session is required, or produced without requirement, include the labeled DVD disk.
- C. Electronic Copy of Demonstration And Training Manual:
 - 1. PDF single file format on digital media disk; labeled with identification information.
 - 2. Content to be the same and organized in like manner as described for Paper Copy of Demonstration And Training Manual.
 - 3. Digital file to include bookmarked panel with digitally hyperlinked bookmarks duplicating the Table of Contents for digital navigation to contents.

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4. Include video recordings as separate files on Manual media disk; hyperlinked to references in the Manual; playable by mouse click on hyperlinked references.
- D. Closeout Submittal: Manual in accordance with requirements indicated in Section 01 77 00 - Closeout Procedures.

END OF SECTION

**SECTION 02 41 19
SELECTIVE DEMOLITION**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this section shall be bound by the documents and general provisions of the Contract, including the General and Supplementary Conditions as well as Division 01 General Requirements in its entirety.

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected existing building elements.

1.3 DEFINITIONS

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

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at the Project site to comply with requirements of Division 01.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain, and which require protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Protect existing elements to remain from new construction.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Interruption of utility services. Inform Owner of any utilities or services that are shut off.
 - 2. Coordination for shutoff, capping, and continuation of utility services.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Submit before Work begins.

1.7 FIELD CONDITIONS

- A. Owner will not occupy portions of building during construction.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect / Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

- C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove HVAC systems and electrical components indicated on Drawings to be removed.
 - a. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - b. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - c. Equipment to be Removed: Disconnect and cap services and remove equipment and delivery to Owner.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and

cooling specified in Section 015000 "Temporary Facilities and Controls."

- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from 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. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove 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. Site Access and Temporary Controls: Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them according to Section 017419 Construction Waste Management and Disposal.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Slabs-on-grade.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For Manufacturer and Testing agency.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
- E. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Aggregates
 - 3. Admixtures.
 - 4. Form materials and form-release agents.
 - 5. Steel reinforcement and accessories.
 - 6. Fiber reinforcement.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Vapor retarders.
 - 10. Semirigid joint filler.
 - 11. Joint-filler strips.
- F. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

1.4 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete", Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. 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.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615 Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494 Type A.
 - 2. Retarding Admixture: ASTM C 494, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.7 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
 - 1. Available Products:
 - a. Monofilament Fibers:
 - 1) ABC Polymer Industries.
 - 2) Euclid Chemical Company (The); Fiberstrand 100.
 - 3) GCP Applied Technologies Inc.
 - 4) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.
 - 6) SI Concrete Systems; Fibermix Stealth.

2.8 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Available Products:
 - a. ChemMasters; Chemisil Plus.
 - b. Dayton Superior Corporation; Day-Chem Sure Hard.
 - c. Euclid Chemical Company (The); Euco Diamond Hard.
 - d. Kaufman Products, Inc.; SureHard.
 - e. Metalcrete Industries; Floorsaver.
 - f. Nox-Crete Products Group, Kinsman Corporation; Duranox.
 - g. W.R. Meadows

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Available Products:
 - a. Dayton Superior Corporation; Sure Film.
 - b. Euclid Chemical Company (The); Eucobar.
 - c. Kaufman Products, Inc.; Vapor Aid.
 - d. Lambert Corporation; Lambco Skin.
 - e. Meadows, W. R., Inc.; Sealtight Evapre.
 - f. Nox-Crete Products Group, Kinsman Corporation; Monofilm.

- g. Sika Corporation, Inc.; SikaFilm.
 - h. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. Available Products:
 - a. ChemMasters; Polyseal WB.
 - b. Euclid Chemical Company (The); Super Diamond Clear VOX.
 - c. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
 - d. Lambert Corporation; UV Safe Seal.
 - e. Meadows, W. R., Inc.; Vocomp-30.
 - f. Metalcrete Industries; Metcure 30.
 - g. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or Joint Filler, Type C: Premolded sponge rubber, Comply with ASTM D1752.
 - 1. Thickness: 1 inch
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, per ASTM D2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not

- exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio 0.50 maximum.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Slump Limit: 4 inches, plus or minus 1 inch.
 3. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
 4. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, blocking, and screeds required in the Work.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of walls, piers, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate horizontal joints in walls and piers at underside of slabs and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for slabs in continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered epoxy paint, or another thin-film- finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on- grade.
 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch.

3.8 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot- weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before floatfinishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including walls, piers and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including slabs and other surfaces.

- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs, not receiving a floor covering, in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than 28 days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

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SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes load bearing formed steel stud exterior wall framing, formed steel framing accessories.
- B. Related Sections:
 - 1. Section 06 10 00 - Rough Carpentry: Wood blocking.
 - 2. Section 07 21 16 - Blanket Insulation: Insulation within framing members.

1.2 REFERENCES

- A. American Iron and Steel Institute:
 - 1. AISI General - Standard for Cold-Formed Steel Framing - General Provisions.
 - 2. AISI Header - Standard for Cold-Formed Steel Framing - Header Design.
 - 3. AISI NAS - North American Specification for Design of Cold-Formed Steel Structural Members.
- B. ASTM International:
 - 1. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
 - 2. ASTM C955 - Standard Specification for Load bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.
 - 2. AWS D1.3 - Structural Welding Code - Sheet Steel.
- D. National Association of Architectural Metal Manufacturers:
 - 1. NAAMM ML/SFA 540 - Lightweight Steel Framing Systems Manual.
- E. SSPC: The Society for Protective Coatings:
 - 1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
- F. Steel Stud Manufacturers Association:
 - 1. SSMA - Product Technical Information.

1.3 PERFORMANCE REQUIREMENTS

- A. Refer to Structural Sheet S0.2 for additional information and requirements.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings:
 - 1. Indicate component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and accessories or items required of related Work.
 - 2. Indicate stud layout.
 - 3. Describe method for securing studs to tracks.
 - 4. Submit calculations for loadings and stresses of specially fabricated framing under Professional Engineer's seal (Licensed in the state of North Carolina).
- C. Product Data: Submit data on standard framing members; describe materials and finish, product criteria and limitations.

- D. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.
- E. Mill Certifications: Submit mill certifications for steel delivered to site. Certify steel bare metal thickness in 0.001-inch, yield strength, tensile strength, total elongation in 2 inch or 8 inch gauge length, chemical analysis, and galvanized coating thickness.
- F. Design Data: Submit design calculations.

1.5 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with AISI NAS.
- B. Furnish framing materials in accordance with SSMA - Product Technical Information.
- C. Perform Work in accordance with the following:
 - 1. Framing: AISI General and AISI NAS.
 - 2. Headers: AISI Header.
 - 3. Wall Studs: AISI WSD.
 - 4. Lateral Design: AISI Lateral.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience.
 - 1. Current member of Steel Stud Manufacturers Association.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience and approved by manufacturer.
- C. Design structural elements under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of North Carolina.
- D. Form, fabricate, provide, and connect components in accordance with NAAMM ML/SFA 540 - Lightweight Steel Framing Systems Manual.
- E. Welders and Welding Procedures: AWS D.1 qualified within the previous 12 months for employed weld types.

1.7 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate placement of components within stud framing system specified in other Sections.

PART 2 PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Maximum Allowable Deflection: 1:360 of span.
- B. Wall System:
 - 1. Design to AISI NAS, AISC General, and AISC Header.
 - 2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 3. Design system to accommodate:
 - a. Construction tolerances, deflection of building structural members, and clearances of intended openings.
 - b. Expansion and contraction of members and building movement without damage to connections or members.

4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated according to North Carolina Building Code.

- C. Select stud thickness to resist minimum 5 psf uniform load and maximum 1/360 deflection.

2.2 COLD-FORMED METAL FRAMING

- A. Manufacturers:
 1. Clark Steel Framing Systems.
 2. Marino\Ware.
 3. Unimast Incorporated.
- B. Cold-Formed Metal Framing: ASTM C955.

2.3 FRAMING COMPONENTS

- A. Steel Sheet: ASTM A1003/A1003M; Structural Grade, Type H, metallic coated:
 1. Grade: As required by performance requirements for 33 ksi.
 2. Coating: G60.
- B. Studs: Steel sheet, formed to channel shape, punched web, knurled faces; size indicated on drawings; gage to be determined by metal stud fabricator's engineer.
- C. Deflection Track: S ASTM C645; GA-216 and GA-600, galvanized sheet steel top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet ASTM C645 and GA-216, galvanized sheet steel or blocking and bracing in length and width required for appropriate blocking conditions.
 1. Minimum Base-Metal Thickness: 0.0538 inch.
 2. Backing Plate: Proprietary fire-resistance-treated blocking and bracing.
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- F. Track:
 1. Steel sheet, formed to channel shape.
 2. Width: Same as studs, tight fit.
 3. Gage to be determined by metal stud fabricator's engineer.
 4. Type: Solid web.

2.4 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined by performance requirements specified.
- B. Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

2.5 FASTENERS

- A. Self-drilling, Self-tapping Screws, Bolts, Nuts, and Washers: Steel, hot dip galvanized.
- B. Anchorage Devices: Power actuated.
- C. Welding: In conformance with AWS D1.1 and AWS D1.3.

2.6 FABRICATION

- A. Fabricate assemblies of formed sections of sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify building framing components are ready to receive Work.
- B. Verify rough-in utilities are in proper location.

3.2 ERECTION OF STUDS

- A. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 16 inches oc.
- B. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener or welding method.
- C. Construct double stud wall opening window jambs.
- D. Erect load bearing studs one-piece full length. Splicing of studs is not permitted.
- E. Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.
- F. Fully seat axial loaded studs in receiving tracks (maximum 1/16-inch gap between stud and track web).
- G. Coordinate placement of insulation in multiple stud spaces after erection.
- H. Install intermediate studs above and below openings to align with wall stud spacing.
- I. Install studs with deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing. Provide devices that provide horizontal bracing and a minimum of one inch of structural movement, up or down.
- J. Attach cross studs to studs for attachment of fixtures anchored to walls.
- K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- L. Touch-up field welds and damaged metallic coatings surfaces with primer to match shop coating.
- M. Complete framing ready to receive wall sheathing.
- N. Blocking: Bolt or screw fire retarded wood blocking to studs. Install blocking for support of HVAC Equipment

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Indicated Position: 1/4 inch.
- C. Maximum Variation of Members from Plane: 1/4 inch.

END OF SECTION

**SECTION 05 52 13
PIPE AND TUBE RAILINGS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe and tube railings for exterior handrails.
- B. Related Sections:
 - 1. Section 09 90 00 - Painting and Coating: Paint finished.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 2. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
- B. National Ornamental & Miscellaneous Metals Association:
 - 1. NOMMA Guideline 1 - Joint Finishes.
- C. SSPC: The Society for Protective Coatings:
 - 1. SSPC - Steel Structures Painting Manual.
 - 2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the professional engineer responsible for their preparation. Professional engineer must be qualified and licensed in the State of North Carolina.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL RAILING SYSTEM COMPONENTS

- A. Tubing: ASTM A513, Type 5, minimum 50 ksi yield strength.
- B. Hollow Structural Sections: ASTM A500/A500M, Grade B.
- C. Top Rail: 1-1/4 inch diameter round steel tubing welded joints.
- D. Rails: 1-1/4 inch diameter hollow structural sections; welded joints.
- F. Posts: 1-1/4 inch diameter round steel tubing.
- G. Baluster: 1-1/4 inch diameter round steel tubing, welded to stringers
- H. Fittings: Elbows, T-shapes, brackets, escutcheons; machined steel.
- I. Mounting Plates with steel inserts for casting in concrete.
- J. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- K. Splice Connectors: Steel concealed spigots.
- L. Shop Primer: SSPC Paint 15, Type 1, red oxide.
- M. Touch-Up Primer: Match shop primer.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- D. Anchors: Provide torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 painting Sections.
- C. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire

bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

- J. Close exposed ends of railing members with prefabricated end fittings.
- K. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- L. Flanges, Fittings, and Anchors: Provide flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
- M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.7 FINISHES, GENERAL

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

2.8 STEEL FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
 - 1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- B. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Exterior installation core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, non-metallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.
- C. Anchor posts to metal surfaces with rectangle flanges, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using welded connections.

3.6 ADJUSTING AND CLEANING

- A. Maximum out of position or offset from alignment: ¼ inch.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

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**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wood blocking.
 - 2. Plywood

1.2 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NLGA - National Lumber Grades Authority.
 - 2. SPIB - Southern Pine Inspection Bureau.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Preservative-treated wood.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 – PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Provide dressed lumber, S4S, unless otherwise indicated.Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.2 SHEATHING AND UNDERLAYMENT LOCATIONS

- A. Plywood sheathing for equipment support
 - 1. Thickness: 1/2 inch.
 - 2. Sheet Size: 48 by 96 inch
 - 3. Wood Structural Panel Roof Sheathing: APA-rated Structural I, plywood.
 - 4. Exposure Durability: 1 Exterior.
 - 5. Facing: Unsanded.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2 (lumber), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Chromated copper arsenate (CCA).
 - b. Ammoniacal copper zinc arsenate (ACZA).
 - c. Ammoniacal, or amine, copper quat (ACQ).
 - d. Ammoniacal copper citrate (CC).
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Application: Treat all rough carpentry, unless otherwise indicated.
 - 1. Nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - a. When in contact with metal deck, metal flashing and cold-formed metal framing, Preservative-Treated wood is to be separated by 30# roofing felt, 8 mil polyethylene sheet, ice & water shield or approved equal.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any species:

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where fasteners are in contact with Preservative-Treated wood, provide Type 304 Stainless Steel fasteners.
 - 2. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

END OF SECTION

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SECTION 07 21 16
BLANKET INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes batt insulation and vapor retarder in exterior wall construction, and batt insulation for filling crevices in exterior wall and roof.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria and limitations.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
 - 1. Batt Insulation: Maximum 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.
- B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

PART 2 PRODUCTS

2.1 BATT INSULATION

- A. Manufacturers:
 - 1. CertainTeed Insulation. Certa Pro (FSK-25)
 - 2. Johns Manville. – Model FSK 25
 - 3. Knauf Fiber Glass – Model Eco Batt
 - 4. Owens Corning Fiberglas. Model FSK-25

2.2 COMPONENTS

- A. Batt Insulation: ASTM C665; preformed glass fiber batt blanket; friction fit, conforming to the following:
 - 1. Thermal Resistance: Refer to Drawings for location.
 - a. R of 38
 - b. R of 15

2. Batt Size: 12 x 19.25 inches (R-38)
 3. Batt Size 3-1/2" x 15 inches (R-15).
 4. Facing Concealed and Exposed Application: Faced on one side with fire resistance foil scrim kraft.
- B. Steel wire; galvanized; type and size to suit application.
- C. Tape: Bright aluminum self-adhering type, mesh reinforced 2 inch wide.
- D. Insulation Fasteners: Steel impale spindle and clip on flat metal base, self adhering backing, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION

- A. Install in exterior walls spaces and roof structure without gaps or voids. Do not compress insulation.
- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.
- D. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- F. Wood and Metal Framing: Place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

END OF SECTION

**SECTION 07 24 23
EXTERIOR FINISH SYSTEMS**

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes exterior insulation and finish system applied over cement board substrate.
- B. Related Sections:
 - 1. Section 07 62 00 - Sheet Metal Flashing and Trim: Perimeter flashings.
 - 2. Section 07 90 00 - Joint Protection: Sealing EFS joints.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products.
 - 2. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 3. ASTM C1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 4. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.
 - 5. ASTM C1325 – Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units
 - 6. ASTM C1382 – Standard Test Method for Determining Tensile Adhesion Properties of Sealant when used in Exterior Insulation and Finish System (EIFS) Joints
 - 7. ASTM C 1396 – Standard Specification for Gypsum Board.
 - 8. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 9. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
 - 10. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - 11. ASTM E84 - Standard Test Methods for Surface Burning Characteristics of Building Materials.
 - 12. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- B. Exterior Insulation Manufacturers Association:
 - 13. EIMA - Guideline Specification for Exterior Insulation and Finish Systems, Class PM.

1.3 SYSTEM DESCRIPTION

- A. Exterior Coating and Finish System: EIMA Class PM, High-impact resistant, water-managed wall system incorporating a cement-board core, reinforced base coat and 100% acrylic polymer exterior finish.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate details of construction including attachments, joint patterns, penetrations, interface with flashings and adjacent materials.
- C. Samples: Submit two 12 x 12-inch size samples illustrating coating color and texture range for selection.
- D. Manufacturer's Installation Instructions: Submit preparation required, installation techniques, jointing requirements.

- E. Certificate: System manufacturer's approval of applicator.
- F. Sealant: Sealant manufacturer's certificate of compliance with ASTM C920.
- G. Product Data: Submit System manufacturer's current specifications, typical details, system design guide and related product literature which indicate preparation required, storage, installation techniques, jointing requirements and finishing techniques

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.
 - 1. Knowledgeable in the proper use and handling of EFS materials.
 - 2. Employ skilled mechanics who are experienced and knowledgeable in Class PB EFS application, and familiar with the requirements of the specified work.
 - 3. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with specifications and details and the project plans and specifications.
- C. Insulation board manufacturer requirements: Recognized by the Manufacturer as capable of producing insulation board to meet system requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect adhesives and finish materials from freezing by storing in environment no less than 40°F or in excess of 90°F. Store away from direct sunlight
- C. Store reinforcing mesh, and flexible flashing in a cool, dry place protected from exposure to moisture.
- D. Protect Portland cement-based materials from moisture and humidity. Store under cover off the ground in a dry location.

1.7 PROJECT SITE CONDITIONS

- A. Provide properly vented, supplementary heat during installation and drying period when temperatures less than 40°F prevail.
- B. Do not apply insulation materials to frozen surfaces.
- C. Maintain ambient temperature at or above 40°F during and at least 24 hours after insulation installation and finish until dry.

1.8 WARRANTY

- A. Manufacturer to provide a written limited materials warranty against defective material upon written request.
 - 1. 10-year limited repair and replacement material warranty
 - 2. 5-year moisture drainage warranty
- B. Applicator shall warrant workmanship separately.

1.9 SCHEDULING

- A. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.
- B. Schedule Work to maintain integrity of exterior wall to prevent water penetration behind EFS. Allow sufficient time for curing of EFS materials prior to sealant application.

PART 2 PRODUCTS

2.1 EXTERIOR FINISH SYSTEM

- A. Manufacturers:
 - 1. Dryvit Systems, Inc.
 - 2. Finestone Simplex Products.
 - 3. Senergy BASF Wall Systems Inc. (CBS 1000 CI Wall System) basis of design
 - 4. STO Corporation.

2.2 COMPONENTS

- A. Air / Barrier Component. EFS Manufacturer system - One component fluid applied vapor permeable air / water-resistive barrier (Senergy- Senersshield-R)
- B. Sheathing Fabric: A spun-bonded non-woven reinforced polyester web for use with Senergy fluid applied air/weather-resistive barriers.
- C. Transitional Membrane / Expansion Joint Flashing:
 - 1. 30-mil thick, self-sealing, self-healing composite membrane of polyester fabric and rubberized asphalt. Flashing. Compatible with Senergy liquid air/weather resistive barriers. (Senergy WS Flash)
 - 2. Flashing Primer: Water-based primer for use prior to application of WS FLASH on all acceptable surfaces.
- D. Drainage Mat: Three-dimensional drainage core consisting of fused entangled filaments.
- E. Rigid Insulation with Cementitious Backing Board: Exterior type aggregated Portland cement board with polymer-coated woven High density, glass-fiber mesh embedded in back and front surfaces, 1/2-inch-thick square cut, edges formed smooth adhere to 1-1/2" inch rigid insulation. Acceptable manufacturer: PermaBase by National Gypsum or equivalent.
- F. Base Coat: Dry mix containing Portland cement and latex polymers, gray color. Senergy – XTRA-Stop)
- G. Finish Coat Materials, Modified acrylic base for water repellent properties, compatible with base coat, as recommended by manufacturer, color and texture as selected.
 - 1. Color: Selected from Manufacturer's Standards
 - 2. Texture: Selected from Manufacturer's Standards
- H. Primer/Adhesive and Base Coat: Recommended by manufacturer.
- I. Reinforcing Mesh: Interwoven glass fiber mesh, types as recommended by manufacturer for each location and substrate.
 - 1. Standard Mesh: Minimum 4.0 oz/sq yd.
- J. Finish Coat Materials, EIMA Class PB: Synthetic vinyl composition, as recommended by manufacturer, color and texture as selected.

2.3 ACCESSORIES

- A. Sealant Materials: Recommended by coating manufacturer.
- B. Starter track: Rigid polyvinyl chloride (PVC) track, UV resistant for exterior use, with drip edge to allow moisture to shed down the surface.
- C. Self-Stick SBS Type Flashing: Composite sheet 40 mils thick; 38 mils thick self-adhesive rubberized asphalt bonded to 2 mils thick high density polyethylene film. Refer to drawings for location.

- D. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177:
1. Thickness: 1/2 inch.
 2. Width: 4 feet.
 3. Length: 8 feet.
 4. Edges: Square.
 5. Surfacing: Fiberglass mat on face, back, and long edges.
 6. Racking Strength ASTM E72: Not less than 540 pounds per square foot, dry.
 7. Flexural Strength, Parallel ASTM C473: 80 lbf, parallel.
 8. Humidified Deflection ASTM C1177: Not more than 2/8 inch.
 9. Permeance ASTM E96: 23 perms.
 10. R-Value ASTM C518: 0.56.
 11. Mold Resistance ASTM D3273: 10, in a test as manufactured.
 12. Acceptable Manufacturers:
 - a. Certaineed – Model: Glasroc Sheathing.
 - b. Georgia-Pacific – Model: DensGlass Sheathing
 - c. National Gypsum Co. – Model: e2xp Extended Exposure Sheathing
 - d. US Gypsum – Model: Securock

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate and adjacent materials are dry.
- C. Verify substrate surface is flat, free of fins or irregularities.

3.2 SURFACE PREPARATION

1. Sheathing substrate and the exterior cement board surface are free of dust, loose particles, oil and other conditions that would affect the adhesion or installation of Cement Board Finish System materials.
2. All fasteners are corrosion resistant and installed in a manner as to be flush with the surface of the cement board.
3. All accessories including corner aids, casing beads, etc. are properly fastened and positioned according to contract drawings, manufacturer requirements and local building code requirements.
4. The water-resistive barrier is of a proper type and, if sheet form, has been installed in a weatherboard fashion in accordance with building code and manufacturer's requirements. Apply conditioner by sprayer or roller to chalking or excessively absorptive surfaces.
5. Replace weather damaged sheathing and repair damaged or cracked surfaces.
6. Level surfaces to comply with required tolerances.

3.3 INSTALLATION

- A. Install gypsum sheathing with corrosion-resistant fasteners. Stager joints of Insulation / cement board. Erect gypsum sheathing in accordance with ASTM C1280, horizontally, with edges butted and ends occurring over firm bearing.
- B. Install starter track level and in accordance with manufacturer's instructions.
- C. Install secondary flexible flashing around openings and overlap starter track.

- D. Install Air / Water- Resistive Barrier:
1. Substrate shall be dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than ¼" in 10'.
 2. Unsatisfactory conditions shall be corrected before application of the air/water-resistive barriers.
 3. Install barrier in accordance with the manufacturer's recommendations.
 4. Install flashing material in accordance with manufacturer's recommendations. Ensure air-water barrier or flashing overlaps the top flange of the starter track.
- E. Drainage Mat: Apply horizontally or vertically over Air / Water-Resistive Barrier ensuring it is free of wrinkles. Abut all vertical and horizontal edge and secure drainage mat to substrate with sufficient building staples or galvanized nails to remain in place prior to application of insulation board.
- F. Insulation / Cement-Board Substrates:
1. Cement-board must be securely fastened per National Gypsum's recommendations, applicable building code and project requirements.
 2. Walls shall have maximum deflection not to exceed L/360 of span under positive or negative design loads.
 3. Cement-board must be a single piece around corners of openings.
 4. Cement-board must be fastened with corrosion resistant fasteners.
 5. Cement-board and sheathing joints must be offset.
- G. Backwrapping: Apply a strip of detail mesh to the dry air barrier membrane at all system terminations (ceiling grilles) with adhesive. The mesh must be wide enough to adhere approximately 4 inches of mesh onto the wall, be able to wrap around the insulation board edge and cover a minimum of 2 1/2 inches on the outside surface of the insulation board. After adhering mesh strips to the air barrier membrane, they will dangle until the backwrap procedure is completed.
- H. Base Coat and Reinforcing Mesh Application
1. Apply minimum 9x12 inch diagonal strips at corners of windows and all penetrations through the system. Embed the strips in wet base coat and trowel from the center to the edges of the mesh to avoid wrinkles.
 2. Standard mesh application: Apply base coat over the insulation board. Work horizontally or vertically in strips of 40 inches, and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2 inches at mesh seams and at overlaps of detail mesh. Feather seams and edges. Double wrap all inside and outside corners with minimum 2 1/2 inches overlap in each direction. (Alternate corner treatment: Embed corner mat in base coat, allow to dry, then overlap up to corner with standard reinforcing mesh embedded in base coat.) Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through the base coat when it is dry. Re-skim with additional base coat if mesh color is visible.
 3. The minimum required reinforced base coat thickness is 1/16 inch when it is dry. Allow the base coat to thoroughly dry before applying primer.
- I. Primer application
1. Apply primer evenly with brush, roller or proper spray equipment over the clean, dry base coat and allow to dry thoroughly before applying finish.

J. Finish Coat Application

1. Apply finish directly over the primed base coat **ONLY AFTER THE PRIMER HAS THOROUGHLY DRIED**. Apply finish by spraying or troweling with a stainless-steel trowel, depending on the finish specified.
2. Follow these general rules for application of finish:
 - a. Avoid application in direct sunlight.
 - b. Apply finish in a continuous application, and work to a wet edge.
 - c. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
 - d. Do not install separate batches of finish side-by-side.
 - e. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
 - f. Do not apply finish over irregular or unprepared surfaces or surfaces not in compliance with the requirements of the project specifications.
3. Float finish coat to achieve final texture, using conventional stucco tools. Texture to be as selected by Architect.
4. Coordinate sealant application and control joints with placement of base and finish coats as recommended by EIFS manufacturers and in accordance with Section 07 90 00.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit the finish surface to become soiled or damaged.
- C. Clean adjacent surfaces and remove excess materials, droppings, and debris.

END OF SECTION

**SECTION 07 62 00
SHEET METAL FLASHING AND TRIM**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following manufactured roof specialties:
 - 1. Counterflashing and Reglets as required
 - 2. Through-Wall Flashing

1.2 PERFORMANCE REQUIREMENTS

- A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Comply with ANSI/SPRI ES-1 for edge-metal flashings, including but not limited to copings, fascia, gravel stops, etc., per all applicable building codes.
- C. FMG Listing: Manufacture and install copings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1A - 90. Identify materials with FMG markings.
- D. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.
- F. The metal flashing and trim shall create a complete system that will be viewed as a component of the building envelope system. The building envelope system will be tested at the completion of the project for thermal and air tightness. All components of the building envelope system are to exceed ASHRAE 189.1 and US Army Corps of Engineer guidelines.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:
 - 1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
 - 2. Details for expansion and contraction.
- C. Samples for Initial Selection: For each type of manufactured roof specialty indicated with factory-applied color finishes.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of copings with performance requirements.

1.4 QUALITY ASSURANCE

- A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

- A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 COUNTERFLASHINGS and, REGLETS

- A. Counterflashings: Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
 - 1. Pre-Finished Aluminum Sheet: ASTM B209; 3003 alloy, H14 temper alloy and temper as required for application and finish; 0.032 inch thick; plain finish shop pre-coated with PVDF (polyvinylidene fluoride) color as selected from manufacturer's standards.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and -welded corners and junctions, from the following exposed metal in thickness indicated:
 - 1. Pre-Finished Aluminum Sheet: ASTM B209; 3003 alloy, H14 temper alloy and temper as required for application and finish; 0.032 inch thick; plain finish shop pre-coated with PVDF (polyvinylidene fluoride) color as selected from manufacturer's standards.

2.2 THRU-WALL FLASHING

- A. General: Thru-Wall Flashing assembly to be self-adhering flexible stainless steel flashing over stainless steel base flashing at all masonry veneer cavity walls.
- B. Metal Flashing: Provide through-wall metal flashing as indicated, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual Division 7 Section "Sheet Metal Flashing and Trim", as indicated on the drawings and as follows:
 - 1. Stainless Steel; 26 gauge, Type 304 as tested in accordance with ASTM A 167, unless noted otherwise.
 - 2. Fabricate continuous flashings in sections 120 inches lengths. Provide 8" long stainless steel splice plates at straight joints of formed, smooth metal flashing as indicated.
 - 3. Fabricate mitered corners by lapping the formed stainless steel, rivet heads closed and solder all seams.

4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 5. Fabricate through-wall flashing with drip edge, unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.
- C. Flexible Flashing: For flashing as indicated, not exposed to the exterior, use one of the following, unless otherwise indicated: York 304 SS self-adhered membrane with Flashing Primer as required.
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Flexible flashing to extend a minimum of 6" above the top of cavity drainage material and be terminated with an aluminum termination bar and sealant per manufacturer recommendations and as indicated.

2.3 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable.

2.4 FABRICATION

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, geometry, metal thickness, and other characteristics of installations indicated. Fabricate at the shop to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
1. Examine existing conditions for suitable conditions for manufactured specialties.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install manufactured specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured specialty systems.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of uncoated Aluminum-Zinc Alloy-Coated Steel Sheet manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt

underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.

- C. Install manufactured specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
- D. Install manufactured specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
- E. Expansion Provisions: Provide for thermal expansion of exposed manufactured specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.
- F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

3.3 DRAINAGE SYSTEM INSTALLATION

A. COUNTERFLASHING AND REGLET INSTALLATION

- 1. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings over base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
- 2. Reglets: Anchor to substrate and terminate with a continuous termination bar and sealant.
- 3. See drawings for specific installation.

3.4 CLEANING AND PROTECTION

- 1. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- 2. Clean and neutralize flux materials. Clean off excess solder and sealants.
- 3. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- 4. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 90 00
JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Sections include sealants and joint backing, pre-compressed foam sealers, and accessories.
- B. Related Sections:
 - 1. Section 07 24 23 – Exterior Finish System for perimeter sealant

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C834 - Standard Specification for Latex Sealants.
 - 2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 3. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 4. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two samples, 2 inches in length illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.
- E. Warranty: Include coverage for installed sealants and accessories failing to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

- C. Do not use products under conditions of precipitation or in inclement or freezing weather. Verify that substrates are clean, dry, and frost free. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number.
- B. Store products in original, unopened containers in clean, dry areas away from heat and direct sunlight.

1.7 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with sections referencing this section.

1.8 WARRANTY

- A. Warranty: Provide manufacturer's standard material warranty.
- B. Installer's Two-year warranty on workmanship.

PART 2 PRODUCTS

2.1 JOINT SEALERS

- A. Manufacturers:
 - 1. BASF (Sonneborne)
 - 2. Dow Corning Corp.
 - 3. GE Silicones.
 - 4. Pecora Corp.
 - 5. Tremco Sealants & Waterproofing.

2.2 PRODUCT DESCRIPTION

- 1. High Performance General Purpose Exterior (Nontraffic) Polyurethane Sealant:
 - 1. Color: Colors as selected from manufacturer's full color range.
 - 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior nontraffic joints for which no other sealant is indicated.
 - 3. One-component, high-performance, nonpriming, gun-grade, elastomeric polyurethane sealant.
 - 4. Performance Requirements: Provide sealant complying with the following requirements:
 - a. Compliances:
 - 1. ASTM C920, Type S, Grade NS, Class 35, Use NT₁ M, A, G, and I.
 - 2. UL classified, fire resistance only.
 - b. Service Temperature Range: Minus 40 to 180 degrees F.

- c. Shrinkage: None.
 - d. Movement Capability, ASTM C719: Plus or minus 35 percent.
 - e. Tensile Strength, ASTM D412: 350 psi (2.4 MPa).
 - f. Tear Strength, ASTM D1004: 50 pli.
 - g. Ultimate Elongation at Break, ASTM D412: 800 percent.
 - h. Rheological, ASTM C639, sag in vertical displacement, 120 degrees F: No sag.
 - i. Extrudability, ASTM C603, 3 seconds: Passes.
 - j. Hardness, ASTM C661, Shore A:
 - 1. Standard Conditions: 25 to 30.
 - 2. After Heat Aging: 25.
 - k. Weight Loss, ASTM C792, after heat aging: 3 percent.
 - l. Cracking and Chalking, ASTM C792, after heat aging: None.
 - m. Tack-Free Time, ASTM C679: Passes.
 - n. Stain and Color Change, ASTM C510: Passes, no visible stain.
 - o. Bond Durability, ASTM C719, on glass, aluminum, and concrete: Passes, plus or minus 35 percent movement.
 - p. Adhesion in Peel, ASTM C794: 30 pli.
 - q. Adhesion in Peel, after UV radiation through glass, ASTM C794: Passes.
 - r. Artificial Weathering, ASTM C793, Xenon arc, 250 hours: Passes.
 - s. Artificial Weathering, ASTM G26, Xenon arc, 3,000 hours: No surface cracking.
 - t. Water Immersion, ASTM C1247, 122 degrees F (50 degrees C): Passes 10 weeks with movement cycling.
 - u. VOC Content: 0.36 lbs per gal (43 g/L), less water and exempt solvents.
5. Design Requirements:
- a. Design number of joints and joint widths for maximum of plus or minus 25 percent movement.
 - b. Design depth of sealant to be 1/2 width of joint.
 - 1. Maximum Depth: 1/2 inch.
 - 2. Minimum Depth: 1/4 inch.
 - 3. Maximum Recommended Width: 1-1/2 inches.
2. General Purpose Traffic Bearing Sealant: Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Class 25, Uses T, M, A; single component, chemical curing, non-staining, non-bleeding.
- 1. Color: Gray.
 - 2. Applications: Use for exterior and interior pedestrian traffic bearing joints.
 - 3. Performance Requirements: Provide material complying with the following requirements:
 - a. Movement Capability: Plus and minus 25 percent.
 - b. Service Temperature Range: -40 to 180 degrees F.
 - c. Shore A Hardness Range: 20 to 60. Per ASTM D 2240
 - d. Tensile strength (Basecoat): 752 psi per ASTM D 412.
 - e. Elongation (Basecoat): 595 percent per ASTM D 412.
 - f. Tear strength (Basecoat): 74 PIT per ASTM D 1004.
 - g. Weight loss (Basecoat): 16 percent. Max: 40.
 - h. Tensile Strength 3,000 psi per ASTM D 412.
 - i. Elongation 250 percent per ASTM D 412.
 - j. Taber Abrasion Resistance (M200/TC275) 100 mgms lost, (M200/TC295) 82 mgms, per ASTM C 957. CS-17 Wheel, 1,000 gm load, 1,000 cycles.
3. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene sealant: ASTM C920, Grade NS, Class 12-1/2, Use NT; single component, solvent release, non-skinning, non-sagging.
- 1. Color: Color as selected from manufacturer's full color range.
 - 2. Movement Capability: Plus and minus 12-1/2 percent.
 - 3. Service Temperature Range: -13 to 180 degrees F.
 - 4. Shore A Hardness Range: 10 to 30.

5. Applications: Use for concealed sealant bead in sheet metal work.
4. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable, non-staining, non-bleeding, non-sagging.
 1. Color: Colors as selected.
 2. Movement Capability: 2 to 5 percent.
 3. Service Temperature Range: 2 to 160 degrees F.
 4. Shore A Hardness Range: 15 to 40.
 5. Applications: Use for interior wall and ceiling control joints, joints between door and window frames and wall surfaces, and other interior joints for which no other type of sealant is indicated.
5. Plumbing Fixtures /Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.
 1. Applications: Use for joints between plumbing fixtures and floor and wall surfaces.
6. Silicone Sealant: One-component, neutral-cure, RTV (room temperature vulcanizing) silicone rubber sealant, and above-grade weathersealing joints with most common construction materials
 1. Color: Colors as selected from manufacturer's full color range.
 2. Application use for:
 - a. Lap Joints in Exterior Sheet Metal Work
 - b. Structural and non-structural glazing
 3. Movement Capability: Plus and minus 25 percent.
 4. Service Temperature Range: -65 to 180 degrees F.
 5. Shore A Hardness Range: 15 to 35.
 6. Class: 100/50 for vertical joints.
 7. Use Related to Exposure: NT (non-traffic).
 8. ASTM C920, Grade NS (non-sag), Class 25, Type S (single component) chemical curing, non-sagging, non-staining, fungus resistant, non-bleeding.

2.3 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant. Surfaces to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax. Concrete surfaces contaminated by oil, paint, or other foreign matter which would impair the bond of the sealant shall be cleaned by sandblasting. Clean and prime joints.
- B. Surfaces shall be clean and primed before the sealant is applied as recommend by sealant manufacturer.
- C. Protect elements surrounding Work of this section from damage or disfiguration.
- D. Sealing work shall be done before any field painting work is started. The air temperature and the temperature of the sealed surfaces shall be above 50 F when sealing work is performed. Upon completion of the sealing work, each sealed joint shall be filled solidly and smoothly, providing a neat convex bead free from tool marks, recessed 1/8", and all adjacent surfaces shall be clean.
- E. Do not lap sealant onto adjacent surfaces. Any sealant so applied as to prevent the painting of adjacent surfaces to a clean line, or with an excess of material outside the joint and feathered onto surfaces, shall be removed and the joint resealed.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2: 1.
 - 2. Neck dimension no greater than 1/3 of joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- C. Install bond breaker where joint backing is not used.
- D. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.
- H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
 - 1. Back-Up Material:
 - a. Install appropriate size backer rod, larger than joint where necessary in accordance with manufacturer's recommendations, and in manner to provide concave sealant profile.
 - b. Where joint depth does not permit installation of backer rod, install adhesive-backed polyethylene bond-breaker tape along entire back of joint to prevent 3-sided adhesion of joint sealant.

2. Sealant:
 - a. Apply sealant in accordance with manufacturer's instructions.
 - b. Verify that temperature and moisture conditions are within manufacturer's acceptable limits.
 - c. Completely fill joint with sealant, filling from bottom up to avoid entrapping air.
 - d. Using clean, dry tool with rounded edge, and of appropriate width for each joint, tool freshly installed sealant to provide preferred concave profile, to ensure intimate contact between sealant and substrate, and to provide neat appearance. Where surface aggregate does not permit proper tooling, install sealant and backer rod so that face of joint is recessed behind exposed aggregate, and sealant is bonded to firm, even surface.
 - e. Use dry tooling method. Do not use tooling agents such as soapy water or solvents that have not been approved by sealant manufacturer.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Protect sealants until cured.

END OF SECTION

SECTION 08 17 43

FRP / ALUMINUM-HYBRID DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. FRP / Aluminum Hybrid doors in Aluminum-framing.
- B. Related Requirements:
 - 1. Section 07 90 00 - Joint Protection: System perimeter sealant and backup materials.
 - 2. Section 08 71 00 - Door Hardware: Mortised hardware reinforcement requirements affecting framing members, and hardware items other than specified in this Section.
 - 3. Section 08 80 00 - Glazing: Exterior and interior glazing materials and methods.

1.2 REFERENCE STANDARDS

- A. American Architectural Manufacturers Association/Window & Door Manufacturers Association:
 - 1. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
 - 2. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- B. ASTM International:
 - 1. ASTM-B117 – Standard Practices for Operating Salt Spray (Fog) Apparatus.
 - 2. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM-B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 4. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
 - 5. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
 - 6. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
 - 7. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
 - 8. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 9. ASTM-D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 10. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - 11. ASTM-D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
 - 12. ASTM-D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
 - 13. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 14. ASTM-D3029 – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).
 - 15. ASTM-D5116 – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
 - 16. ASTM-D5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).

17. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
18. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
19. ASTM-E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
20. ASTM-E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
21. ASTM-E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
22. ASTM-E1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
23. ASTM-E1996 – Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.
24. ASTM-F476 – Standard Test Methods for Security of Swinging Door Assemblies.
25. ASTM-F1642-04 – Standard Test Method for Glazing Systems Subject to Air Blast Loading.

1.3 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
- C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- D. Samples. Submit manufacturer's door sample composed of door face sheet, core, framing and finish. Submit manufacturer's sample of standard colors for door face and frame.
- E. Testing and Evaluation Reports: Submit testing reports and evaluations provided by manufacturer conducted by an accredited independent testing agency certifying doors and frames comply with specified performance requirements listed.
- F. Closeout Submittals: Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store products according to manufacturer instructions.

- D. Protection:
 - 1. Protect materials from moisture and dust by storing them in clean, dry location remote from construction operations areas.
 - 2. Protect finished aluminum surfaces with wrapping.
 - 3. Do not use adhesive papers or spray coatings which bond when exposed to sunlight or weather.
 - 4. Provide additional protection according to manufacturer instructions.

1.6 AMBIENT CONDITIONS

- A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not install sealants or glazing materials if the ambient temperature is less than 40 deg. F during and 48 hours after installation.

1.7 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.8 WARRANTY

- A. Section 017000 - Closeout Procedures: Requirements for warranties.
- B. Furnish standard ten-year manufacturer's warranty.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Standard Wall Door; 1-3/4" thick flush door with fiberglass reinforced polyester (FRP) face sheets.
- B. Door trim, vision lights and internal sub-frame stiles and rails are constructed of extruded tubular aluminum shapes using billet aluminum, grade 6063 and a T6 tempered alloy.
- C. Door perimeter edge trim, top and bottom are applied to the doors sub-frame.
- D. Construction Components:
 - 1. Sub-Frame stiles and rails.
 - a. Top horizontal rails; full 6" rectangular tube full 6" with 1/8" wall thickness with tie-rod spline.
 - b. Bottom horizontal rails: full 2 1/2" rectangular tube with 1/8" wall thickness supports for mortise and tenon assembly. Tube extruded with a bottom tie-rod spline.
 - c. Lock and hinge vertical stiles; full 2 1/2" extrusion with integral edge trim.
 - d. Flange channel hardware reinforcing; full 2 1/2" with 1/8" wall thickness.
 - e. Lock and hinge stiles have integral locking edges that secure the face edge at the seams.
 - f. Corner joint assembled using monumental type mortise and tenon joinery with 3/8" tie-rods through splines.
 - 2. Perimeter trims are aluminum shapes and are finished to anodize as selected.
 - a. Top and Bottom trims have tee-slot to accept for weather-seal. Bottom trim supplied with pile weather-seal.
 - b. Lock and hinge edge stiles are beveled with tee-slot pile weather-seal.

3. Core Insulation will be high density expanded polystyrene fitted to fill voids between stiles and rails of sub-frame. Core to have compressive strength ASTM D1621 - 25psi density with a nominal R-Value of 6.5.
 - a. Optional Core Insulation will be expanded urethane foam injected in place to fill voids between stiles and rails. Core to be 5lb. in place density and have an R-value of 9.
4. Face Sheet to be fiberglass reinforced polyester (FRP) with an abuse resistant surface and U.V. additives to aide in the protection against normal weathering and normal usage.
 - a. Face Sheet to be .120 Thickness.
 - b. Standard Face sheet to be color throughout. Custom color optional face sheets to be specially designed to accept specially formulated paint products, color to match selected color.
 - c. Face sheet to have patterned pebble embossed texture.
5. Vision Light (cut-outs) to be specifically made to accept 1" Glass. Glass types are determined under the related glass and glazing sections.
6. Factory Hardware preparation options are required for reinforcing and preparations of mortised and concealed hardware. Surface hardware may be applied in the field as required per related hardware sections.

2.2 PERFORMANCE AND DESIGN CRITERIA

- A. System Design:
 1. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall.
 2. Testing: Comply with ASTM E330/E330M.
- B. System Assembly: Without damage to components or deterioration of seals, accommodate movement within system, movement between system and peripheral construction, dynamic loading and release of loads, and deflection of structural support framing.
- C. Air Infiltration:
 1. Opaque door less than 50 percent of glazing:
 - a. 1.57 psf.
 - b. Measurement: Comply with ASTM E283.
- D. Thermal and Solar Heat Transmittance of Assembly U-Value .30.
- E. Expansion/Contraction: Ensure that system components can withstand expansion and contraction caused by minimum cycling temperature range of 170 deg. F over a 12-hour period, without causing detrimental effect to system components or anchorage.

2.3 FRP / ALUMINUM HYBRID DOORS

- A. Manufacturers:
 1. FRP Architectural Doors Inc.
 2. Kawneer North America, an Arconic company.
 3. Special Lite, Inc.

2.4 MATERIALS

- A. Glass: As specified in Section 088000 - Glazing.
- B. Sealant and Backing Materials:
 1. Perimeter Sealant: As specified in Section 079000 - Joint Protection.
- C. Fasteners: Stainless steel.

2.5 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.
- B. Joints and Corners:
 - 1. Accurately fit and secure joints and corners.
 - 2. Make joints flush, weatherproof, and hairline.
- C. Provide for **interior or exterior** replacement of glazing.
- D. Provide physical and thermal isolation of glazing from framing members.
- E. Arrange fasteners and attachments to conceal from view.
- F. Prepare components with internal reinforcement for door hardware.
- G. Reinforce framing members for imposed loads.

2.6 FINISHES

- A. Color Anodized Aluminum Surfaces:
 - 1. AAMA 611, AA-M12C22A44.
 - 2. Coating:
 - a. Architectural Class I, 0.7 mils.
 - b. Medium bronze.

2.7 ACCESSORIES

- A. Hardware:
 - 1. Furnish manufacturer's standard door hardware for types of doors and for indicated applications.
 - 2. Unless otherwise noted Weather Stripping, Sill Sweep Strips, and Thresholds by Manufacturer's standard type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Closeout Procedures: Requirements for installation examination.
- B. Verify dimensions, tolerances, and method of attachment with other Work.
- C. Verify that wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section.
- D. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- B. Install doors in accordance with manufacturer's instructions.
- C. Install doors plumb, level, square, true to line, and without warp or rack.

- D. Anchor frames securely in place.
- E. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- F. Set thresholds in bed of mastic and back seal.
- G. Install exterior doors to be weathertight in closed position.
- H. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- I. Remove and replace damaged components that cannot be successfully repaired as determined by architect.
- J. Hardware:
 - 1. As specified in Section 087100 - Door Hardware.
- K. Glass:
 - 1. As specified in Section 088000 - Glazing.
- L. Perimeter Sealants: As specified in Section 079000 - Joint Protection.

3.3 TOLERANCES

- A. Section 014000 - Quality Requirements: Requirements for tolerances.
- B. Maximum Variation from Plumb: 0.06 in./3 ft. noncumulative, or 1/16 in./10 ft., whichever is less.

3.4 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.5 CLEANING

- A. Remove protective material from prefinished aluminum surfaces. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Surfaces:
 - 1. Wash down with a solution of mild detergent in warm water.
 - 2. Apply with soft, clean wiping cloths.
 - 3. Wipe surfaces clean.
- C. Do not use harsh cleaning materials or methods that would damage the finish.
- D. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: nonrated access doors with frames.
- B. Related Requirements:
 - 1. Section 09 30 00 - Tiling: Preparing for wall tile installation.
 - 2. Section 099000 - Painting and Coating: Field paint finished.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hard enamel.

1.3 COORDINATION

- A. Section 013000 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with controls, valves, and similar items requiring operation behind finished surfaces.
- C. Coordinate exact locations of access doors.

1.4 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's information indicating sizes, types, finishes, hardware, scheduled locations, and details of adjoining Work.
- C. Shop Drawings: Indicate exact position of access door units and any special installation conditions.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing them in clean, dry locations remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

- A. Manufacturers:
 - 1. Milcor
 - 2. Mifab
 - 3. Nystrom
 - 4. Williams Brothers
- B. Flush-Framed Access Doors:
 - 1. Exposed Frame Flanges:
 - a. Door: 16 ga. cold rolled steel.
 - b. Frame: 16 ga. cold rolled steel surrounded by a galvanized steel drywall bead. Frame provided with pre-formed mounting holes 3/16" diameter at 4" spacing.
 - c. Hinge: Concealed spring hinges mounted to frame to allow 175° opening for complete access. Extracting pin from hinge leaf attached to panel permits panel removal.
 - d. Latch: Manufacturer's standard cylinder lock furnished with two keys.
 - e. Size: 12 x 12 inches
 - 2. Construction:
 - a. Continuously welded.
 - b. Joints: Weld, fill, and grind to ensure flush and square units.

2.2 FINISHES

- A. Base Metal Protection:
 - 1. Coat units with baked-on primer.
- B. Top Coat:
 - 1. Two coats baked enamel or powder coated.
 - 2. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings for access doors and panels are correctly sized and located.
- B. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Secure frames rigidly in place, plumb, and level in opening.
- B. Adjacent Surfaces:
 - 1. Align plane of door and panel face with adjacent finished surfaces.
 - 2. Set concealed-frame type units flush with adjacent finished surfaces.
- C. Position unit to provide convenient access to concealed Work.
- D. Adjust door and hardware after installation to ensure proper operation.

3.3 SCHEDULE

- A. Girls Restroom Wall – Access to water shut off value.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED STOREFRONT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes thermally broken, aluminum-window frames.
- B. Related Sections:
 - 1. Section 07 90 00 - Joint Protection: System perimeter sealant and back-up materials.
 - 2. Section 08 80 00 - Glazing.

1.2 REFERENCES

- A. Aluminum Association:
 - 1. AA ADM 1 - Aluminum Design Manual.
- B. American Architectural Manufacturers Association/Window & Door Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
 - 3. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.
 - 4. AAMA MCWM-1 - Metal Curtain Wall Manual.
 - 5. AAMA SFM-1 - Aluminum Store Front and Entrance Manual.
- C. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 5. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 6. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 7. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 8. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- D. National Fenestration Rating Council Incorporated:
 - 1. NFRC 100 - Procedures for Determining Fenestration Product U-Factors.
- E. SSPC: The Society for Protective Coatings:
 - 1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 SYSTEM DESCRIPTION

- A. Aluminum-framed storefront system includes tubular aluminum sections with supplementary internal support framing, thermally broken, shop fabricated, factory finished, related flashings, anchorage, and attachment devices.
- B. System Assembly: Site assembled.

1.4 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall, including overall building and corners.
 - 1. To design pressure of 30 lb/sq ft, as tested in accordance with ASTM E330.
- B. Deflection: Limit mullion deflection to 1/175 for spans under 13'-6" and 1/240 plus 1/4 inch for spans over 13'-6" with full recovery of glazing materials.
- C. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq. ft of wall area, measured at reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
- E. Condensation Resistance Factor: CRF of not less than 50 when measured in accordance with AAMA 1503.
- F. Water Leakage: None, when measured in accordance with ASTM E331 with test pressure difference of 20 percent of design pressure, with minimum differential of 2.86 lbf/sq ft and maximum of 12.00 lbf/sq ft.
- G. Thermal and Solar Heat Transmittance of Assembly (U Value and SHGC): Comply with ICC IEEC for climate zone in which project is located. Frames to be thermally broken.
- H. Expansion / Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over 12-hour period without causing detrimental effect to system components and anchorage.
- I. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior by weep drainage network.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.
- C. Product Data: Submit component dimensions; describe components within assembly, anchorage and fasteners, glass and internal drainage details.
- D. Samples: Submit two samples 2 x 3 inches in size illustrating finished aluminum surface.

- E. Design Data: Indicate framing member structural and physical characteristics, calculations, dimensional limitations.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

1.7 QUALIFICATIONS

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with a minimum of five years documented experience.
- B. Design structural support framing components under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of North Carolina.
- C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Do not modify size and dimensional requirements. If modifications are proposed, submit comprehensive explanatory data to the Architect for review.

1.8 DELIVERY, STORAGE, AND PROTECTION

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Handle Products of this section in accordance with AAMA MCWM-1 - Curtain Wall Manual #10.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing them in clean, dry locations from construction operations.
 - 2. Protect finished aluminum surfaces with wrapping or strippable coating.
 - 3. Do not use adhesive papers or spray coatings which bond when exposed to sunlight or weather.
 - 4. Provide additional protection according to manufacturer instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not install sealants or glazing materials when the ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.11 WARRANTY

- A. Section 017700 - Closeout Procedures: Requirements for warranties.
- B. Furnish one-year manufacturer's warranty for aluminum framing components and assemblies.
- C. Furnish 10-year manufacturer's warranty for aluminum finishes.

PART 2 PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

- A. Aluminum Framed Storefront Manufacturers:
 - 1. EFCO Corp.
 - 2. Kawneer Co., Inc. Model TriFab VG451T (*Basis of Design*).
 - 3. Old Castle Building Envelope.
 - 4. YKK AP America.
 - 5. Tubelite
 - 6. Vistawall
 - 7. United States Aluminum
- B. Product Description:
 - 1. Aluminum Frame: Thermally broken; flush glazing stops; drainage holes; internal weep drainage system. Frames for interior glazing need not to be thermally broken.

2.2 COMPONENTS

- A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper typical, 6061 alloy, T6 temper for extruded structural members.
- B. Sheet Aluminum: ASTM B209, 5005 alloy, H15 or H34 temper.
- C. Steel Sections: ASTM A36/A36M; shaped to suit mullion sections, galvanized to minimum G90 coating class.
- D. Glass: Specified in Section 08 80 00.
- E. Glazing Materials: Storefront manufacturer's standard types to suit application and to achieve weather, moisture, and air infiltration requirements.
- F. Flashings: Minimum 0.032 inch thick aluminum to match mullion sections where exposed.
- G. Sealant and Backing Materials:
 - 1. Sealant used within system (Not Used for Glazing): Manufacturer's standard materials to achieve weather, moisture, and air infiltration requirements.
 - 2. Perimeter Sealant: Specified in Section 07 90 00.
- H. Fasteners: Stainless steel.
- I. Arrange fasteners and attachments to conceal from view.

2.3 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.
- E. Prepare components with internal reinforcement for door hardware.
- F. Reinforce framing members for imposed loads.

2.4 SHOP FINISHING

- A. Color Anodized Aluminum Surfaces:
 - 1. AAMA 611, AA-M12C22A44.
 - 2. Coating: Architectural Class I, 0.7 mils.
 - 3. Medium bronze
- B. Concealed Steel Items: Galvanized to ASTM A123/A123M; minimum 2.0 oz/sq ft coating thickness; galvanized after fabrication.
- C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.
- D. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.
- E. Extent of Finish:
 - 1. Apply factory coating to surfaces exposed at completed assemblies.
 - 2. Apply finish to surfaces cut during fabrication so no natural aluminum is visible in completed assemblies, including joint edges.
 - 3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

2.5 ACCESSORIES

- A. Flashings: Minimum 0.032-inch-thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify dimensions, tolerances, and method of attachment with other Work.
- C. Verify wall openings and adjoining materials are ready to receive Work of this Section.

- D. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.2 INSTALLATION

- A. Install wall system in accordance with AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent Work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent Work to form watertight dam.
- G. Coordinate attachment and seal of perimeter air and vapor retarder materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install integral flashings and integral joint sealers.
- J. Coordinate installation of glass with Section 08 80 00; separate glass from metal surfaces.
- K. Coordinate installation of perimeter sealants with Section 07 90 00.
- L. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.

3.3 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inches per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

- D. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels, and clean surfaces.
- F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

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SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes hardware for wood doors.
- B. Related Sections:
 - Section 08 17 43 – FRP / Aluminum Hybrid Doors

1.2 REFERENCES

- A. American National Standards Institute:
 - ANSI A156 - Complete Set of 24 BHMA Standards (A156 Series) with Binder.
- B. Builders Hardware Manufacturers Association:
 - BHMA Directory of Certified Products.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Final Hardware Schedule content: based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following:
 - 1. Type, style, function, size and finish of each hardware item.
 - 2. Name and manufacturer of each item.
 - 3. Fastenings and other pertinent information.
 - 4. Location of each hardware set cross referenced to indications on drawings both on floor plans and door and frame schedule.
 - 5. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 6. Mounting location for hardware.
 - 7. Door and frame sizes and materials.
- C. Submittal sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical to the Project construction schedule. Include with schedule the project data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedules.
- D. Keying Schedule: Submit a separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks have been fulfilled.
- E. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.
- F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of installed cylinders and their master key code.
- B. Operation and Maintenance Data: Submit data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- C. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following requirements:
 - 1. ANSI A156 series.
- B. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, where possible.
- C. Supplier to meet with the owner to finalize keying requirements and to obtain final instructions in writing.
- D. All hardware to meet the requirements of North Carolina State Building Code, and "Americans with Disabilities Act", (ADA).

1.6 QUALIFICATIONS

- A. Supplier Qualifications: A recognized architectural door hardware supplier, with three years documented experience / warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation
- B. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- C. Hardware Supplier: Company specializing in supplying commercial door hardware with a minimum of three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually with necessary fasteners, instructions, and installation templates, when necessary; label and identify each package with door opening code to match hardware schedule.
- B. Packaging of door hardware is the responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer, until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to the place of installation.

- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by the hardware losses both before and after installation.

1.8 COORDINATION

- A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
 - 1. Provide templates or actual hardware as required to ensure proper preparation of doors and frames.
- B. Coordinate Owner's keying requirements during course of Work.

1.9 WARRANTY

- A. Furnish a two-year manufacturer warranty for locksets and door closers.

1.10 MAINTENANCE MATERIALS

- A. Furnish special wrenches and tools applicable for each different and for each special hardware component.
- B. Furnish maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.1 DOOR HARDWARE

- A. Manufacturers:
 - 1. Provide products as hereafter specified. Substitutions other than those manufacturers listed as Approved Equals must be approved, in writing.
- B. Hinge Manufacturers:
 - 1. Stanley.
 - 2. McKinney.
 - 3. Hager.
 - 4. Ives – Select Hinges
- C. Lockset, and Cylinder Manufacturers:
 - 1. Schlage
 - 2. Yale
 - 3. Corbin Russwin
- D. Protection Plates, and Trim Manufacturers:
 - 1. Rockwood
 - 2. Trimco.
 - 3. Hager.
 - 4. Ives.
- E. Closers Manufacturers:
 - 1. Norton.
 - 2. LCN
 - 3. Sargent.
 - 4. Yale.

2.2 COMPONENTS

- A. General Hardware Requirements: Where not specifically indicated, comply with applicable ANSI A156 standard for type of hardware required. Furnish each type of hardware with accessories as required for applications indicated and for complete, finished, operational doors.
 - 1. Templates: Furnish templates or physical hardware items to door and frame manufacturers sufficiently in advance to avoid delay in Work.
 - 2. Reinforcing Units: Furnished by door and frame manufacturers; coordinated by hardware supplier or hardware manufacturer.
 - 3. Fasteners: Furnish as recommended by hardware manufacturer and as required to secure hardware.
 - a. Finish: Match hardware item being fastened.
 - 4. Keying: Keyed as directed by Owner.
 - 5. Supply keys in the following minimum quantities:
 - a. 3 keys for each door.

2.3 ACCESSORIES

- A. Lock Trim: Furnish levers with rose and escutcheon plate as indicated in Schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify doors and frames are ready to receive door hardware and dimensions are as indicated on shop drawings and instructed by manufacturer.

3.2 INSTALLATION

- A. Coordinate mounting heights with door and frame manufacturers. Use templates provided by hardware item manufacturer.
- B. Mounting Heights from Finished Floor to Center Line Hardware Item: Comply with manufacturer recommendations and applicable codes where not otherwise indicated.
 - 1. Locksets: 38 inch.
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Section. Do not install surface mounted items until finishes have been completed on the substrates involved.
- D. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers".
- G. Weather stripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

H. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

3.3 ADJUSTING

A. Adjust hardware for smooth operation.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit adjacent work to damage hardware or hardware finish.

3.5 SCHEDULES

A. The following hardware sets are intended to establish type and standard of quality when used together with these section requirements. Examine Drawings and Specifications and furnish proper hardware for door openings.

<u>DOOR NUMBER</u>	<u>SET NUMBER</u>
100B	1

Hardware Set 1:
EACH LEAF TO RECEIVE

Mfr.	Quantity	Description	Model Number	Finish
IV	2 EA	Continuous Hinge	112HD Size as needed	Bronze
VD	1 EA	Removable Mullion	KR4954	SP28
VD	1 EA	Exit Device	CD- 99NL-OP x 110 MD-NL	US26D
VD	1 EA	Exit Device	LD-99EO x 299 Exit only	US26D
HES	1 EA	Electric Strike	9400-12/24D-630	630
IVES	1 EA	Push/ Pull	9190HD-24-2	US32D
SC	1 EA	Rim Cylinder	20-057T X CMK	626
SC	1 EA	Mortise Cylinder	30-030 x 112	626
SC	2 EA	Core	Match Existing Keying	626
LCN	2 EA	Closer	4041XP SP CUSH	689

Weatherstrip and Threshold by Door Mfr .

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SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass glazing for metal windows.
- B. Related Sections:
 - 1. Section 07 90 00 - Joint Protection: Sealant and back-up material other than glazing sealants.
 - 2. Section 08 41 13 - Aluminum-Framed Entrances and Storefronts.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.
- B. ASTM International:
 - 1. ASTM C509 - Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
 - 2. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1036 - Standard Specification for Flat Glass.
 - 5. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 - 6. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 7. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
 - 8. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
 - 9. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- C. Glass Association of North America:
 - 1. GANA - Sealant Manual.
 - 2. GANA - Glazing Manual.
- D. National Fenestration Rating Council Incorporated:
 - 1. NFRC 100 - Procedures for Determining Fenestration Product U-Factors.
 - 2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
 - 3. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.3 PERFORMANCE REQUIREMENTS

- A. Glass Thickness: Select minimum thickness in accordance with ASTM E1300 to resist specified design loads with the following maximum probability of breakage:
 - 1. Vertical Glass: 8 lites per 1000 for wind loads with 60 seconds maximum load duration.
 - 2. Minimum Thickness: 1/4 inch for exterior glass.
- B. Structural Design: Design in accordance with North Carolina Building code for most critical combination of wind, snow, seismic, and dead loads.
- C. Wind Loads: Design and size glass to withstand positive and negative wind loads acting normal to plane of wall, including increased loads at building corners.
 - 1. Design Wind Load: As calculated in accordance with North Carolina Building code.
- D. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with North Carolina Building code.
- E. Exterior Glass Deflection: Maximum of 1/175 of glass edge length or 3/4 inch, whichever is less with full recovery of glazing materials.
- F. Thermal and Solar Optical Performance: Measured or calculated in accordance with the following:
 - 1. Maximum U-Values: Comply with ICC IECC for climate zone in which project is located. Measure in accordance with NFRC 100.
 - 2. Maximum SHGC: Comply with ICC IECC for climate zone in which project is located. Measure in accordance with NFRC 200.
 - 3. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings:
 - 1. Indicate sizes, layout, thicknesses, and loading conditions for glass.
- C. Product Data:
 - 1. Glass: Provide structural, physical, thermal and solar optical performance characteristics, size limitations, and special handling or installation requirements.
 - 2. Glazing Sealants, Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
- D. Samples:
 - 1. Glass: Submit two samples illustrating each glass, coloration.
- E. Manufacturer's Certificate: Certify sealed insulating glass, meets or exceeds specified requirements.
- F. Installer's Certificate: Certify glass furnished without identification label is installed in accordance with Construction Documents and North Carolina Building code.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, GANA Laminated Glass Design Guide for glazing installation methods.

1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not install glazing when the ambient temperature is less than 50 degrees F.
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

- A. Section 01 77 00 - Closeout Procedures: Product warranties and product bonds.
- B. Furnish five-year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.1 FLOAT GLASS MATERIALS

- A. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
 - 1. Furnish tempered glass where heat strengthened glass cannot meet specified performance requirements.
 - 2. Furnish tempered glass conforming to CPSC 16 CFR 1201 Category II at locations where safety glass is required by North Carolina Building Code and indicated on Drawings.

2.2 FLOAT GLASS PRODUCTS

- A. Float Glass Manufacturers:
 - 1. AFG Industries, Inc.
 - 2. Guardian Industries Corp.
 - 3. PPG Industries Model
 - 4. Pilkington North America, Inc.
- B. Clear Glass: Annealed, and Tempered float glass as specified; Class 1 clear.
 - 1. Clear tempered glass (FG-CT).
 - 2. Minimum Thickness: 1/4 inch unless otherwise indicated.
- C. Tinted Glass: Annealed and Tempered float glass as specified; Class 2 tinted. Type 1 Glass Type Exterior Insulated, outboard.
 - 1. Tinted tempered glass (FG-TT).

2. Minimum Thickness: 1/4 inch unless otherwise indicated.
- D. Low E Glass: Tempered float glass as specified; Class 1 clear, Class 2 tinted.
1. Clear Low E tempered glass (FG-ECT).
 2. Tinted Low E tempered glass (FG-ETT).
 3. Minimum Thickness: 1/4 inch unless otherwise indicated.

2.3 INSULATING GLASS PRODUCTS

- A. Insulating Glass Manufacturers:
1. AFG Industries, Inc.
 2. Guardian Industries Corp.
 3. PPG Industries.
 4. Pilkington North American (*Basis of Design*)
 5. Viracon.
 6. Guardian Sunguard
- B. Insulating Glass: ASTM E2190 certified by Insulating Glass Certification Council and Insulating Glass Manufacturers Alliance; with silicone sealant edge seal; purge interpane space with dry hermetic air filled with argon.
1. Total Unit Thickness: 1 inch unless otherwise indicated.
 2. Insulating Glass Unit Edge Seal Construction: Aluminum, bent and soldered corners.
 3. Insulating Glass Unit Edge Seal Material: black color.
- C. Double Pane Insulating Vision Glass (IG-TT): (**Type 1 per Glazing Schedule**)
1. Total Unit Thickness: 1 inch.
 2. Product: manufactured by Pilkington (Basis of Design)
 3. Outer Pane: (FG-ETT) Glass Type Pilkington Tempered Solar E Plus Grey Tint on the #2 surface.
 4. Inner Pane: (FG-TT) Glass Type Pilkington Tempered Clear
 5. U-Factor Winter: 0.29 maximum.
 6. U-Factor Summer: 0.28 maximum.
 7. Solar Heat Gain Coefficient: 0.45 maximum.
 8. UV Transmittance: 21% maximum.
 9. Visible Light Transmittance: 62% minimum.
 10. Solar Transmittance: 34% maximum.

2.4 GLAZING SEALANTS

- A. Elastomeric Glazing Sealants: Materials compatible with adjacent materials including glass, laminated glass core, insulating glass seals, and glazing channels.
1. Silicone Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, and non-staining, cured Shore A hardness of 15 to 25.
 - a. Structural Silicone: Furnish high-modulus structural silicone glazing materials where sealant bonds glass to substrate.
 2. Polyurethane Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component, chemical curing, non-staining, non-bleeding, Shore A Hardness Range 20 to 35.

- B. Dense Gaskets: Resilient extruded shape to suit glazing channel retaining slot; black color.
 - 1. Neoprene: ASTM C864.
 - 2. EPDM: ASTM C864.
 - 3. Silicone: ASTM C1115.
- C. Soft Gaskets: ASTM C509; resilient extruded shape to suit glazing channel retaining slot; black color.
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
- D. Pre-Formed Glazing Tape: Size to suit application.
 - 1. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to affect an air barrier and vapor retarder seal.
- E. Pre-Formed Glazing Tape: Size to suit application.
 - 1. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to affect an air barrier and vapor retarder seal.

2.5 GLAZING ACCESSORIES

- A. Setting Blocks: Elastomeric material recommended by glass manufacturer, 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness, minimum 3-inch-long x one half the height of glazing stop x thickness to suit application, self-adhesive on one face.
- C. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify openings for glazing are correctly sized and within acceptable tolerance.
- C. Verify surfaces of glazing channels or recesses are clean, free of obstructions impeding moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces are scheduled to receive sealant.

3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
 - 1. Glazing Sealants: Comply with ASTM C1193.
- B. Exterior Dry Method (Gasket Glazing):
 - 1. Cut glazing gasket to length; install on glazing pane. Seal corners by butting tape and sealing junctions with compatible butyl sealant.
 - 2. Place setting blocks at 1/3 points with edge block no more than 6 inches from corners.
 - 3. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
 - 4. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

3.4 CLEANING

- A. Section 01 77 00 - Closeout Procedures: Final cleaning.
- B. Remove glazing materials from the finish surfaces.
- C. Remove labels after Work is complete.
- D. Clean glass and adjacent surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. After installation, mark the pane with an 'X' by using removable plastic tape or paste.

3.6 GLAZING SCHEDULE

- A.

<u>Type</u>	<u>Description</u>
Type 1	1" Insulated tinted tempered (IG-TT)
- B. Refer to the Drawings for location of Glazing Types.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal stud wall framing.
 - 2. Gypsum board and joint treatment.
- B. Related Requirements:
 - 1. Section 06 10 00 - Rough Carpentry: Wood blocking for support of wall mounted items.
 - 2. Section 07 21 16 - Blanket Insulation: Thermal insulation.
 - 3. Section 09 30 00 – Tiling: Cementitious backer board as tile substrate.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM C475- Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 2. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
 - 3. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 4. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - 5. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
 - 6. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.
 - 7. ASTM C1396 - Standard Specification for Gypsum Board.
 - 8. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Gypsum Association:
 - 1. GA 214 - Recommended Levels of Gypsum Board Finish.
 - 2. GA 216 - Application and Finishing of Gypsum Board.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on metal framing, gypsum board joint tape and acoustic accessories.
- C. Shop Drawings:
 - 1. Indicate special details associated with fireproofing.
 - 2. Indicated framing sizes, thicknesses, and types of steel framing.
 - 3. Indicated special framing, fastening, anchorage details, including mechanical fasteners and attachment to adjoining work.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GA-214 and GA-216.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Maintain temperature at not less than 40 degrees F for the mechanical application of gypsum board unless otherwise recommended by manufacturer.
- D. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications of panels that are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Manufacturer and Product List:
 - 1. CertainTeed
 - 2. Georgia-Pacific.
 - 3. National Gypsum Co.
 - 4. United States Gypsum Co.

2.2 COMPONENTS

- A. Interior Gypsum Board:
 - 1. Standard Gypsum Board Materials: ASTM C1396:
 - 1. 5/8 inch thick
 - 2. Maximum available length in place; ends square cut, tapered edges.
 - 2. Moisture Resistant Gypsum Board ASTM C 1396:
 - 1. 5/8 inch thick,
 - 2. Maximum available length in place; ends square cut, tapered edges.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 ACCESSORIES

- A. Gypsum Board Accessories: ASTM C1047; metal and paper combination; corner beads, edge trim, and expansion joints.
 - 1. Metal Accessories: Galvanized steel.
 - 2. Edge Trim: Type L and U bead.
- B. Joint Materials: ASTM C475;
 - 1. Joint Tape:
 - a. Interior Gypsum Board: Paper.
 - 2. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

- 1) Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- C. Gypsum Board Screws: ASTM C1002; length to suit application.
1. Screws for Steel Framing: Type S; complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. Screws for Wood Framing: Type W complying with ASTM C954 for fastening panels to wood framing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions are ready to receive work and opening dimensions are as indicated on shop drawings or instructed by manufacturer.
- B. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Gypsum Board Wall Installation:
 1. Install gypsum board in accordance with GA-216, and GA-600.
 2. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing. Set gypsum board 1/2 inch above the finish floor.
 3. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
 4. Use screws when fastening gypsum board to metal furring or framing.
 5. Double Layer Applications: Use gypsum base for first layer, placed parallel to framing or furring members. Use fire rated gypsum base for fire rated partitions and ceilings]
 6. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
 7. Treat cut edges and holes in moisture resistant gypsum board with sealant.
 8. Place control joints consistent with lines of building spaces as indicated on Drawings.
 9. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- B. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - b. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - c. Finish Coat: For third coat, use drying-type, all-purpose compound.

- d. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
 - e. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.
- C. Installing Trim Accessories
- 1. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
 - 2. Control Joints: Install control joints at locations indicated on Drawings, or if no indicated on drawings, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
 - 3. Interior Trim: Install in the following locations:
 - a) Cornerbead: Use at outside corners.
 - b) L-Bead: Use where indicated.
 - c) U-Bead: Use where indicated.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

3.4 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - (1) Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - (2) Indication that panel are mold damage includes but are not limited to fuzzy or splotchy surface contamination and discoloration.

3.5 ATTACHMENTS

- A. Finishes in accordance with GA-214 Level:
 - 1. Level 1: Above finished ceilings concealed from view.
 - 2. Level 5: Walls exposed to view.

END OF SECTION

**SECTION 09 30 00
TILING**

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes porcelain tile for floor and wall applications; cementitious backer board as tile substrate; thresholds at door openings; and accessories.
- B. Related Sections:
 - 1. Section 07 90 00 – Joint Protection.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A108.1 - Installation of Ceramic Tile, A collection.
 - 2. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
 - 3. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
 - 4. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
 - 5. ANSI A118.4 - Latex-Portland Cement Mortar.
 - 6. ANSI A118.6 - Ceramic Tile Grouts.
 - 7. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units.
 - 8. ANSI A137.1 - Ceramic Tile.
- B. Tile Council of America:
 - 1. TCA - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit instructions for using grouts and adhesives.
- C. Samples: Submit mounted tile and grout on plywood panels, illustrating pattern, color variations, and grout joint size variations.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 77 00 - Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

- B. Protect adhesives and grouts from freezing or overheating.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 77 00 - Closeout Procedures: Requirements for maintenance materials.
- B. Extra Stock Materials: Furnish two percent (2%) of each size, color, and surface finish of tile specified.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not install adhesives and grouts in an unventilated environment.
- C. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

- A. Manufacturers:
 - 1. American Olean Tile Co.
 - 2. Crossville Porcelain Stone.
 - 3. Dal Tile International.
 - 4. Florida Tile Inc. – Memorable (*Basis of Design Porcelain Tile*)
 - 5. Metropolitan Ceramics.

2.2 COMPONENTS

- A. Porcelain Floor Tile: (PFT) ANSI A137.1, conforming to the following:
 - 1. Moisture Absorption: 0 to 0.5 percent.
 - 2. ANSI A326.3 – interior Wet Plus .50
 - 3. Size: 12 x 24 inches or larger.
 - 4. Shape: Rectangular
 - 5. Edge: Square or Rectified.
 - 6. Color: As selected.
- B. Porcelain Wall Tile: ANSI A137.1, conforming to the following:
 - 1. Moisture Absorption: 0 to 0.5 percent.
 - 2. Size: 12 x 24 inches.
 - 3. Shape: Rectangular
 - 4. Edge: Square or Rectified.
 - 5. Color: As selected.

2.3 ACCESSORIES

- A. Mortar Materials:
 - 1. Mortar Bed Materials; portland cement, sand, latex additive, and water.
 - 2. Mortar Bond Coat Materials:
 - a. Dry-Set Portland Cement type: ANSI A118.1.
 - b. Latex-Portland Cement type: ANSI A118.4.
- B. Grout Materials:
 - 1. Epoxy Grout: ANSI A118.8, modified epoxy emulsion grout.
 - 2. Color: As selected from manufacturer's standards.

- C. Waterproofing at Floors: Self-Curing liquid rubber polymer and reinforcing fabric as manufactured by Laticrete – Model 9235.
- D. Membrane at Walls: No. 15 asphalt saturated felt.
- E. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 5/8 inch thick; 2-inch-wide coated glass fiber tape for joints and corners; manufactured by USG Corporation - Durock.
- F. Thresholds: Extruded aluminum transition between floor tile and adjacent flooring material. Acceptable manufacturer: Schluter.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify surfaces are ready to receive work.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Waterproofing membrane application surface to be free from oil, grease, dust, paint and concrete sealers.
- D. Sand existing floor tile with 100 grit sandpaper to scruff up the surface to allow tile mortar to adhere to the existing floor surface.
- E. Adjust door jambs to accommodate the height of the new floor.
- F. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances. Do not level with gypsum or asphalt-based products.
- G. Install cementitious backer board. Tape joints and corners, cover with skim coat of dry-set mortar to feather edge.

3.3 INSTALLATION

- A. Existing Floor cracks or joints: Apply waterproofing membrane approximately 8 inches wide over the floor surface associated with the crack or joint using a paint brush or roller (heavy napped). Place 6-inch-wide anti-fracture fabric in the wet waterproofing membrane to span the crack or joint pressing down until the waterproofing membrane “bleeds” through from below. Apply another coat of waterproofing membrane over the entire floor surface associated with the fabric strip.
- B. Waterproofing Membrane application for floors and wall bases: Allow all pre-treated areas to be dry to the touch before applying the main application. Apply waterproofing membrane to the entire wall surface using a paint brush or roller (heavy napped). Lay waterproofing fabric into the wet waterproofing membrane to smooth out any wrinkles. Lap membrane seams by 2 inches. Press down until the waterproofing membrane “bleeds” through from below. Apply another coat of waterproofing membrane over the entire wall surface. Review installation after the last coat has dried to detect any pinholes, voids or thin spots in the application use additional waterproofing membrane.
- C. Wall Corners and Seams: Apply waterproofing membrane approximately 8 inches wide over the wall surface associated with the substrate corners and seams using a paint brush or roller (heavy napped). Fold 6-inch-wide anti-fracture fabric into half and place

into the wet waterproofing membrane 3 inches up walls and other vertical surfaces. Press down until the waterproofing membrane “bleeds” through from below. Apply another coat of waterproofing membrane over the fabric strip.

- D. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.
- E. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- F. Place thresholds at exposed tile edges.
- G. Cut and fit tile to penetrate through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.
 - 1. Porcelain Tile: 1/8 inch.
- I. Form internal angles square and external angles bullnosed.
- J. Sound tile after setting. Replace hollow sounding units.
- K. Keep control joints free of adhesive or grout. Apply sealant to joints.
- L. Allow tile to set for a minimum of 48 hours prior to grouting.
- M. Grout tile joints. Fully pack the joints between the tiles with a clean, hard rubber float. Work a small area at one time (5 to 10 square feet). Apply in a diagonal direction across the joint lines to prevent the grout from being dragged out of the joints. Remove any excess grout from the surface of the tile by holding the float at a 90-degree angle to the surface and moving it diagonally across the joints.
- N. Installation - Floors - Thin-Set Methods:
 - 1. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, unless otherwise indicated.
 - a. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.
- O. Installation - Wall Tile:
 - 1. Over cementitious backer units install in accordance with TCA Handbook Method W244, using membrane at restrooms.
Over interior masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat

3.4 CLEANING

- A. Section 01 77 00 - Closeout Procedures: Final cleaning.
- B. Clean tile and grout surfaces.
- C. Clean tile and grout surfaces after the grout has firmed up in the joints. Wet a grout sponge in a pail of clean water and wiring out excess liquid. Clean the tile diagonally to smooth the grout to the proper height in the joint. Continue this procedure on the next area of the floor, rinsing the sponge in clean water. Allow the grout to dry an hour before removing the remaining grout residue with a dry terrycloth towel.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustic panels.
 - 2. Suspended metal grid ceiling system and perimeter trim.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 2. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 3. ASTM A1008 – Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 4. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 5. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - 6. ASTM C423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 7. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 8. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 9. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 10. ASTM E580/E580M - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
 - 11. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
 - 12. ASTM E1477 – Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
- B. Ceilings and Interior Systems Construction Association:
 - 1. CISCA - Acoustical Ceilings: Use and Practice.
- C. National Fire Protection Association:
 - 1. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- D. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.

1.3 PERFORMANCE REQUIREMENTS

- A. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit data on metal grid system components and acoustic units.
- C. Shop Drawings:
 - 1. Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, and interrelation of mechanical and electrical items related to system. Indicate method of suspension where interference exists.
- D. Samples:
 - 1. Submit two samples 6 x 6 inch in size illustrating material and finish of acoustic units.
- E. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 77 00 - Closeout Requirements: Spare Parts and Maintenance Products.
- B. Extra Stock Materials:
 - 1. Supply an amount equal to 2% of each type of panel that is installed on the project, to the Owner.

1.6 QUALITY ASSURANCE

- A. Conform to CISCA requirements.
- B. Surface Burning Characteristics: Maximum 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.
- C. Single Source Responsibility: Provide acoustical panels and grid components by a single manufacturer.
- D. Fire-Test Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements.
- B. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustic unit installation.

1.9 SEQUENCING

- A. Sequence Work to ensure acoustic ceilings are not installed until the building has sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustic units after interior wet work is dry.
- C. Handle acoustic units carefully to avoid chipping edges or damaged units in any way.
- D. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels.

PART 2 PRODUCTS

2.1 SUSPENDED ACOUSTICAL CEILINGS

- A. Acoustic Panel Manufacturer:
 - 1. Armstrong World Industries, Inc.
 - 2. Certain Teed
 - 3. US Gypsum
- B. Suspended Grid Manufacturer:
 - 1. Armstrong World Industries, Inc.
 - 2. Certain Teed
 - 3. Chicago Metallic
 - 4. US Gypsum

2.2 COMPONENTS

- A. Acoustic Panels (ACT-1): Acoustic panels, conforming to the following:
 - 1. Model: Cortega 770 (Basis of Design).
 - 2. Size: 24 x 24 inches.
 - 3. Thickness: 5/8 inches.
 - 4. Composition: Wet-formed mineral fiber.
 - 5. Light Reflectance (LR): ASTM E1477; White Panel, 0.82.
 - 6. Noise Reduction Coefficient (NRC): ASTM C423; Classified with UL label on product carton, 0.55.
 - 7. Ceiling Attenuation Class (CAC): ASTM C1414; Classified with UL label on product carton, 33.
 - 8. Fire Resistance / Flame Spread: ASTM E1264; Class A (UL).
 - 9. Edge: Square Lay-In.
 - 10. Surface Color: White (WH).
 - 11. Surface Finish: Medium Texture, Factory applied latex paint.
 - 12. Humidity / Sag Resistance

- B. Grid:
1. Model: Prelude ML 15/16" Exposed Tee System (basis of design).
 2. Non-fire Rated Grid: ASTM C635, intermediate duty; exposed T; components die cut and interlocking.
 3. Grid Materials: Commercial quality hot dipped galvanized steel.
 4. Exposed Grid Surface Width: 15/16 inch.
 5. Perimeter Molding Width: Match grid width.
 6. Grid Finish: White (WH). Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint.
 7. Accessories: Stabilizer bars, clips, splices, and perimeter moldings required for suspended grid system.

2.3 ACCESSORIES

- A. Touch-up Paint: Type and color to match acoustic and grid units.
- B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 12 ga. diameter wire.
- C. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle-Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inchthick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch diameter bolts.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 40 00 – Quality Requirements
- B. Verify layout of hangers will not interfere with other work.
- C. Do not proceed with installation until all wet work such as concrete and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 INSTALLATION

- A. Lay-In Grid Suspension System:
1. Install suspension system in accordance with ASTM C635, ASTM C636, the manufacturer's instructions, and with the authorities having jurisdiction.
 2. Install system capable of supporting imposed loads with maximum deflection of 1/360 maximum.
 3. Locate system on room axis according to reflected plan.
 4. Lay out system to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans.
 5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.

6. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
 7. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 8. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.
 9. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Unless otherwise noted support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently. Refer to Section 25 50 00 Lighting fixtures pages 26 50 00-9 and 25 50 00-10 for additional information regarding the scope of work associated with the support of the overhead lighting. Suspended Ceiling installer to provide and install support wires to be secured to the light fixture by the Electrical Contractor.
 10. Do not eccentrically load system, or produce rotation of runners.
 11. Perimeter Molding:
 - a. Install edge molding at intersection of ceiling and vertical surfaces.
 - b. Use longest practical lengths.
 - c. Miter corners or install corner caps.
 - d. Install at junctions with other interruptions.
- B. Acoustic Units:
1. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
 2. Install units after the above ceiling work is complete.
 3. Install acoustic units in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
 4. Install acoustic units' level, in uniform plane, and free from twist, warp, and dents.
 5. Cutting Acoustic Units:
 - a. Cut to fit irregular grid and perimeter edge trim.
 - b. Cut bevel edges to field cut units.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. 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.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes resilient tile flooring and resilient base.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
 - 2. ASTM F1861 - Standard Specification for Resilient Wall Base.
- B. National Fire Protection Association:
 - 1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal Procedures.
- B. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. MSDS (Material Safety Data Sheets): Submit data for adhesives, liquid wax, and cleaning agents.
- D. Samples:
 - 1. Submit manufacturer's complete set of color samples for initial selection.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 77 00 - Closeout Requirements: Operation and Maintenance Data.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Floor Finishes and Stair Coverings: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
 - 2. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
 - 1. Color Matching: Provide wall base and accessory products from one manufacturer to ensure color matching.
 - 2. Manufacturer capable of providing technical field service representation.

- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience and approved by the manufacturer for the requirements of the project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product Storage and Handling Requirements.
- B. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.
- C. Deliver materials sufficiently in advance of installation to condition materials to room temperature prior to installation.
- D. Protect roll materials from damage by storing them on end.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- C. Store materials in the area of installation for not less than 48 hours prior to installation. Do not place in direct sunlight.
- D. Maintain a minimum 70 degrees F and maximum 85 degrees F ambient temperature three days prior to, during, and after installation. Thereafter, maintain conditions above 55 degrees F permanently.

1.9 EXTRA MATERIALS

- A. Section 01 77 00 - Closeout Procedures: Spare Parts and Maintenance Products.
- B. Furnish 20 square feet of flooring.
- C. Furnish 20 lineal feet of base of each type and color specified.

1.10 WARRANTY

- A. Furnish a five-year manufacturer's warranty.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc.
 - 2. Mannington Commercial
 - 3. Tarkett
- B. Vinyl Composition Tile: ASTM F1066:
 - 1. Size: 12 x 12 inch.
 - 2. Thickness: 0.125 inch (3.2 mm) minimum.
 - 3. Pattern: Through pattern.

2.2 RESILIENT BASE

- A. Manufacturers:
 - 1. Armstrong World Industries.
 - 2. Johnsonite. A Tarkett Company
 - 3. Roppe Corporation.
- B. Base: ASTM F1861 Type TP – Thermoplastic Rubber; straight style:
 - 1. Height: 4 inch.
 - 2. Thickness: 0.125 inch thick.
 - 3. Finish: Matte.
 - 4. Length: 100' Roll.
 - 5. Accessories: Premolded end stops.

2.3 ACCESSORIES

- A. Subfloor Filler: Cementitious; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings and Edge Strips: Same material as flooring as recommended by flooring manufacturer.
- D. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 40 00 - Quality Requirements
- B. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Apply trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.
- D. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.

3.3 EXISTING WORK

- A. Extend existing resilient flooring installations using materials and methods compatible with existing installations.

3.4 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed.

- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- C. Install tile to be installed 90 degrees to each other "basket weave" pattern. Allow minimum 1/2 full size tile width at room or area perimeter.
- D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- E. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Secure metal strips before installation of flooring with stainless steel screws.

3.5 INSTALLATION - BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use pre-molded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.6 CLEANING

- A. Section 01 77 00 - Closeout Procedures: Final Cleaning.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Clean, seal, and maintain resilient flooring products.
- D. Floor Cleaning and Finishing for all new VCT flooring; Sweep, mop, strip, wax, and buff flooring in accordance with floor wax product manufacturer's recommendations.
 - a. Apply wax at 3 micron dry film thickness per coat.
 - b. Strip and apply three coats of wax and buff.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Carpet tile, installed with pressure sensitive adhesive tabs.
 - 2. Accessories.

1.2 REFERENCE STANDARDS

- A. Carpet and Rug Institute:
 - 1. CRI Carpet Installation Standard - Standard for Installation of Commercial Carpet.
 - 2. CRI Green Label Plus Testing Program.
 - 3. CRI Model Specifications for Commercial Carpets.
- B. Consumer Products Safety Commission:
 - 1. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.
- C. National Fire Protection Association:
 - 1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

1.3 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints, installation pattern, direction of carpet pile, location of edge moldings.
- D. Samples:
 - 1. Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
 - 2. Submit two 12-inch-long samples of edge strip material for each color specified.
- E. Manufacturer's Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Operation and Maintenance Data.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Floor Finishes: Comply with one of the following:
 - a. Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
 - b. CPSC 16 CFR 1630.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 – Product Requirements.
- B. Store materials in area of installation for not less than 48 hours prior to installation. Do not place in direct sunlight.
- C. Maintain a minimum 65 degrees F and maximum 85 degrees F ambient temperature three days prior to, during, and permanently after installation.

PART 2 PRODUCTS

2.1 CARPET TILE

- A. Manufacturer List:
 - 1. Interface Flooring Systems, Inc.
 - 2. Patcraft Commercial Carpet
 - 3. Shaw Contract Group
 - 4. Tandus Centiva Powerbond

2.2 COMPONENTS

- A. Carpet Tile: Tufted, manufactured in one color dye in accordance with manufacturer's recommendations; conforming to the following criteria:
 - 1. Pile Fiber & Type: Nylon
 - 2. Dye Method: 100% Solution Dyed
 - 3. Pile Weight: minimum 18 oz/sq yd.
 - 4. Average Pile Density: minimum 5000 oz/cu yd.
 - 5. Soil/Stain Protection.
 - 6. Carpet Backing: Heterogeneous construction of nylon and closed-cell cushion.

2.3 ACCESSORIES

- A. Sub-Floor Filler: Cementitious; type recommended by flooring material manufacturer.
- B. Moldings and Edge Strips: Rubber, color as selected from manufacturer of wall base.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 40 00 – Quality Requirements.
- B. Verify floor surfaces are smooth and flat and are ready to receive work.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

3.3 INSTALLATION

- A. Install carpet tile in accordance with Carpet and Rug Institute CRI Carpet Installation Standard.
- B. Do not mix carpet from different cartons unless from same dye lot.
- C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- D. Install carpet tile in square pattern with quarter turn, set aligned as indicated on shop drawings.
- E. Locate change of color or pattern between rooms under door centerline.
- F. Install carpet tile onto clean and dry substrate with pressure sensitive self-stick adhesive tabs as recommended by manufacturer.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

- A. Section 01 77 00 -Closeout Procedures: Final Cleaning.
- B. Clean and vacuum carpet surfaces.
- C. Do not permit traffic over unprotected floor surface.
- D. Cover carpeting in traffic areas with protective non-staining building paper. Do not use plastic sheeting.

END OF SECTION

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SECTION 09 77 00
FIBERGLASS REINFORCED PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: fiberglass reinforced plastic panels and associated trim.

1.2 REFERENCES

- A. ASTM International:
 1. ASTM D 570 – Standard Test Method for Water Absorptions of Plastic.
 2. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 3. ASTM D3029 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
 4. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on Surface of Interior coatings in an Environmental Chamber
 5. ASTM D3274 – Standard Test Method for Evaluation Degree of Surface Disfigurement of Paint Films by fungal or Algal Growth, or Soil and Dirt Accumulation.
 6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide fiberglass reinforced plastic (FRP) panels which have been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product data, including manufacturer's product sheet, for specified products.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.
- D. Samples: Submit selection and verification samples for finishes, colors, and textures. Submit 2 samples of each type of panel, trim and fastener.

1.5 QUALITY ASSURANCE

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Installer Qualifications: Installer should be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project.
- C. Source Quality: Obtain fiberglass reinforced plastic (FRP) panels from a single manufacturer. Provide panels and molding only from manufacturer specified to ensure warranty and color harmonization of accessories.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers

with identification labels intact. Package sheets on skids or pallets for shipment to project site.

- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store panels indoors. Lying flat in a dry place at the project site. Panels will be allowed to acclimatize to room temperature for at least 48 hours prior to installation.
- D. Handling: Remove foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.

1.7 PROJECT CONDITIONS

- A. Section 01 60 00 - Product Requirements.
- B. Environmental Requirements:
 - 1. Installation shall not begin until the building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from gypsum board and work has dissipated.
 - 2. During installation, and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
 - 3. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.
- C. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

- 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 a limitation of other rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

- A. Acceptable Manufacturer:
 - 1. Crane Composites
 - 2. Panolam
 - 3. Fiber-Lite
 - 4. Marlite

2.2 MANUFACTURED UNITS

- A. Fiberglass reinforced Plastic (RFP) Panels:
 - 1. Size: 4' x 8'
 - 2. Color: Selected from Manufacturer Standard
 - 3. Moldings: Provide harmonizing PVC (polyvinyl chloride) moldings. Color as selected from standard.
 - 4. Rivets: Provide and install in areas where there are large fluctuations in temperature and/or humidity, where the substrate is unusually uneven, and in all low temperature or cold storage applications.
 - 5. Finish: Smooth

- B. Performance Properties: Provide products with the following properties:
 - 1. Class A flamespread of less than 25, smoke developed less than 450 per ASTM E84 latest version.
 - 2. Barcol Hardness (scratch resistance) of 45 as per ASTM D2583.
 - 3. Panels will exhibit no more than a 0.038% weight loss after a 25 cycle Taber Abrasion Test using CS-17 abrasive wheels with 1000 g weight.
 - 4. Gardner Impact Strength of 20 in-lb (4.5 J) showing no visible damage on front side per ASTM D3029.
 - 5. Water absorption: 0.16% 24 hours at 70°F degrees per ASTM D570
 - 6. Meets USDA/FSIS requirements. Does not support mold or mildew per ASTM D3273 and ASTM D3274

2.3 ACCESSORIES

- A. Adhesive: Provide panel adhesive as recommended by panel manufacturer.
- B. Division Bars, Corner Trim: Panel manufacturer's standard length extruded vinyl pieces; longest length possible to eliminate end joints.
- C. Fasteners: Noncorrosive drive rivets

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Verification of existing conditions before starting work.
- B. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails are countersunk, and joints and cracks are filled flush and smooth with the adjoining surface.
- C. Do not begin installation until backup surfaces are in satisfactory condition.

3.3 INSTALLATION

- A. Fiberglass Reinforced Panel (FRP) Installation:
 - 1. Cut and drill panels with carbide tipped saw blades or drill bits or cut with snips.
 - 2. Install panels with manufacturer's recommended gap for panel field and corner joints.
 - 3. Predrill fastener holes in panels with 1/8-inch oversize.
 - 4. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.
- B. Use products acceptable to panel manufacturer and install FRP system in accordance with panel manufacturer's printed instructions.

3.4 CLEANING

- A. Section 01 77 00 - Closeout Procedures: Final cleaning.

- B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace products that have been installed and are damaged. 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.
 - 1. Remove any adhesive or excessive sealant from panel face using solvent or cleaner recommended by panel manufacturer.

3.5 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 09 99 00
PAINTING (PROFESSIONAL LINE PRODUCTS)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
 - 2. Entire interior of School (where existing paint occurs) is to be repainted unless specifically noted on drawings.

- B. Paint exposed surfaces, except where the drawings or Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, labels and exterior galvanized steel.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Door hardware.
 - c. Finished mechanical and electrical equipment.
 - d. Light fixtures.
 - e. Signage.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Pipe spaces.
 - d. Duct shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Galvanized steel.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Galvanized Steel: Do not paint over exterior galvanized structural steel members (beams, joints, lintels, misc. members, deck, etc.).

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.

1.4 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - 2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Green Seal:
 - 1. GC-03-2nd Edition, January 7, 1997 - Anti-Corrosive Paints.
 - 2. GS-11-1st Edition, May 20, 1993 - Product Specific Environmental Requirements.
- C. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1113-January 1, 2004 - Architectural Coatings.
- D. SSPC: The Society for Protective Coatings:
 - 1. SSPC - Steel Structures Painting Manual.

1.5 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples: Samples for Initial Selection: For each type of finish-coat material indicated.
 - 1. After color selection, Architect will furnish color chips for surfaces to be coated.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 - 3. Submit Samples on the following substrates for Architect's review of color and texture only:
 - a. Concrete Unit Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.
 - b. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural or stained wood finish on representative surfaces.
 - c. Ferrous Metal: Provide two 4 inch square Samples of flat metal and 8 inch long Samples of solid metal for each color and finish.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. .

1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m).
 - b. Small Areas and Items: Architect will designate items or areas required.
2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
3. Final approval of colors will be from benchmark samples.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of materials.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F and maximum of 90 degrees F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.8 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 degrees F.
- B. Do not apply exterior coatings during rain or snow, when relative humidity is outside humidity ranges, or when moisture content of surfaces exceeds those required by paint manufacturer. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- C. Do not apply interior coating when surface and ambient temperatures are outside temperature ranges required by paint manufacturer.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
 2. Lighting Level: 80 fc, measured mid-height at substrate surface.

1.9 WARRANTY

- A. See Section 01 78 36 - WARRANTIES, for warranty requirements.
- B. Furnish five year manufacturer warranty for paints and coatings.

1.10 EXTRA MATERIALS

- A. Provide five gallons of the main wall paint color and one gallon of each color paint used. Material to be delivered to the school.
- B. Label each container with color, type, and room locations in addition to manufacturer's label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Benjamin Moore Paints.
 - 2. Duron Inc
 - 3. PPG Industries, Inc./ PPG Paints;.
 - 3. The Sherwin-Williams Company (Basis of Design).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint material containers not displaying manufacturer's product identification will not be acceptable.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
 - 1. Flat Paints and Coatings: VOC not more than 50 g/L.
 - 2. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
 - 3. Anticorrosive Coatings: VOC not more than 250 g/L.
 - 4. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
 - 5. Stains: VOC not more than 250 g/L.
 - 6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 7. Restricted Components: Paints and coatings shall not contain:
 - a. acrolein
 - b. acrylonitrile
 - c. antimony
 - d. benzene
 - e. butyl benzyl phthalate
 - f. cadmium
 - g. di (2-ethylhexyl) phthalate
 - h. di-n-butyl phthalate
 - i. di-n-octyl phthalate
 - j. 1,1,-dichlorobenzene
 - k. diethyl phthalate
 - l. dimethyl phthalate
 - m. ethylbenzene
 - n. formaldehyde
 - o. hexavalent chromium
 - p. isophorone
 - q. lead
 - r. mercury
 - s. methyl ethyl ketone
 - t. methyl isobutyl ketone
 - u. methylene chloride
 - v. naphthalene
 - w. toluene (methylbenzene)
 - x. 1,1,1, -trichloroethane

y. vinyl chloride

D. Colors: As selected from manufacturer's full range.

2.3 SUSTAINABILITY CHARACTERISTICS

A. Indoor Environmental Quality Characteristics:

1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
2. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
3. Interior Clear Wood Finishes, Floor Coatings, Stains, Primers, and Shellacs: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
4. Interior Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine all of the existing substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
 3. Inspect and test for passivators that may be present before proceeding to the coating phase. Passivators must be removed before application of the coating system.
 4. Coordinate with drawings and Owner for locations in existing building that are to be preserved and not painted over.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn,

- correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 10/NACE No. 2.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods. Lightly sand the surface to promote adhesion. Prior to coating, remove sanding dust and any residual contamination from the surface.
- D. Material Preparation:
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
 4. Ensure color uniformity in paint mixing.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Exposed mechanical items to be painted include, but are not limited to, the following:
1. Pipe hangers and supports.
 2. Heat exchangers.
 3. Tanks that do not have factory-applied final finishes.
 4. Ductwork.
 5. Insulation.
 6. Motors and mechanical equipment.
 7. Accessory items.
- G. Exposed electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
 2. Switchgear (Not already pre-finished).
 3. Panelboards (Not already pre-finished).
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime

coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats unless otherwise scheduled.
- L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.5 EXTERIOR PAINT SCHEDULE

- A. Concrete: Provide the following finish systems over exterior concrete, Stain Finish:
Primer: Loxon® Concrete & Masonry Primer Sealer, A24W8300
1st coat: A-100® Exterior Latex Satin, A82 Series
2nd coat: A-100® Exterior Latex Satin, A82 Series.
- B. Masonry: Provide the following finish systems over exterior masonry, Elastomeric
Filler: Loxon® Block Surfacer, A24W200
1st coat: ConFlex XL™ Elastomeric High Build Coating, A5-400 Series
2nd coat: ConFlex XL™ Elastomeric High Build Coating, A5-400 Series
- C. Ferrous Metal: Provide the following system over ferrous metal. Primer is not required if prime coat is proved.
Primer Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series acrylic primer.
1st coat B70 Water Base Catalyzed Epoxy, gloss.
2nd coat B70 Water Base Catalyzed Epoxy, gloss.
- D. Perimeter Building Trim Ferrous Metal: Provide the following finish systems over exterior ferrous metal, Semi-Gloss.
Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series
1st coat: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series
2nd coat: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series

- E. Exterior Window / Doors Ferrous Metal: Provide the following finish systems over exterior ferrous metal, Gloss.
Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series
1st coat: Pro Industrial™ Water Based Acrolon 100 Urethane, B65-720 Series
2nd coat: Pro Industrial™ Water Based Acrolon 100 Urethane, B65-720 Series

3.6 INTERIOR PAINT SCHEDULE

- A. Concrete: Provide the following paint systems over interior concrete and brick masonry substrates:
Filler: PrepRite® Block Filler, B25W25
1st coat: ProMar® 200 Zero VOC Interior Latex Egg-Shel, B20-2600 Series
2nd coat: ProMar® 200 Zero VOC Interior Latex Egg-Shel, B20-2600 Series
- B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry.
Primer: PrepRite® Block Filler, B25W25
1st coat: ProMar® 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
2nd coat: ProMar® 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
- C. Gypsum Board: Provide the following finish systems over interior gypsum board wall surfaces:
Primer: ProMar® 200 Zero VOC Latex Primer, B28W2600
1st coat: ProMar® 200 Zero VOC Interior Latex Egg-Shel, B20-2600 Series
2nd coat: ProMar® 200 Zero VOC Interior Latex Egg-Shel, B20-2600 Series1. Semigloss
- .D. Semi-Gloss- Provide following system over gypsum board wall surface – wet areas
Primer: ProMar® 200 Zero VOC Latex Primer, B28W2600
1st coat: Pro Industrial™ Pre-Catalyzed Waterbased Epoxy, Semi-Gloss, K46 Series
2nd coat: Pro Industrial™ Pre-Catalyzed Waterbased Epoxy, Semi-Gloss, K46 Series
- E. Gypsum Board: Provide the follow finish system over interior gypsum board ceiling surfaces
Primer: ProMar® 200 Zero VOC Latex Primer, B28W2600
1st coat: ProMar® 200 Zero VOC Interior Latex Flat, B30-2600 Series
2nd coat: ProMar® 200 Zero VOC Interior Latex Flat, B30-2600 Series
- F. Wood and Hardboard: Provide the following paint finish systems over new interior wood, Semi-Gloss surfaces:
Primer: PrepRite® ProBlock® Latex Primer/Sealer B51 Series
1st coat: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series
2nd coat: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series
- G. Ferrous Door Frames and miscellaneous metal: Provide the following finish systems over ferrous metal: Primer is not required is
Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series
1st coat: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series
2nd coat: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series
- G. Ferrous Metal Hand / Guardrails: Provide the following finish systems over ferrous metal:
Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series
1st coat: Pro Industrial™ Water Based Catalyzed Epoxy Eg-Shel B73-360 Series or Gloss, B73-300 Series
2nd coat: Pro Industrial™ Water Based Catalyzed Epoxy Eg-Shel B73-360 Series or Gloss, B73-300 Series.
- F. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
a. Finish Coats: Interior flat latex-emulsion size.

3.7 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

- A. Stained interior doors (If factory finish is not provided): Provide the following stained finishes over new interior woodwork:

Stain: Wood Classics® 250 Stain, A49-800 Series

2nd coat: Wood Classics® Waterborne Polyurethane Satin or Gloss A68 Series

3rd coat: Wood Classics® Waterborne Polyurethane Satin or Gloss A68 Series

END OF SECTION

SECTION 10 21 15
PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid plastic toilet and urinal compartments with overhead braced and floor anchored.
- B. Related Sections:
 - 1. Section 10 28 00 – Toilet Accessories: Execution requirements for accessories specified in this Section.

1.2 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Material
 - 2. ASTM D6578 Standard Practice for Determination of Graffiti Resistance
 - 3. ASTM D1037 Direct Screw Withdrawal Test
 - 4. ASTM D570 Standard Test Method for Water Absorption
 - 5. ASTM A167, 18-8, Type 304 Cast Stainless Steel
- B. National Fire Protection Association (NFPA).
- C. ADA, Accessibility Guidelines for Buildings and Facilities.
- D. American National Standards Institute, Inc.
 - 1. ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities
- E. 2005 LD-3 NEMA Standard Test, Chemical Resistance, Modulus of Elasticity, Shear Strength and Compression Strength.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: For each type of product provided, including but not limited to materials for fabrication & installation, anchors, hardware, fasteners and accessories. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
- D. Samples for Verification: Of each type of color and finish required for units, 2-inch-square sample of same thickness, sheen and finish of panels indicated on drawings.
- E. Maintenance Instructions: Provide manufacturer's printed Instructions for Cleaning and Maintenance of Installed Work.

1.5 QUALITY ASSURANCE

- A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."
- B. Flame Spread: When tested in accordance with ASTM E84, toilet partition shall meet or exceed requirements for Class B Flame Spread Rating and Smoke Developed and shall carry a Class B fire rating certification in accordance with the requirements of NFPA and ICC. Fire rating certification shall be in the name of the toilet partition manufacturer.
 - 1. Flame Spread shall not exceed 74.

2. Smoke developed shall not exceed 450.
- C. Graffiti Resistance: When tested in accordance with ASTM D6578 partition materials shall prove resistant to all chemicals tested for a period of 1 to 10 minutes and shall leave no mar or blemish when cleaned. Partition materials shall have guaranteed surface cleanability from permanent markers and shall have non-ghosting properties.
- D. Scratch Resistant: When tested in accordance with ASTM D2197, partition materials shall prove to be scratch resistant when the maximum load value exceeds 10 kilograms.
- E. Impact Resistance: When tested in accordance with ASTM D2794 partition materials shall withstand an impact force value in excess of 45 inch-lbs.
- F. Screw Holding Strength: When tested in accordance with ASTM D1037, Direct Screw Withdrawal Test, partition materials shall withstand a direct pull force that exceeds 2,500 lbs per fastener.
- G. Tensile Strength: 1.5 million psi minimum Modulus of Elasticity
- H. Shear Strength: Minimum shear strength of 2,000 psi.
- I. Water Absorption: Less than .5% per ASTM D570.
- J. Door Hardware: Hinges and mounting brackets shall be 14 gauge Type 304 stainless steel.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurement cannot be made without delaying the work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction and fixture locations to ensure actual dimensions correspond to established dimensions.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original packaging to protect from damage.
- B. Store materials in manufacturer's original packaging in accordance with manufacturer's instructions. Store materials indoors, protected from the elements and construction hazards.
- C. Handle materials in a manner that will protect the finished product.

1.8 WARRANTY

- A. See Section 01 77 00 – Closeout Procedures, for warranty requirements.
 1. Manufacturer's Fifteen year written limited warranty on its panels, pilasters and doors against breakage, corrosion, and defects in workmanship; full replacement, material and labor.
 2. Manufacturer's Ten year written limited warranty on all cast stainless steel hardware, hinges and mounting brackets and full high aluminum, mounting brackets against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ampco Inc.
 2. Bradley Corp - Bradmar.
 3. Metpar
 4. Scranton Products (*Basic of Design*)
 5. ASI Group – Accurate

2.2 COMPONENTS

- A. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges and with homogenous color and pattern throughout thickness of material. Fabricated from SEQ CHAPTER extruded polymer resins, forming single thickness panel. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
1. Color and Pattern: Selected from manufacturer's standard colors.
- B. Continuous Hinge: 14 gauge, Type 304, stainless steel with a #4 polished satin finish. Hinges shall be 3" min. wide with cam knuckles for gravity type self-closing action and .25" diameter pivot pin. In swinging hinges shall provide emergency access by lifting the door.
- C. Pilaster Shoes: 18 gauge, Type 304, stainless steel with a #4 polished satin finish. Shoes shall be 3" high and have an integral heel for structural connection to the floor with stainless steel fasteners. Shoes shall be attached to pilasters with theft proof stainless steel Torx head screws.
- D. Overhead Bracing (Headrail): Continuous heavy duty extruded 6060-T5 satin anodized aluminum with anti-grip profile. Headrail to have a 2" min. height and .125" min. wall thickness. Provide stainless steel (18 gauge min.) brackets.
- E. Slide Latch: Heavy duty, Type 304, stainless steel with a #4 polished satin finish. To be surface mounted and require less than five lbs. to operate. The slide bar to be .125" thick (min.) and 1" wide (min.). Provide a latch with an internal buffering spring.
- F. Strike and Keeper: Heavy duty, Type 304, stainless steel with a #4 polished satin finish. Shall provide emergency egress by lifting the door. Wall thickness to be .125" (min.). An integral bumper door stop to be capable of resisting a 350 lbs. impact.
- G. Coat Hook: Heavy duty, Type 304, stainless steel with a #4 polished satin finish. Hook and bumper shall project 3".
- H. Pull Handle: Heavy duty, Type 304, stainless steel with a #4 polished satin finish. Furnish two for each disable accessible door.
- I. Door Stops: Heavy duty, Type 304 stainless steel with a #4 polish satin finish. Bumper to be .25" diameter (min.) and project approximately 1.75"
- J. Anchors and Fasteners: All exposed fasteners to be Type 304 stainless steel with theft proof Torx head. Stainless steel through-bolts shall withstand a direct pull force in excess of 2000 lbs each. All fasteners shall be through-bolted unless noted otherwise.
- K. Continuous Mounting Brackets: Full height, Type 304, stainless steel with a #4 polished satin finish.
1. Continuous double ear and single ear brackets at connection to walls.
 2. Continuous "U" brackets at panel to pilaster connection.
 3. All bracket, panel and pilaster holes to be pre-drilled, 9" oc. (min.).

- L. Urinal Screens: Wall mounted with two panel brackets.

2.3 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Doors: Unless otherwise indicated, provide 24 inch wide in-swinging doors for standard toilet compartments and 36 inch wide out-swinging doors with a minimum 32 inch wide clear opening for compartments indicated to be accessible to people with disabilities.
 - 1. Hinges: Manufacturer's standard continuous 14 gage. Stainless steel hinge. Hinges shall be 3 inches wide with five (5) stainless steel wire springs for self-closing action. Pivot pin shall be .250 inch in diameter and shall be made of Type 302/304 stainless steel. Hinges shall provide emergency access by lifting the door.
 - 2. Latch and Keeper: Manufacturer's standard cast stainless steel surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities. Strike and keeper shall have .125 inch minimal wall thickness. Slide latch shall be minimum .150 inch thick. Latch shall have an internal stainless steel buffering spring to prevent damage. Latch knob shall be riveted and welded to the slide bar to ensure the knob will not come off.
 - 3. Coat Hook: Manufacturer's standard combination cast stainless steel coat hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories, but protruding out from door not less than 3 inches. The hook portion shall have a finished diameter of .25 inch.
 - 4. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Between pilasters and panels: 1/2 inch.
 - b. Between pilasters/panels and walls: 1 inch.
 - 2. No evidence of drilling, cutting and patching shall be visible.
 - 3. Continuous Brackets: Secure panels to walls and to pilasters with a continuous bracket.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position. Secure continuous overhead brace (headrail) to each pilaster with not less than two theft proof stainless steel torx head through bolts.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet partitions are without damage at Substantial Completion. Clean all exposed surfaces of partitions and hardware.

END OF SECTION

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**SECTION 10 28 00
TOILET ACCESSORIES**

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes toilet accessories and utility room accessories.
- B. Related Sections:
 - 1. Section 10 21 15 - Plastic Toilet Compartments.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 4. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.3 DESIGN REQUIREMENTS

- A. Design grab bars to resist minimum 250 lb. concentrated load applied at any point in any direction as required by North Carolina Building code.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.

1.5 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 TOILET ACCESSORIES

- A. Manufacturers:
 - 1. A & J Washroom Accessories.
 - 2. American Specialties, Inc.
 - 3. Bobrick.
 - 4. Bradley Corp.
 - 5. Kimberly-Clark Corp.

2.2 COMPONENTS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666 Type 304.
- C. Stainless Steel Tubing: ASTM A269 , Type 304 stainless steel.
- D. Galvanized Sheet Steel: ASTM A653/A653M, G90 zinc coating.
- E. Mirror Glass (Type MR-F): ASTM C1036, Type 1 transparent flat, Class 1 clear with copper and silver coating, and organic overcoating.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.
- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 TOILET ROOM ACCESSORIES

- A. Surface Mounted Toilet Tissue Dispenser (**Item 1**): Supplied by Owner, installed by General Contractor
- B. Surface Mounted Paper Towel Dispenser (**Item 2**): Supplied by Owner, installed by General Contractor
- C. Grab Bars (**Item 3**): Stainless steel, 1-1/4 inches outside diameter, minimum 18 gauge wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on Drawing schedule.
 - 2. Length: 42 inches.
 - 3. Product: Basic of Design Bobrick model # B-5806.99 x 42.
- D. Grab Bars (**Item 4**): Stainless steel, 1-1/4 inches outside diameter, minimum 18 gauge wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on Drawing schedule.
 - 2. Length: 36 inches.
 - 3. Product: Basic of Design Bobrick model # B-5806.99 x 36.
- E. Grab Bars (**Item 5**): Stainless steel, 1-1/4 inches outside diameter, minimum 18 gauge wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on Drawing schedule.
 - 2. Length: 18 inches.
 - 3. Product: Basic of Design Bobrick model # B-5806.99 x 18.
- F. Wall Mounted Soap Dispenser (**Item 6**) Supplied by Owner, installed by General Contractor.
- G. Sanitary Napkin Disposal (**Item 7**): Surface mounted disposal of high-impact grey ABS with a gloss finish on exposed surfaces. Radius corners and edges with finger-tip handles.
 - 1. Capacity: 1.3 gallon
 - 2. Product: Basic of Design Bobrick model # B-5270
- H. I. Mirror (**Item 8**): Bright-polished stainless steel 20 gauge. Mirror has 1/4" return concealing 1/4" tempered masonite backing. Furnished with four mounting screws.
 - 1. Size: 24" x 36"
 - 2. Product: Basic of Design Bobrick Model # B-1556 1824

2.4 UTILITY ROOM ACCESSORIES

- A. Mop and Broom Holder (**Item 9**): 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
 - 1. Holders: 3 spring-loaded rubber cam holders.
 - 2. Length: 24 inches.
 - 3. Length: Manufacturer's standard length for number of holders.
 - 4. Product: B-223X24 manufactured by Bobrick.

2.5 FACTORY FINISHING

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, Type SC 2, polished finish, unless otherwise noted.
- C. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
- D. Galvanizing for Nuts, Bolts and Washers: ASTM A153/A153M.
- E. Back paint components where contact is made with building finishes preventing electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify exact location of accessories for installation.
- C. Verify field measurements are as indicated on product data.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install plumb and level, securely and rigidly anchored to substrate with appropriate type anchors for substrate.
- B. Mounting Heights and Locations: As indicated in the Drawings.

END OF SECTION

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SECTION 22 05 05
COMMON PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General project related items that apply to all Division 22 sections. The provisions included in this section are complementary to and amendatory of the Division 1 sections of these project specifications - they do not replace them.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections apply to this section. Where conflicts may exist between Division 1 Specifications Sections and Division 22 Specification Sections, the Division 1 provisions shall take precedence except for when the Division 22 provisions expand, enhance, or extend the project, material or equipment requirements.

1.03 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual.
- B. NEMA MG 1 - Motors and Generators.
- C. NFPA 70 - National Electrical Code.
- D. SSPC-Paint 15 - Steel Joist Shop Paint; Steel Structures Painting Council.
- E. North Carolina State Building Code (All Volumes)

1.04 DEFINITIONS

- A. Building Code: Collectively, the current editions of all applicable codes whose requirements must be met in order for the Building Owner to be granted an Occupancy Permit by the authorities having jurisdiction over the building. These codes shall include but not be limited to the following specific volumes as well as any additional codes or standards referenced in these publications:
 - 1. General Construction.
 - 2. Administrative.
 - 3. Accessibility.
 - 4. Plumbing.
 - 5. Mechanical.
 - 6. Electrical.
 - 7. Fire Prevention.
 - 8. Fuel Gas.
 - 9. Energy Conservation.
 - 10. Existing Building Code (for existing buildings).
- B. Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing work or offering to perform work. The term "Contractor" shall apply to such entity regardless of whether the entity is working as a Prime Contractor or as a Sub Contractor on the project.
 - 1. Prime Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing or offering to perform work and who is awarded a contract with the Owner for work on this project.
 - 2. Sub Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing or offering to perform work and who is working on the project under contract with a Prime Contractor.
- C. Collectively, the current editions of all applicable laws whose requirements must be met in order for the Building Owner to provide access to the public and to occupy and conduct business lawfully including any additional laws, codes or standards referenced in these laws. These laws include but are not limited to the following:
 - 1. Americans With Disabilities Act.
 - 2. Energy Policy Act.
- D. Provide: When used in these specifications or on the drawings, the term "provide" shall mean to furnish, install, and adjust as required for safe and efficient operation.

- E. Supply: When used in these specifications or on the drawings, the term "supply" shall mean to furnish with all required appurtenances for a complete installation and advise the installing contractor on details relating to the installation as needed.
- F. Applicable version of referenced standards: Wherever standards are referenced throughout these specifications and on the drawings, the version applicable will be the year that is referenced in the current version of the Building Codes. Where later versions have been published, but not officially adopted into the current Building Codes, the later versions do not apply to this project.

1.05 GENERAL PROJECT REQUIREMENTS

- A. The plans and specifications for this project are prepared to represent the general project requirements and intent. They are diagrammatic in nature and are not intended to show each and every fitting, offset, or other modifications or minor devices that may be required in the field to provide a complete system that is safe, efficient and effective in operation. Minor components or modifications that are required to provide a safe, efficient and effective system shall be included in the bid price whether or not they are specifically called for on the plans or in these specifications. It is understood that the contractors bidding this project are required to be licensed in their respective trade and are therefore knowledgeable in the trade in which they are licensed.
- B. The Contractor shall provide all contingencies and supply all tools, fixtures, transportation, etc as well as materials necessary for installation. In all its details, the work and materials shall be subject to the approval of the Architect or Engineer whose decision on all points of difference shall be final and binding on this Contractor.
- C. The Contractor shall secure and pay for all necessary approvals, permits, inspections, certificates etc. required by state or local codes or statutes, rules, or regulations and pay all fees required unless specifically noted otherwise.
- D. All work and materials are required to be in compliance with State and Local Codes. Any conflicts between the plans and State or Local Codes, Rules, Statutes, or Regulations shall be brought to the Architect's or Engineer's attention in writing immediately.
- E. Plans are diagrammatic in nature and show the general design and arrangement of the systems. They are not intended to show each and every offset or fitting required for installation of work under this contract. This Contractor, as a licensed professional, is required to be proficient and knowledgeable in his trade and is required to include all such items and contingencies in his bid. The plans are not to be scaled for rough-in dimensions nor are they to be used for shop drawings.
 - 1. Where dimensions are given on the plans, they must be verified with actual field measurements taken on the project site. This Contractor shall take such field measurements as required to coordinate the installation of his work or to prepare shop drawings.
 - 2. Slight relocation of fixtures, equipment, devices and other items may be made by this Contractor as required to fit his work to casework, trim, brick coursing, etc as long as such relocation does not interfere with work of any other Contractor.
- F. Cutting, patching and firestopping for all work under this contract will be the responsibility of the installing contractor. Holes shall be cut in walls, floors, ceilings, etc as required for installation of materials, access for installation of materials - or other reasons as may require cutting - by this contractor for all of his work. Patching holes and spaces around installed materials or equipment shall also be by this contractor.
 - 1. All penetrations through walls, floors, ceilings, etc shall be sealed. Leave all patched surfaces in exposed locations ready for application of final finishes. Leave patched surfaces in concealed locations neat in appearance and continuous around all sides of the penetration.
 - 2. For non rated partitions, seal with caulk, grout or other approved material that is appropriate for the substrate that the patch is matched to. For 1 hour rated partitions, seal with approved non combustible materials as listed in the State Building Code. For penetrations in partitions with fire resistance ratings in excess of 1 hour, firestop penetrations with UL listed firestopping assemblies approved for the penetrating materials as well as the partition type and materials.

1.06 COORDINATION OTHER DIVISIONS

- A. Requirements noted in this division are intended to be supplementary to Division 1 requirements. Where Division 1 requirements exceed the requirements in this section, the Division 1 requirements shall govern. Where requirements in this section exceed Division 1 requirements, the requirements in this division shall govern. This Contractor is required to review the Division 1 requirements as well as other Divisions to allow coordination of his work with other trades.

1.07 PERFORMANCE REQUIREMENTS

- A. All equipment installed in fire rated walls, ceilings, or other partitions shall be listed to maintain the fire rating and shall be installed to maintain the rating.
- B. Materials (such as conduit, pipes, ducts, etc.) passing through fire rated walls, ceilings or other partitions shall be suitably firestopped using only approved materials and methods to maintain the fire rating of the assembly.
- C. Schedule all required inspections by State and Local Authorities, and make all corrections as required by such inspections.

1.08 SUBMITTALS

- A. Shop Drawings: Submit shop drawings as specified in the respective specification section. When equipment, materials or systems other than the one specified are submitted, this Contractor shall be required to clearly mark differences between the items submitted and the items specified. This Contractor shall be responsible for all changes required (including but not limited to piping, wiring, mounting, clearances, etc) under this and other divisions due to the use of items other than those specified.
 - 1. Submit shop drawings in one complete package and not at intervals.
 - 2. The Contractor shall check each submittal for accuracy and completeness prior to submitting the shop drawings to the Engineer. The Contractor shall stamp and sign the documents accordingly
 - 3. Each item being submitted for review shall be clearly identified in the submittal. In the event that multiple items are cataloged in a section and a single item is not clearly identified as the one that is being submitted, the Engineer may at his discretion select any suitable item from the page that meets or exceeds the requirements for the project.

1.09 QUALITY ASSURANCE

- A. Perform in accordance with state and local building codes, laws and ordinances.
- B. Obtain and pay for all inspections, permits, and fees required for work under this contract.
- C. Substitutions: Substitutions shall be made in accordance with the procedures given in the applicable Division 1 sections. The following procedures shall supplement the procedures given in Division 1. In the event that there are not substitution procedures given in Division 1, these procedures shall be used for all Division 22 and Division 16 items.
 - 1. When equipment, materials or systems other than the one specified are submitted, this Contractor shall be required to clearly mark differences between the items submitted and the items specified. This Contractor shall be responsible for all changes required (including but not limited to piping, wiring, mounting, clearances, etc) under this and other divisions due to the use of items other than those specified. The costs for these required changes shall be borne by the Contractor making the substitution at no additional costs to the Owner. The Engineer's decision on the acceptability of substitute equipment shall be final and binding under this contract. The acceptance of substitute items shall in no way relieve the Contractor from meeting any of the project requirements.
 - 2. Items that are to be substituted for a specified item shall be equal in quality, performance, capacity, size, construction, utility requirements, appearance, etc to the item specified.
 - 3. Substitutions may be made for all items specified using the term "or equal". Where an item is specified without the use of the term "or equal" that item must be used for the project bid. No substitutions may be made for items that are specified without the "or equal" term.
 - 4. Items exceeding the performance, efficiency, quality, etc may be used when approved by the Engineer, but no additional money will be paid under the contract for such features.

5. The Engineer may consider qualities and characteristics of the specified item which may or may not have been specifically called out in the schedules or specifications when evaluating the suitability of a substitute item. The Engineer's decision regarding the acceptability of substitute items shall be final and binding under this contract.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and properly licensed to perform the work.
- E. Install equipment to comply with the Americans With Disabilities Act requirements.

1.10 DELIVERY, STORAGE, AND PROTECTION

- A. Store materials and equipment under cover and elevated above grade until ready for installation.
- B. Deliver materials and products to project site in their original shipping containers.

1.11 PROJECT CONDITIONS

- A. Coordinate new work installation with size, location and installation of any existing service utilities. Field verify all locations of utilities prior to beginning work and as necessary during project progress.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.12 WARRANTY

- A. All labor, materials, and products supplied on this project shall have a minimum of 1 year parts and labor replacement warranty.
- B. Consult individual specification sections for additional warranty requirements. Warranty requirements stated in the subsequent specifications sections are supplemental to requirements in this warranty section.
- C. Correct defective Work within a one year period after Date of Substantial Completion unless a different date is given in Division 1 specifications sections. Provide all materials, labor, supplies etc. as required to remove, disassemble, replace, reassemble, etc. the failed or otherwise defective parts that are covered under the warranty terms.
- D. Provide five year manufacturer warranty for parts of all compressors.

1.13 MAINTENANCE SERVICE

- A. Provide service and maintenance of all equipment installed under this contract for 12 months from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials and equipment supplied on this project shall comply with the applicable standards for the material or equipment where such standard exists. All items shall be listed by Underwriters Laboratories or other approved third party listing agency where a listing is available.
- B. All materials and equipment used on the project shall be new unless specifically specified otherwise in the Project Plans or Specifications.
- C. All equipment used on the project shall be the latest current production model available at the time of bidding. No discontinued, superseded, suspended production models or otherwise obsolete equipment shall be used on this project. In the event that equipment is discontinued, superseded, or production is suspended on the models bid, current production models shall be substituted and so noted on the shop drawing submittals.
- D. All materials and equipment shall be in accordance with the North Carolina State Building Code (all volumes), local codes and ordinances and shall be approved for the intended use on the project.
- E. Materials and equipment of a similar type shall be supplied by the same manufacturer where possible. Do not provide similar products from two or more manufacturers unless a highly specialized item without equal has been specified. Do not provide similar products from two or more manufacturers if the items must fit together to provide their intended function.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are proper for the installation of material or equipment prior to installing such equipment. Correct (or have corrected) any unsatisfactory conditions prior to installing materials or equipment.

3.01 INSTALLATION

- A. Install materials and equipment in accordance with manufacturer's instructions and recommendations. Supply additional materials and labor as may be recommended by the manufacturer or where required for compliance with codes for the best installation of the materials or equipment whether such items are specifically called for otherwise in the project plans or specifications.
- B. Unless specifically shown otherwise on the plans, install all piping, concealed from view of finished spaces.
- C. Coordinate rough-in of plumbing fixtures, thermostats, etc with the requirements of the Americans With Disabilities Act requirements.
- D. Install all equipment, materials, components, etc. in accordance with the applicable Building Code requirements and Building Related Laws. The project plans and specifications are prepared with the knowledge that bidders must be licensed contractors in their respective trade, and as such, are required to be knowledgeable of code and law requirements. All materials, components, accessories or other appurtenances required by code or law for a proper, safe, efficient, and legal installation shall be included in the project base bid price. Any and all work, materials, equipment, supplies or other items made necessary by code or law requirements shall be included in the project base bid price whether or not said items are specifically called for on the project plans or in the specifications. No additional charges shall be allowed to the contract for items that are legally required by such code or laws.
- E. Provide all cutting and patching as required for installation of materials or equipment under this contract except where specifically noted otherwise on the plans.
- F. Where applicable, provide all demolition, disassembly, removal, transportation, and legal disposal of existing items that are not being reused or salvaged.
- G. Label all equipment and piping installed as well as all existing equipment and piping that remain on this project. Label equipment with engraved laminated phenolic plates secured to the exterior of the equipment. Label valves with brass valve tags and provide a Valve Tag Schedule. Label above ground pipes with the medium in the pipe and the flow direction.
- H. Identify underground piping by installing a plastic tape with indicator wire approximately 6" above the pipe.
- I. Provide all trenching and backfilling required for installation of work in this project. Backfill in 8" lifts and compact to 95% proctor unless a different compaction level is listed on the plan or in the earthwork sections of the specifications. Seed and straw disturbed grass areas. Patch disturbed paved areas equal to the adjacent paving. Provide new mulch for disturbed mulched areas.

3.01 INTERFACE WITH OTHER WORK

- A. This Contractor shall coordinate his work with that of all other Contractors on the project and shall consult the drawings and specifications of the other trades to determine the nature and effect of work by others. This Contractor shall be responsible for all his work fitting in place with in an approved manner, and shall consult with others as required for drawings, dimensions, elevations, actual building measurements, etc. as necessary to ensure that his work does fit properly and does not conflict with other trades.
- B. In the event that interferences develop, this Contractor shall cooperate with others to eliminate the interference. Should pipes, ductwork, equipment or other items have to be relocated, the Architect's or Engineer's decision will be the final authority as to which Contractor shall relocate his work.
- C. Coordinate voltage and current characteristics of all equipment installed with other Contractors, Subcontractors or Owner on the project.
- D. Coordinate the power connections for all equipment installed by this Contractor with other Contractors on the project.
- E. Consult the kitchen equipment shop drawings to determine exact rough-in and connection locations for kitchen equipment.
- F. Do not route pipes over electrical panelboards
- G. Do not route pipes through ductwork.

3.02 FIELD QUALITY CONTROL

- A. Thoroughly inspect equipment installed on this project for proper installation prior to start-up of the equipment.

- B. Adjust and test each piece of equipment to insure that all operating and safety controls are functioning safely, properly and efficiently. Replace any defective items that would prevent such operations.

3.03 STARTING EQUIPMENT AND SYSTEMS

- A. Adjust for proper operation within manufacturer's published tolerances.
- B. Demonstrate proper operation of systems to Owner's designated representative and instruct him in the proper maintenance procedures of each system.

3.04 ADJUSTING

- A. Adjust equipment for smooth, quiet, safe and efficient operation.

3.05 CLEANING

- A. Clean all equipment, piping, labels, mechanical rooms, attics etc prior to project closeout. All construction debris is to be removed and properly disposed of. Remove all stains and drips from the equipment and from the building.
- B. Protect installed material and equipment from subsequent construction operations.
- C. Do not permit traffic over unprotected floor surface.

END OF SECTION 22-05-05

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturers catalog literature for each product required.
- B. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.

2.02 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Chart: Typewritten letter size list under polycarbonate cover in anodized aluminum frame.

2.03 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
 - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
 - 6. Ductwork and Equipment: 2-1/2 inch high letters.
 - 7. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
 - 1. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
 - 2. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
 - 3. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.05 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers and Smoke Dampers: Red.
 - 3. Plumbing Valves: Green.
 - 4. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Degrease and clean surfaces for stencil painting.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats relating to terminal boxes, air handling units, or valves with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Identify air terminal units and radiator valves with numbered tags.
- K. Tag automatic controls, instruments, and relays. Key to control schematic.
- L. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- M. Install ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- N. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 22 05 53

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections apply to this section. Where conflicts may exist between Division 1 Specifications Sections and Division 23 and 25 Specification Sections, the Division 1 provisions shall take precedence except for when the Division 23 and 25 provisions expand, enhance, or extend the project, material or equipment requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
- C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.04 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER

- A. Insulation: ASTM C547 ; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 650 degrees F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
 - 1. White kraft paper with glass fiber yarn, bonded to aluminized film per ASTM C921.
 - 2. Moisture vapor transmission: ASTM E 96; 0.02 perm-inches.

- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Vapor Barrier Lap Adhesive:
 - 1. Compatible with insulation.
- E. Insulating Cement/Mastic:
 - 1. ASTM C195; hydraulic setting on mineral wool.
- F. Fibrous Glass Fabric:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Weave: 5x5.

2.03 JACKETS

- A. Canvas Jacket: UL listed.
 - 1. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
 - 2. Lagging Adhesive:
 - a. Compatible with insulation.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- C. Install in accordance with manufacturer's instructions.
- D. Install in accordance with NAIMA National Insulation Standards.
- E. Exposed Piping: Locate insulation and cover seams in least visible locations.
 - 1. Finish insulation systems that are exposed in Mechanical Rooms or other locations with canvas or fiberglass cloth covered with mastic to create a durable firm finish.
 - 2. Paint finish to Owner's color keyed identification system.
- F. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- G. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with PVC fitting covers.
- H. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- I. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- J. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with PVC fitting covers.
- K. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

1. Insert material: Hydrous calcium silicate insulation, cellular glass insulation, or other heavy density insulating material suitable for the planned temperature range.
- L. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, provide firestopping system suitable for penetrating item and penetrated.
- M. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- N. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- O. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A. Plumbing Systems:

1. Domestic Cold Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1/2"-1" inch.
(a) Thickness: 1/2 inch.
 - 2) Pipe Size Range: 1-1/4" - 3" inch.
(a) Thickness: 1 inch.
2. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1/2"-1" inch.
(a) Thickness: 1/2 inch.
 - 2) Pipe Size Range: 1-1/4" - 3" inch.
(a) Thickness: 1 inch.

END OF SECTION 22-07-19

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.

1.02 RELATED REQUIREMENTS

- A. Section 22 07 19 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).
- D. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- E. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- G. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).
- I. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- J. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- K. AWWA C651 - Disinfecting Water Mains; American Water Works Association (ANSI/AWWA C651).
- L. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute.
- M. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute
- N. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.
- O. ICC-ES AC106 - Acceptance Criteria for Pre-drilled Fasteners (Screw Anchors) in Masonry Elements.
- P. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- Q. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- R. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- S. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- T. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- U. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

1.04 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B. Project Record Documents: Record actual locations of pipe and valves.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

- D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
- E. Conform to applicable water supplier's requirements for type and installation of backflow prevention devices.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 elastomer gaskets, or lead and oakum.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 elastomer gaskets or lead and oakum.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 elastomer gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, elastomer gaskets and stainless steel clamp-and-shield assemblies.

2.04 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B 32, alloy Sn95 Tin-Antimony solder. (For piping up to 1-1/4" nominal diameter.)
 - 3. Joints: AWS A5.8, Silver alloy brazing filler BAg1. (For piping 1-1/2" nominal diameter and larger.)

2.05 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
 - 1. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.06 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.

4. Vertical Pipe Support: Steel riser clamp.
 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
 6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
 - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Conform to ASME B31.9.
- C. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
1. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 2. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 5. Vertical Support: Steel riser clamp.
 6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Plumbing Piping - Water:
1. Conform to ASME B31.9.
 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
 3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 4. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 7. Vertical Support: Steel riser clamp.
 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 10. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 6. Other Types: As required.

2.07 GLOBE VALVES

- A. Up To and Including 3 Inches:
1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends as appropriate for the application.

2.08 BALL VALVES

- A. Manufacturers: Subject to meeting project requirements, manufacturers offering products include but are not limited to:
1. Conbraco Industries; www.apollovalves.com.

2. Grinnell Mechanical Products, a Tyco International Company: www.grinnell.com.
 3. Nibco, Inc: www.nibco.com.
 4. Milwaukee Valve Company: www.milwaukeevalve.com.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.09 PLUG VALVES

- A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.10 BUTTERFLY VALVES

- A. Manufacturers: Subject to meeting project requirements, manufacturers offering products include but are not limited to:
1. Tyco Flow Control: www.tycoflowcontrol.com.
 2. Hammond Valve: www.hammondvalve.com.
 3. Crane Co.: www.cranvalve.com.
- B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.11 SWING CHECK VALVES

- A. Manufacturers: Subject to meeting project requirements, manufacturers offering products include but are not limited to:
1. Hammond Valve: www.hammondvalve.com.
 2. Nibco, Inc: www.nibco.com.
 3. Milwaukee Valve Company: www.milwaukeevalve.com.
- B. Up to 3 Inches:
1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

2.12 SPRING LOADED CHECK VALVES

- A. Manufacturers: Subject to meeting project requirements, manufacturers offering products include but are not limited to:
1. Hammond Valve: www.hammondvalve.com.
 2. Crane Co.: www.cranvalve.com.
 3. Milwaukee Valve Company: www.milwaukeevalve.com.
- B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Install piping to allow removal of equipment without requiring the removal of pipe sections.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.

- I. Provide access where valves and fittings are not exposed.
- J. Establish elevations of buried piping outside the building to ensure not less than one and one half ft of cover.
- K. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; .
 - 1. Single-ply roofs: G.C. will supply and install flashing materials on vent piping.
 - 2. Built-up roofs: Install sheet lead slashing assemblies or other approved flashing materials.
 - 3. Metal Roofs: G.C. to supply flashing assemblies. Install under this contract.
 - 4. Shingled Roofs: Provide flashing assemblies.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to the weld.
- M. Provide support for utility meters in accordance with requirements of utility companies.
- N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- O. Excavate in accordance with Division I Sections for work of this Section.
- P. Backfill in accordance with Division I Sections for work of this Section.
- Q. Install bell and spigot pipe with bell end upstream.
- R. Install valves with stems upright or horizontal, not inverted.
- S. Install valves at no more than 45 degrees from the upright position.
- T. Support cast iron drainage piping at every joint.
- U. Install water piping to ASME B31.9.
- V. Sleeve pipes passing through partitions, walls and floors. Seal air and water tight between the sleeve and pipe with approved sealant material. Provide UL firestopping assembly at pipes that penetration fire barriers.
- W. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Provide copper plated hangers and supports for copper piping.
 - 8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 9. Support cast iron drainage piping at every joint.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe or ball valves for throttling, bypass, or manual flow control services.
- E. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

- A. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.

- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

A. Pipe Hanger Spacing:

(1) Metal Piping:

- (a) Pipe size: 1/2 inches to 1-1/4 inches:
 - i. Maximum hanger spacing: 6.5 ft.
 - ii. Hanger rod diameter: 3/8 inches.
- (b) Pipe size: 1-1/2 inches to 2 inches:
 - i. Maximum hanger spacing: 10 ft.
 - ii. Hanger rod diameter: 3/8 inch.
- (c) Pipe size: 2-1/2 inches to 3 inches:
 - i. Maximum hanger spacing: 10 ft.
 - ii. Hanger rod diameter: 1/2 inch.
- (d) Pipe size: 4 inches to 6 inches:
 - i. Maximum hanger spacing: 10 ft.
 - ii. Hanger rod diameter: 5/8 inch.

(2) Plastic Piping:

(a) All Sizes:

- i. Maximum hanger spacing: 6 ft.
- ii. Hanger rod diameter: 3/8 inch.

END OF SECTION 22 10 05

SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof and floor drains.
- B. Floor drains.
- C. Cleanouts.
- D. Hose bibbs.
- E. Hydrants.
- F. Backflow preventers.
- G. Water hammer arrestors.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 40 00 - Plumbing Fixtures.
- C. Section 22 30 00 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.
- B. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering (ANSI/ASSE 1011).
- C. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering (ANSI/ASSE 1019).
- D. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute.

1.04 SUBMITTALS

- A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- C. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, and valves.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.
 - 1. Two loose keys for outside hose bibbs.

PART 2 PRODUCTS

2.01 DRAINS

2.02 ROOF DRAINS:

- A. Roof drains will be supplied and installed by the General Contractor. Connection to the drain with a flexible connector will be required under this section.

2.03 ROOF OVERFLOW DRAINS:

- A. Overflow drains will be furnished and installed by the General Contractor. Connection to the drain with a flexible connector will be required under this section.

2.04 DOWNSPOUT NOZZLES:

- A. Bronze round with offset bottom section.
- B. Internal screen assembly for pipe sizes larger than 2"

2.05 FLOOR DRAINS:

- A. Floor Drain for "finished" areas: Equal to Zurn ZN415 with square Nickalloy top.
 - 1. ASME A112.21.1M; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and square, adjustable nickel-bronze strainer.

2.06 FLOOR SINKS

- A. Rectangular cast iron with acid resistant enamel interior coating, aluminum dome strainer and nickalloy top grate.

2.07 CLEANOUTS

- A. Cleanouts at Interior Finished Floor Areas:
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and square gasketed depressed cover to accept floor finish in finished floor areas.

2.08 HOSE BIBBS

- A. Interior Hose Bibbs:
 - 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lockshield and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.09 HYDRANTS

- A. Wall Hydrants:
 - 1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, lockshield and removable key, and integral vacuum breaker.

2.10 REFRIGERATOR VALVE AND RECESSED BOX

- A. Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.11 BACKFLOW PREVENTERS

- A. Reduced Pressure Backflow Preventers:
 - 1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.12 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors:
 - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.13 MIXING VALVES

- A. THERMOSTATIC MIXING VALVES:
 - 1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
 - 2. Accessories:
 - 3. Check valve on inlets.
 - 4. Volume control shut-off valve on outlet.
 - 5. Stem thermometer on outlet.
 - 6. Strainer stop checks on inlets.
 - 7. Cabinet: 16 gage prime coated steel, for recessed mounting with keyed lock.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in a 12"x12"x6" minimum concrete pad flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to quick acting valves such as flush valves, solenoid actuated valves, etc.

END OF SECTION 22 10 06

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water heaters.
- B. Pumps.
- C. Circulators.

1.02 REFERENCE STANDARDS

- A. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.
- B. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide electrical characteristics and connection requirements.
- B. Shop Drawings:
 - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 CERTIFICATIONS

- A. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

- A. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

- A. A.O. Smith Water Products Co: www.hotwater.com.
- B. Bradford White Company: bradfordwhite.com.
- C. Bock Water Heaters, Inc: www.bockwaterheaters.com.
- D. Rheem Manufacturing Company: www.rheem.com.

2.02 RESIDENTIAL ELECTRIC WATER HEATERS

- A. Type: Automatic, electric, vertical storage.
- B. Performance:
 - 1. As scheduled on plans.
- C. Electrical Characteristics:
 - 1. As scheduled on plans.
- D. Tank: Glass lined welded steel, thermally insulated with one inch thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
- E. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light.
- F. Accessories. Provide:
 - 1. Water Connections: Brass.

2. Dip tube: Brass.
3. Drain Valve.
4. Anode: Magnesium

2.03 COMMERCIAL ELECTRIC WATER HEATERS

- A. Type: Factory-assembled and wired, electric, vertical storage.
- B. Performance:
 1. As scheduled on plans.
- C. Electrical Characteristics:
 1. As scheduled on plans.
- D. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- E. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
- F. Accessories: Provide:
 1. Dip tube.
 2. Drain Valve.
 3. Anode: Magnesium.
 4. Temperature and Pressure Relief Valve: ASME labelled.
- G. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gages.
- H. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

2.04 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible diaphragm sealed into tank, and steel legs or saddles. NSF listed.
- B. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.

2.05 IN-LINE CIRCULATOR PUMPS

- A. Subject to meeting project requirements, manufacturers include, but are not limited to:
 1. Armstrong Pumps Inc: www.armstrongpumps.com.
 2. ITT Bell & Gossett: www.bellgossett.com.
 3. Grundfoss: www.grundfoss.com
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Pipe P&T relief valve to floor or exterior as appropriate for the job condition.
- C. Coordinate with plumbing piping and related electrical work to achieve operating system.
- D. Pumps:
 1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
 2. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
 3. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 22 30 00

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Electric water coolers.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 10 06 - Plumbing Piping Specialties.
- C. Section 22 30 00 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration.
- B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers.
- C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers.
- D. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers.
- E. ASME A112.19.2 - Ceramic Plumbing Fixtures; The American Society of Mechanical Engineers.
- F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers.

1.04 SUBMITTALS

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Manufacturer's Instructions: Indicate installation methods and procedures.
- C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

- A. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, wall mounted or floor mounted as scheduled, siphon jet flush action, with chair carriers (for wall mounted), hardware, connection nipple or floor outletas required for configuration and application.
 - 1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.
 - 2. Flush Valve: Exposed (top spud) unless scheduled otherwise.
 - 3. Flush Operation: Manual, oscillating handle unless scheduled otherwise.
 - 4. Handle Height: 44 inches or less.
 - 5. Color: White.

6. Manufacturers: Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 - a. American Standard: www.americanstandard-us.com.
 - b. Eljer www.eljer.com
 - c. Kohler Company: www.kohler.com.
 - d. Zurn Industries, Inc: www.zurn.com.
 7. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories. Manual lever type unless scheduled otherwise.
 - a. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - b. ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. ADA compliant handle. Handle to be mounted on the access side of the water closet for H.C. accessible stalls (handle on the "wide" side of the stall).
 8. Seats:
 - a. Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 - 1) American Standard, Inc: www.americanstandard-us.com.
 - 2) Bemis Manufacturing Company: www.bemismfg.com.
 - 3) Church Seat Company: www.churchseats.com.
 - 4) Olsonite: www.olsonite.com.
 - 5) Zurn Industries, Inc: www.zurn.com.
 - b. Solid white plastic, open front, extended back, brass bolts, without cover.
- B. Fixture to be as specified on plan.

2.02 WALL HUNG URINALS

- A. Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 1. American Standard: www.americanstandard-us.com.
 2. Eljer: www.eljer.com.
 3. Kohler Company: www.kohler.com.
 4. Zurn Industries, Inc: www.zurn.com.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 1. Flush Volume: 0.125 gallon, maximum.
 2. Flush Style: Washout.
 3. Flush Valve: Exposed (top spud).
 4. Flush Operation: Sensor operated.
 5. Trap: Integral.
 6. Supply Size: 3/4 inch.
 7. Outlet Size: 2 inches.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories. Furnish with manual lever unless schedule otherwise.
 1. Manual Lever-Operated Type: Chrome plated brass lever actuator.
 2. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
 3. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
- D. Fixture to be as specified on plan.

2.03 LAVATORIES

- A. Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 1. American Standard: www.americanstandard-us.com.
 2. Eljer: www.eljer.com
 3. Kohler Company: www.kohler.com.
 4. Zurn Industries, Inc: www.zurn.com.
- B. Cast Iron Wall Hung Basin: ASME A112.19.1; porcelain enameled cast iron wall-hung lavatory, 19 by 17 inch minimum, with 4 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow, and soap depression.
- C. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, oval drop in with drillings on 4 inch centers, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.

- D. Fixture to be as scheduled on plan and furnished with wall bracket faucet, waste outlet, tailpiece, p-trap water supply tubing and stops.
- E. Faucets - Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 - 1. Chicago Faucets
 - 2. Delta Faucets
 - 3. Sloan
- F. Metered Faucet: ASME A112.18.1; chrome plated metered mixing faucet with battery operated solenoid operator and infrared sensor, aerator and cover plate, open grid strainer.
- G. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
 - 1. Spout Style: Standard.
 - 2. Power Supply: 24 VAC.
 - a. Direct wired to junction box.
 - b. For 24V applications, provide transformer.
 - 3. Mixing Valve: Internal, automatic.
 - 4. Water Supply: 3/8 inch compression connections.
 - 5. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
 - 6. Automatic Shut-off: 30 seconds.
 - 7. Finish: Polished chrome.
 - 8. Accessory: 4 inch deck plate.
 - 9. Lead Content: Extra low; maximum 0.25 percent by weighed average.
 - 10. Faucets - Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. The Chicago Faucet Company: www.chicagofaucets.com.
 - c. Moen Incorporated: www.moen.com.
 - d. Sloan Valve Company: www.sloanvalve.com.
 - e. Toto USA: www.totousa.com.
 - f. Zurn Industries, Inc: www.zurn.com.
- H. Accessories:
 - 1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
 - 2. Offset waste with perforated open strainer.
 - 3. Screwdriver stops.
 - 4. Rigid supplies.

2.04 SINKS

- A. Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 - 1. American Standard, Inc: www.americanstandard-us.com.
 - 2. Eljer.
 - 3. Kohler Company: www.kohler.com.
- B. Single Compartment Bowl: ASME A112.19.3; X by X by X inch outside dimensions 20 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 - 1. Drain: 1-1/2 inch chromed brass drain.
 - 2. Drain: 3-1/2 inch crumb cup and tailpiece.
- C. Double Compartment Bowl: ASME A112.19.3; X by X by X inch outside dimensions 20 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 - 1. Drain: 1-1/2 inch chromed brass drain for each bowl.
 - 2. Drain: 3-1/2 inch crumb cup and tailpiece for each bowl.
- D. Trim:
 - 1. Trim: ASME A112.18.1M; chrome plated brass supply with swing spout, vandal proof water economy aerator with maximum 2.2 gpm flow, single lever handle.
- E. Fixture to be as specified on plan.

2.05 ELECTRIC WATER COOLERS

- A. Subject to meeting project requirements, manufacturers offering products include but are not limited to:
 - 1. Tri Palm International/Oasis: www.tripalmint.com.
 - 2. Elkay Manufacturing Company: www.elkay.com.

3. Haws Corporation: www.hawesco.com.
- B. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
- C. Capacity: 8 gallons per minute of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
- D. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.
- E. Cane Detection Apron: Installed to lower the high-bowl side body to cane detection maximum height.
- F. Bottle filler where specified to be matching stainless steel and installed on low bowl.
- G. Fixture to be as specified on plan.

2.06 SERVICE SINKS

- A. Bowl: White molded stone or terazzo, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.
- B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- C. Wall guard: Polished stainless steel wall guards installed at top of basin to protect wall finish from splashing.
- D. Wall shelf and mop bracket: Furnished with fixture and installed on wall above basin so that water from wet mops will drain into the basin.
- E. Hose and hose clamp hangar: 5' of flexible hose with wall mounted self gripping hanger to hold end of hose. Install on wall near faucet.
- F. Fixture to be as specified on plan.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid brass supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Seal fixtures to wall and floor surfaces (as applicable) with mildew resistant silicone based sealant to match the fixture color. Do not use clear sealant to seal plumbing fixtures.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.08 SCHEDULES

- A. Fixture Heights: Unless detailed otherwise on the plan, install fixtures to heights above finished floor as indicated.
- B. Water Closet:
 - 1. Standard: 15 inches to top of bowl rim.
 - 2. Accessible: 18 inches to top of seat.
 - 3. Water Closet Flush Valves:
 - a. Standard: 11 inches min. above bowl rim.
- C. Urinal:
 - 1. Standard: 22 inches to top of bowl rim.
 - 2. Accessible: 17 inches to top of bowl rim.
- D. Lavatory:
 - 1. Standard: 31 inches to top of basin rim.
 - 2. Accessible: 34 inches to top of basin rim.
- E. Drinking Fountain & Water Cooler:
 - 1. Standard Adult: 40 inches to top of basin rim.
 - 2. Accessible: 36 inches to top of spout.
- F. Fixture Rough-In
 - 1. Fixture rough-ins to be as specified on plan in the "PLUMBING FIXTURE CONNECTION SCHEDULE".

END OF SECTION 22 40 00

SECTION 23-05-10

COMMON MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General project related items that apply to all Division 23 sections. The provisions included in this section are complementary to and amendatory of the Division 1 sections of these project specifications - they do not replace them.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections apply to this section. Where conflicts may exist between Division 1 Specifications Sections and Division 23 Specification Sections, the Division 1 provisions shall take precedence except for when the Division 23 provisions expand, enhance, or extend the project, material or equipment requirements.
- B. Applicable Division 26 specifications as applicable to wiring of final equipment connections.

1.03 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual.
- B. NEMA MG 1 - Motors and Generators.
- C. NFPA 70 - National Electrical Code.
- D. SSPC-Paint 15 - Steel Joist Shop Paint; Steel Structures Painting Council.
- E. North Carolina State Building Code (All Volumes)

1.04 DEFINITIONS

- A. Building Code: Collectively, the current editions of all applicable codes whose requirements must be met in order for the Building Owner to be granted an Occupancy Permit by the authorities having jurisdiction over the building. These codes shall include but not be limited to the following specific volumes as well as any additional codes or standards referenced in these publications:
 - 1. General Construction.
 - 2. Administrative.
 - 3. Accessibility.
 - 4. Plumbing.
 - 5. Mechanical.
 - 6. Electrical.
 - 7. Fire Prevention.
 - 8. Fuel Gas.
 - 9. Energy Conservation.
- B. Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing work or offering to perform work. The term "Contractor" shall apply to such entity regardless of whether the entity is working as a Prime Contractor or as a Sub Contractor on the project.
 - 1. Prime Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing or offering to perform work and who is awarded a contract with the Owner for work on this project.
 - 2. Sub Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing or offering to perform work and who is working on the project under contract with a Prime Contractor.
- C. Collectively, the current editions of all applicable laws whose requirements must be met in order for the Building Owner to provide access to the public and to occupy and conduct business

lawfully including any additional laws, codes or standards referenced in these laws. These laws include but are not limited to the following:

1. Americans With Disabilities Act.
 2. Energy Policy Act.
- D. Provide: When used in these specifications or on the drawings, the term "provide" shall mean to furnish, install, and adjust as required for safe and efficient operation.
- E. Supply: When used in these specifications or on the drawings, the term "supply" shall mean to furnish with all required appurtenances for a complete installation and advise the installing contractor on details relating to the installation as needed.

1.05 GENERAL PROJECT REQUIREMENTS

- A. The plans and specifications for this project are prepared to represent the general project requirements and intent. They are diagrammatic in nature and are not intended to show each and every fitting, offset, or other modifications or minor devices that may be required in the field to provide a complete system that is safe, efficient and effective in operation. Minor components or modifications that are required to provide a safe, efficient and effective system shall be included in the bid price whether or not they are specifically called for on the plans or in these specifications. It is understood that the contractors bidding this project are required to be licensed in their respective trade and are therefore knowledgeable in the trade in which they are licensed.
- B. The Contractor shall provide all contingencies and supply all tools, fixtures, transportation, etc. as well as materials necessary for installation. In all its details, the work and materials shall be subject to the approval of the Architect or Engineer whose decision on all points of difference shall be final and binding on this Contractor.
- C. The Contractor shall secure and pay for all necessary approvals, permits, inspections, certificates etc.. required by state or local codes or statutes, rules, or regulations and pay all fees required unless specifically noted otherwise.
- D. All work and materials are required to be in compliance with State and Local Codes. Any conflicts between the plans and State or Local Codes, Rules, Statutes, or Regulations shall be brought to the Architect's or Engineer's attention in writing immediately.
- E. Plans are diagrammatic in nature and show the general design and arrangement of the systems. They are not intended to show each and every offset or fitting required for installation of work under this contract. This Contractor, as a licensed professional, is required to be proficient and knowledgeable in his trade and is required to include all such items and contingencies in his bid. The plans are not to be scaled for rough-in dimensions nor are they to be used for shop drawings.
1. Where dimensions are given on the plans, they must be verified with actual field measurements taken on the project site. This Contractor shall take such field measurements as required to coordinate the installation of his work or to prepare shop drawings.
 2. Slight relocation of fixtures, equipment, devices and other items may be made by this Contractor as required to fit his work to casework, trim, brick coursing, etc. as long as such relocation does not interfere with work of any other Contractor.
- F. Cutting, patching and firestopping for all work under this contract will be the responsibility of the installing contractor. Holes shall be cut in walls, floors, ceilings, etc. as required for installation of materials, access for installation of materials - or other reasons as may require cutting - by this contractor for all of his work. Patching holes and spaces around installed materials or equipment shall also be by this contractor.
1. All penetrations through walls, floors, ceilings, etc. shall be sealed. Leave all patched surfaces in exposed locations ready for application of final finishes. Leave patched surfaces in concealed locations neat in appearance and continuous around all sides of the penetration.

2. For non-rated partitions, seal with caulk, grout or other approved material that is appropriate for the substrate that the patch is matched to. For 1 hour rated partitions, seal with approved non-combustible materials as listed in the State Building Code. For penetrations in partitions with fire resistance ratings in excess of 1 hour, firestop penetrations with UL listed firestopping assemblies approved for the penetrating materials as well as the partition type and materials.
- G. Provide starters for equipment supplied under this contract that requires starters unless the starters are scheduled to be a part of a motor control center. Refer to applicable Division 26 drawings and specification sections for starter requirements.
- H. Provide variable speed drives for equipment supplied under this contract that require variable speed drives. Refer to applicable Division 26 drawings and specifications sections for variable speed drive requirements.

1.06 COORDINATION OTHER DIVISIONS (AND COORDINATION DRAWINGS)

- A. Requirements noted in this division are intended to be supplementary to Division 1 requirements. Where Division 1 requirements exceed the requirements in this section, the Division 1 requirements shall govern. Where requirements in this section exceed Division 1 requirements, the requirements in this division shall govern. This Contractor is required to review the Division 1 requirements as well as other Divisions to allow coordination of his work with other trades.
- B. Coordinate with Division 26 contractor to locate point of electrical connection for each piece of equipment and to identify location for point of demarcation from Division 26 contractor wiring.

1.07 PERFORMANCE REQUIREMENTS

- A. All equipment installed in fire rated walls, ceilings, or other partitions shall be listed to maintain the fire rating and shall be installed to maintain the rating.
- B. Materials (such as conduit, pipes, ducts, etc..) passing through fire rated walls, ceilings or other partitions shall be suitably firestopped using only approved materials and methods to maintain the fire rating of the assembly.
- C. Schedule all required inspections by State and Local Authorities, and make all corrections as required by such inspections.

1.08 SUBMITTALS

- A. Submit Coordination Drawings in accordance with Division 1 requirements.
- B. Shop Drawings: Submit shop drawings as specified in the respective specification section. When equipment, materials or systems other than the one specified are submitted, this Contractor shall be required to clearly mark differences between the items submitted and the items specified. This Contractor shall be responsible for all changes required (including but not limited to piping, wiring, mounting, clearances, etc.) under this and other divisions due to the use of items other than those specified.
 1. Submit shop drawings in one complete package and not at intervals.
 2. The Contractor shall check each submittal for accuracy and completeness prior to submitting the shop drawings to the Engineer. The Contractor shall stamp and sign the documents accordingly
 3. Each item being submitted for review shall be clearly identified in the submittal. In the event that multiple items are cataloged in a section and a single item is not clearly identified as the one that is being submitted, the Engineer may at his discretion select any suitable item from the page that meets or exceeds the requirements for the project.
- C. Operation and Maintenance Manuals: Submit quantities as required in Division 1 sections (but not less than 3 sets) bound and tabbed in three ring binders with the project name, the contractors name and contact information and relevant installation, operating and maintenance data for all equipment installed on the project.

1.09 QUALITY ASSURANCE

- A. Perform in accordance with state and local building codes, laws and ordinances.

- B. Obtain and pay for all inspections, permits, and fees required for work under this contract.
- C. Substitutions: Substitutions shall be made in accordance with the procedures given in the applicable Division 1 sections. The following procedures shall supplement the procedures given in Division 1. In the event that there are not substitution procedures given in Division 1, these procedures shall be used for all Division 23 and Division 26 items.
 - 1. When equipment, materials or systems other than the one specified are submitted, this Contractor shall be required to clearly mark differences between the items submitted and the items specified. This Contractor shall be responsible for all changes required (including but not limited to piping, wiring, mounting, clearances, etc.) under this and other divisions due to the use of items other than those specified. The costs for these required changes shall be borne by the Contractor making the substitution at no additional costs to the Owner. The Engineer's decision on the acceptability of substitute equipment shall be final and binding under this contract. The acceptance of substitute items shall in no way relieve the Contractor from meeting any of the project requirements.
 - 2. Items that are to be substituted for a specified item shall be equal in quality, performance, capacity, size, construction, utility requirements, appearance, etc. to the item specified.
 - 3. Substitutions may be made for all items specified using the term "or equal". Where an item is specified without the use of the term "or equal" that item must be used for the project bid. No substitutions may be made for items that are specified without the "or equal" term.
 - 4. Items exceeding the performance, efficiency, quality, etc. may be used when approved by the Engineer, but no additional money will be paid under the contract for such features.
 - 5. The Engineer may consider qualities and characteristics of the specified item which may or may not have been specifically called out in the schedules or specifications when evaluating the suitability of a substitute item. The Engineer's decision regarding the acceptability of substitute items shall be final and binding under this contract.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and properly licensed to perform the work.
- E. Install equipment to comply with the Americans With Disabilities Act requirements.
- F. Pressure test piping systems prior to insulating or introducing system fluid, fuel gas etc. into piping system. Isolate equipment, pressure relief valves, and other specialty items that could be damaged by the test pressures. Conduct tests utilizing a chart recording device to record the piping system pressure for a period of not less than 8 hours. Provide all fittings, valves, installation and removal as required to pressurize the system and connect pressure probes to the system. Submit pressure test charts with annotated with the system tested, the test date, and the person performing the testing. Test systems as follows:
 - 1. Fuel Gas Piping: Pressurize to 100 psi air pressure. Soap joints and check for leaks. Repair as necessary and retest. After all leaks have been repaired, pressurize system and record pressure for test period. Pressure shall not decrease more than 10% during the testing period. If drastic temperature changes influence the test, repeat the testing when temperatures are not expected to change drastically.
 - 2. Hydronic Piping: Fill with water and pressurize to 125 psi using municipal water pressure if possible. Transfer pumps or compressed air may be used to surcharge the pressure if municipal water pressure is unavailable or inadequate. Pressure shall not decrease more than 10% over a 24hr. period.

1.10 DELIVERY, STORAGE, AND PROTECTION

- A. Store materials and equipment under cover and elevated above grade until ready for installation.
- B. Deliver materials and products to project site in their original shipping containers.

1.11 PROJECT CONDITIONS

- A. Coordinate new work installation with size, location and installation of any existing service utilities. Field verify all locations of utilities prior to beginning work and as necessary during project progress.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.12 WARRANTY

- A. See Division 1 Section - Closeout Submittals, for additional warranty requirements.
- B. All labor, materials, and products supplied on this project shall have a minimum of 1 year parts and labor replacement warranty. Provide an additional 4 years parts warranty for all refrigerant compressors.
- C. Consult individual specification sections for additional warranty requirements. Warranty requirements stated in the subsequent specifications sections are supplemental to requirements in this warranty section.
- D. Correct defective Work within a one year period after Date of Substantial Completion unless a different date is given in Division 1 specifications sections. Provide all materials, labor, supplies etc. as required to remove, disassemble, replace, reassemble, etc. the failed or otherwise defective parts that are covered under the warranty terms.
- E. Provide five year manufacturer warranty for parts of all compressors.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials and equipment supplied on this project shall comply with the applicable standards for the material or equipment where such standard exists. All items shall be listed by Underwriters Laboratories or other approved third party listing agency where a listing is available.
- B. All materials and equipment used on the project shall be new unless specifically specified otherwise in the Project Plans or Specifications.
- C. All equipment used on the project shall be the latest current production model available at the time of bidding. No discontinued, superseded, suspended production models or otherwise obsolete equipment shall be used on this project. In the event that equipment is discontinued, superseded, or production is suspended on the models bid, current production models shall be substituted and so noted on the shop drawing submittals.
- D. All materials and equipment shall be in accordance with the North Carolina State Building Code (all volumes), local codes and ordinances and shall be approved for the intended use on the project.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are proper for the installation of material or equipment prior to installing such equipment. Correct (or have corrected) any unsatisfactory conditions prior to installing materials or equipment.

3.02 INSTALLATION

- A. Install materials and equipment in accordance with manufacturer's instructions and recommendations. Supply additional materials and labor as may be recommended by the manufacturer or where required for compliance with codes for the best installation of the materials or equipment whether such items are specifically called for otherwise in the project plans or specifications.
- B. Unless specifically shown otherwise on the plans, install all piping, ductwork, etc. concealed from view of finished spaces.

- C. Coordinate rough-in of plumbing fixtures, thermostats, etc. with the requirements of the Americans With Disabilities Act requirements.
- D. Install all equipment, materials, components, etc. in accordance with the applicable Building Code requirements and Building Related Laws. The project plans and specifications are prepared with the knowledge that bidders must be licensed contractors in their respective trade, and as such, are required to be knowledgeable of code and law requirements. All materials, components, accessories or other appurtenances required by code or law for a proper, safe, efficient, and legal installation shall be included in the project base bid price. Any and all work, materials, equipment, supplies or other items made necessary by code or law requirements shall be included in the project base bid price whether or not said items are specifically called for on the project plans or in the specifications. No additional charges shall be allowed to the contract for items that are legally required by such code or laws.
- E. Provide additional intermediate steel members and attach the steel to the building structure as required to provide structurally sound point of attachment for piping and equipment supports. Install intermediate steel at approved panel points on bar joists. Do not attach to cross bracing that is attached to bar joists. Attach to bar joists at panel points only. Do not attach to bar joists at any point or in any manner that is not approved by the bar joist manufacturer. Paint all bare steel surfaces of supporting steel. Relocate all attachments that are found to be made in unapproved locations.

3.03 INTERFACE WITH OTHER WORK

- A. This Contractor shall coordinate his work with that of all other Contractors on the project and shall consult the drawings and specifications of the other trades to determine the nature and effect of work by others. This Contractor shall be responsible for all his work fitting in place with in an approved manner, and shall consult with others as required for drawings, dimensions, elevations, actual building measurements, etc. as necessary to ensure that his work does fit properly and does not conflict with other trades.
- B. In the event that interferences develop, this Contractor shall cooperate with others to eliminate the interference. Should pipes, ductwork, conduit, equipment or other items have to be relocated, the Architect's or Engineer's decision will be the final authority as to which Contractor shall relocate his work.
- C. Coordinate voltage and current characteristics of all equipment installed with other Contractors, Subcontractors or Owner on the project.
- D. Coordinate the power connections for all equipment installed by this Contractor with other Contractors on the project.
- E. Do not route pipes conveying water, sewer, gas or other medium over electrical panelboards.

3.04 FIELD QUALITY CONTROL

- A. Thoroughly inspect equipment installed on this project for proper installation prior to start-up of the equipment.
- B. Adjust and test each piece of equipment to ensure that all operating and safety controls are functioning safely, properly and efficiently. Replace any defective items that would prevent such operations.

3.05 STARTING EQUIPMENT AND SYSTEMS

- A. Do not operate the permanent building heating, cooling or ventilation systems before building construction activities that generate dust, flyings or other debris are completed and the building has been cleaned to a "broom clean" condition. Do not operate the permanent building systems at any time before the building is in a cleaned condition without temporary filters installed over return and exhaust inlets to prevent entry of construction dirt into the systems. Remove all temporary filters upon completion of the facility. Any coils, fans, ducts, plenums, air inlets, air outlets, or other equipment in the airstream found to have an accumulation of dirt shall be cleaned by the contractor prior to Owner acceptance of the facility.

- B. Provide manufacturer's field representative to prepare and start major equipment such as boilers, chillers, condensing units larger than 25 tons, water heaters in excess of 60,000 btuh, variable frequency drives, energy recovery equipment, and air handling units larger than 10,000 cfm.
- C. Adjust for proper operation within manufacturer's published tolerances.
- D. Demonstrate proper operation of systems to Owner's designated representative and instruct him in the proper maintenance procedures of each system.

3.06 ADJUSTING

- A. Adjust equipment for smooth, quiet, safe and efficient operation.

3.07 CLEANING

- A. Clean all equipment, piping, ductwork, labels, mechanical rooms, attics etc. prior to project closeout. All construction debris is to be removed and properly disposed of. Remove all stains and drips from the equipment and from the building.
- B. Protect installed material and equipment from subsequent construction operations.
- C. Do not permit traffic over unprotected floor surface.

END OF SECTION 23-05-10

SECTION 23-05-13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators.
- C. NEMA MG 1 - Motors and Generators.
- D. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- C. Operation Data: Include instructions for safe operating procedures.
- D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for HVAC use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.
- B. Conform to NFPA 70.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

- A. Provide five year manufacturer warranty for motors larger than 5 horsepower.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Lincoln Motors: www.lincolnmotors.com.
- B. A. O. Smith Electrical Products Company: www.aosmithmotors.com.
- C. Reliance Electric/Rockwell Automation: www.reliance.com.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service:

1. As scheduled for each piece of equipment.
 - a. Voltage listed in schedules is the nominal electrical system supply voltage. Motor must be rated for the system supply voltage and must be rated for operation at plus or minus 10% of the rated voltage.
 - b. Statements such as "Suitable for use" at a specific voltage on the nameplate will identify that the motor is not rated for use on that voltage and is therefore not a suitable application for the listed voltage as a system voltage.
- B. Nominal Efficiency:
 1. Comply with federal laws and state codes for efficiency requirements.
- C. Construction:
 1. Open drip-proof type except where specifically noted otherwise.
 2. Design for continuous operation in 104 degrees F environment.
 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- E. Wiring Terminations:
 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Terminals shall be rated for min 75C temperature rise. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.
- F. Shaft Grounding:
 1. Motor shaft must be equipped with shaft grounding means to prevent motor bearing failures due to VFD induced bearing currents. Shaft grounding is required for all motors whether initially controlled by VFD or not due to the likelihood that a VFD may later be applied to control the motor operation.
- G. Inverter Duty Rated:
 1. Motors shall be constructed to withstand voltage spikes produced by VFD control and rated for VFD compatibility. Inverter Duty Rating is required for all motors whether initially controlled by VFD or not due to the likelihood that a VFD may later be applied to control the motor operation.

2.03 APPLICATIONS

- A. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.
- B. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
- C. Single phase motors for fans, pumps, and blowers: Capacitor start type.
- D. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.
- E. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.
- F. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

2.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.

- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, pre-lubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings.

2.05 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, pre-lubricated sleeve or ball bearings, automatic reset overload protector.

2.06 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, pre-lubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings.

2.07 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26-29-13.
- I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- J. Sound Power Levels: To NEMA MG 1.
- K. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

- L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- M. Nominal Efficiency: As indicated at full load and rated voltage when tested in accordance with IEEE 112.
- N. Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate. Insure that voltage is at least 10% above XXX value if the statement "Suitable for use at XXX Volts" is present on nameplate. Motor must be replaced with suitable system voltage rated motor if needed.
- D. Check for proper rotation direction and adjust phase wiring connections if incorrect.
- E. Check for proper amp draw and insure any overloads are properly sized for the motor.
- F. Check for unusual sounds or vibrations. Repair source if any found.
- G. Check for proper operating temperature rise. If rise exceeds anticipated amount, troubleshoot and repair or replace motor as required.

END OF SECTION 23-05-13

SECTION 23-05-53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive Labels.
- D. Stencils.
- E. Pipe markers.
- F. Ceiling tacks.

1.02 RELATED REQUIREMENTS

- A. Section 09-91-23 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.04 SUBMITTALS

- A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Nameplates.
- C. Automatic Controls: Tags. Key to control schematic.
- D. Control Panels: Nameplates.
- E. Dampers: Ceiling tacks (orange), where located above lay-in ceiling.
- F. Ductwork: Stenciled painting.
- G. Heat Transfer Equipment: Nameplates.
- H. Instrumentation: Tags.
- I. Major Control Components: Nameplates.
- J. Piping: Pipe markers.
- K. Pumps: Nameplates.
- L. Relays: Nameplates or machine printed adhesive labels.
- M. Small-sized Equipment: Tags.
- N. Tanks: Nameplates.
- O. Thermostats: Machine printed adhesive labels.
- P. Valves: Tags and ceiling tacks where located above lay-in ceiling.
- Q. Water Treatment Devices: Nameplates.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.

- B. Champion America, Inc: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brimar Industries, Inc.: www.pipemarker.com.
 - 3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 4. Seton Identification Products: www.seton.com.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Background Color: Black.

2.04 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Brimar Industries, Inc.: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 5. Seton Identification Products: www.seton.com.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.05 ADHESIVE LABELS

- A. Commercial grade labels with bold black letters. Labels shall be machine printed with a commercial grade label maker. Labels shall be water resistant mylar film and lettering shall be permanently impregnated into the label so that it does not flake or peel off from the base material. Labels shall have fully adhesive coated back. Letter and numbers shall be printed in a bold font. Labels shall be of the following minimum widths and colors.
 - 1. 3/4" wide with 1/2" high black letters for labels affixed to thermostats and items smaller than thermostats.
 - 2. 1" wide with 3/4" high black letters for labels affixed to ceilings and to items larger than thermostats
 - 3. Background colors as follows:
 - a. Clear background for controls components.
 - b. Green color background for plumbing components.
 - c. Blue color background for HVAC valves.
 - d. Yellow color background HVAC equipment.
 - e. Red color background for fire dampers, smoke dampers, etc.

2.06 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
 - 5. Ductwork and Equipment: 2-1/2 inch high letters.

2.07 PIPE MARKERS

- A. Color: Conform to ASME A13.1.

- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.08 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers and Smoke Dampers: Red.
 - 3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners (screws or rivets). Adhesives may be used as supplemental fixation, but mechanical fasteners will still be required to ensure the nameplates are permanently secured.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09-91-23.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. Identify air handling units, pumps, chillers, boilers, miscellaneous heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- H. Identify control panels and major control components outside panels with plastic nameplates.
- I. Identify thermostats relating to terminal boxes or valves with nameplates or clear labels with black letters.
- J. Identify valves in main and branch piping with tags.
- K. Identify air terminal units valves with nameplates.
- L. Tag or label automatic controls, instruments, and relays. Key to control schematic.
- M. Paint all gas piping and fittings with 2 coats of safety yellow oil based enamel semi-gloss paint for easy identification.
- N. Paint exposed hydronic piping insulation systems with 2 coats of paint in accordance with the following color code:
 - 1. Chilled Water Piping: Light Blue
 - 2. Hot Water Piping: Light Red
 - 3. Makeup Water Piping: Dark Blue
- O. Paint pipe insulation shields and pipe hangers that are exposed to match the piping supported.
- P. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 12 feet on straight runs including risers and

drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

- Q. Install ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- R. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.
- S. Provide adhesive labels secured to t-bar grid to identify the specific component located above the tack by its unique identifier number listed in the valve schedule, equipment schedule, or other tabulation of components. Attach the label to the bottom of the grid nearest the ceiling tack. Insure full adhesion of the label to the grid.

END OF SECTION 23-05-53

SECTION 23-05-93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of hydronic systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems.

1.03 SUBMITTALS

- A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
 - 4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 7. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - 8. Include detailed procedures, agenda, sample report forms prior to commencing system balance.
 - 9. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.
 - 10. Include the following on the title page of each report:
 - a. Project name.
 - b. Project location.
 - c. Project Engineer.

- d. Project Engineer.
 - e. Project Contractor.
 - f. Project altitude.
 - g. Report date.
- C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.04 QUALITY ASSURANCE (MOVED TO PART 3)

- A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section. TAB agency shall be certified by either AABC or NEBB. The TAB contractor shall be a subcontractor to the Mechanical Contractor.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Hydronic systems are flushed, filled, and vented.
 6. Pumps are rotating correctly.
 7. Proper strainer baskets are clean and in place.
 8. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Hydronic Systems: Adjust to within plus or minus 5 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. HVAC Packaged Units.
 - 2. Fans
 - 3. Packaged Wall Mounted Heat Pumps.
 - 4. Air distribution system supply, return, exhaust grilles registers and diffusers.

END OF SECTION 23-05-93

SECTION 23-07-13

DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

1.02 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- C. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation.
- D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 JACKETS

- A. Aluminum Jacket: ASTM B209 (ASTM B209M).
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
 - 6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.03 DUCT LINER

- A. Manufacturers:
 - 1. Knauf Insulation: www.knaufinsulation.com.
 - 2. Johns Manville: www.jm.com.
 - 3. Owens Corning Corporation: www.ocbuildingspec.com/sle.
 - 4. CertainTeed Corporation: www.certainteed.com.
- B. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
 - 1. Fungal Resistance: No growth when tested according to ASTM G21.
 - 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 - 3. Service Temperature: Up to 250 degrees F.
 - 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 - 5. Minimum Noise Reduction Coefficients:
 - a. 1 inch Thickness: 0.45.

- C. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- D. Liner Fasteners: Galvanized steel, self-adhesive pad, impact applied, or welded with integral head.
- E. Greenguard Certified for Schools.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- E. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- F. Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 90 percent coverage.
 - 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

END OF SECTION 23-07-13

SECTION 23-07-19

HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09-91-23 - Interior Painting: Painting insulation jacket.
- B. Section 23-21-13 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
- G. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
- H. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Samples: Submit two samples of any representative size illustrating each insulation type.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum five years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation: www.knaufinsulation.com.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com.
- B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 650 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Blanket: 1.0 lb/cu ft density.
 - 3. Weave: 5 by 5.
- H. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- I. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Insulating Cement: ASTM C449.

2.03 CELLULAR GLASS

- A. Insulation: ASTM C552, Type II.
 - 1. 'K' Value: Grade 6, 0.35 at 100 degrees F.
 - 2. Service Temperature: Up to 800 degrees F.
 - 3. Water Vapor Permeability: 5 perm inch .
 - 4. Water Absorption: 0.5 percent by volume, maximum.

2.04 JACKETS

- A. PVC Plastic.
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil.
 - e. Connections: Brush on welding adhesive.

- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature.
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation, cellular glass insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to firestopping details.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.
- L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

- M. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

- A. Heating Systems:
1. Heating Water Supply and Return:
 - a. Pipe Sizes 1/2" to 1.5"
 - 1) 1" wall thickness glass fiber pipe insulation with all service jacket.
 - b. Pipe Sizes 2" and larger
 - 1) 2" wall thickness glass fiber pipe insulation with all service jacket.
- B. Cooling Systems:
1. Chilled Water Supply and Return:
 - a. Pipe Sizes 1/2" to 1.5"
 - 1) 1" wall thickness glass fiber pipe insulation with all service jacket.
 - b. Pipe Sizes 2" and larger
 - 1) 2" wall thickness glass fiber pipe insulation with all service jacket.
 2. Condensate Drains from Cooling Coils:
 - a. Pipe Sizes 1/2" to 3"
 - 1) 1" wall thickness glass fiber pipe insulation with all service jacket.
- C. Other Systems:
1. Piping Exposed to Freezing with Heat Tracing:
 - a. Pipe Sizes 1/2" to 1.5"
 - 1) 1.5" wall thickness glass fiber pipe insulation with all service jacket and aluminum jacket cover.
 - b. Pipe Sizes 2" and larger
 - 1) 2" wall thickness glass fiber pipe insulation with all service jacket and aluminum jacket cover.
- D. Refrigerant Gas Piping:
1. Interior piping not exposed to sunlight:
 - a. Pipe Sizes 1/2" to 1.5"
 - 1) 1/2" wall thickness flexible unicellular with all joints and seams sealed. Use seamless tubing for new piping.
 2. Exterior piping exposed to sunlight or weather conditions:
 - a. Pipe Sizes 1/2" to 1.5"
 - 1) 1/2" wall thickness flexible unicellular with all joints and seams sealed. Use seamless tubing for new piping.
 - 2) Paint exposed piping with latex paint per manufacturer's instructions to protect from UV degradation.
 - 3) Provide metal cover to match color of downspout material to cover exposed piping installed on exterior wall.

END OF SECTION 23-07-19

SECTION 23-31-00

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Duct cleaning.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.
- G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.05 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.
- D. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. pressure class, galvanized steel.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - 3. For Use With Flexible Ducts: UL labeled.

- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Insulation:
 - a. Thickness: 1 inch.
 - b. Material: Fiberglass.
- B. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with aluminized vapor barrier film.
 - 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 - 3. Maximum Velocity: 4000 fpm.
 - 4. Temperature Range: Minus 20 degrees F to 210 degrees F.
- C. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- I. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.
- J. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION 23-31-00

SECTION 23-33-00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Backdraft dampers - fabric.
- C. Duct access doors.
- D. Duct test holes.
- E. Flexible duct connections.
- F. Volume control dampers.
- G. Miscellaneous products:
 - 1. Duct opening closure film.

1.02 RELATED REQUIREMENTS

- A. Section 23-31-00 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.04 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc: www.louvers-dampers.com.
 - 2. Nailor Industries Inc: www.nailor.com.
 - 3. Ruskin Company: www.ruskin.com.

2.02 BACKDRAFT DAMPERS - FABRIC

- A. Fabric Backdraft Dampers: Factory-fabricated.
 - 1. Blades: Neoprene coated fabric material.
 - 2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
 - 3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.03 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Acudor Products Inc: www.acudor.com.
 - 2. Elgen Manufacturing: www.elgenmfg.com.
 - 3. Nailor Industries Inc: www.nailor.com.
 - 4. Ruskin Company: www.ruskin.com.

5. SEMCO Incorporated: www.semcohvac.com.
6. Ward Industries by Commercial Products Group of Hart & Cooley, Inc: www.wardind.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.04 DUCT TEST HOLES

2.05 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 1. Carlisle HVAC Products: www.carlislehvac.com.
 2. Elgen Manufacturing: www.elgenmfg.com.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - a. Net Fabric Width: Approximately 2 inches wide.
 2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.
- D. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.
- E. Maximum Installed Length: 14 inch.

2.06 VOLUME CONTROL DAMPERS

- A. Splitter Dampers:

2.07 MISCELLANEOUS PRODUCTS

- A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
 1. Thickness: 2 mils.
 2. High tack water based adhesive.
 3. UV stable light blue color.
 4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23-31-00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- G. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

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- I. Use splitter dampers only where indicated.
- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 23-33-00

SECTION 23-34-23

HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof exhausters.
- B. Wall exhausters.
- C. Cabinet exhaust fans.
- D. Ceiling exhaust fans.

1.02 RELATED REQUIREMENTS

- A. Section 23-05-13 - Common Motor Requirements for HVAC Equipment.
- B. Section 23-05-48 - Vibration Controls for HVAC Piping and Equipment.
- C. Section 23-33-00 - Air Duct Accessories: Backdraft dampers.
- D. Section 26-05-83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program.
- B. AMCA 99 - Standards Handbook.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- I. UL 705 - Power Ventilators.
- J. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of ventilators with size, location and installation of service utilities.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Indicate installation instructions.
- C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.

1.07 FIELD CONDITIONS

- A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck: www.greenheck.com.
- B. Loren Cook Company: www.lorencook.com.
- C. PennBarry: www.pennbarry.com.

2.02 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- G. Enclosed Safety Switches: Conform to NEMA 250.
- H. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.03 WALL EXHAUSTERS

- A. Performance as scheduled on the plans.
- B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor, and wall mounted multiple speed switch.
- D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- E. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.04 CABINET EXHAUST FANS

- A. Performance as scheduled on the plans.
- B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
- D. Grille: Aluminum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide curb adapters for fans that are to be installed on existing roof curbs.

- C. Ceiling and cabinet fans:
 - 1. Support fans from structure with vibration isolation mounts. Do not attach directly to ceiling supports.
 - 2. Provide flexible duct connections to fans.
 - 3. Support ducts independent of fans.
- D. Provide sheaves required for final air balance.
- E. Install backdraft dampers on inlet to roof and wall exhausters.
- F. Provide backdraft dampers on outlet from cabinet and ceiling exhausters fans and as indicated.
- G. Verify proper rotation of fans.
- H. Verify vibration free operation of fans - repair any vibrations if present.
- I. Verify smooth operation of fans. Make adjustments if required to eliminate rubbing or squeaking.
- J. Tension belts on initial startup and re-tension after 10 hour of operation.

END OF SECTION 23-34-23

SECTION 23-37-00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.

1.02 RELATED REQUIREMENTS

- A. Section 09-91-23 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

- A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers.
- B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
- C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets.

1.04 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carnes, a division of Carnes Company Inc: www.carnes.com.
- B. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com.
- C. Price Industries: www.price-hvac.com.
- D. Metalaire: www.metalaire.com
- E. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com.
- F. Tuttle and Bailey: www.tuttleandbailey.com.

2.02 RECTANGULAR CEILING DIFFUSERS

- A. As scheduled on plans

2.03 CEILING SUPPLY REGISTERS/GRILLES

- A. As scheduled on plans
- B. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, four-way deflection.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- D. Construction: Made of aluminum extrusions with factory enamel finish.
- E. Color: As indicated.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. As scheduled on plans

- B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting.
- D. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- E. Color: As indicated.
- F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.
- G. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.05 WALL SUPPLY REGISTERS/GRILLES

- A. As scheduled on plans
- B. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- D. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- E. Color: As indicated.
- F. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.
- G. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.06 WALL SUPPLY REGISTERS/GRILLES

- A. As scheduled on plans
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Aluminum extrusions with factory off-white enamel finish.
- D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.07 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. As scheduled on plans
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Aluminum extrusions, with factory off-white enamel finish .
- D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.
- E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Coordinate diffuser and grille locations with lights, ceiling speakers, occupancy sensors, smoke detectors, ceiling grids, etc. to eliminate conflicts. Where relocation from the location indicated on the plans is required,

locate as close as possible and make modifications to other diffusers and grilles in the room to establish a uniform and symmetrical pattern.

- C. Install diffusers to ductwork with air tight connection.
- D. Provide rectangular to round transitions as required for diffusers with rectangular necks and round runouts.
- E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- F. Use dampers at diffusers and grilles only for fine balancing to reduce airflow by 10% or less. Use dampers at runout take-off for initial balancing and for all balancing requiring a flow reduction in excess of 10%.
- G. Paint ductwork visible behind air outlets and inlets matte black.
- H. Coordinate diffuser and grille type with the ceiling system. Provide plaster frame for devices in gypsum ceilings.

END OF SECTION 23-37-00

SECTION 23-40-00

HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disposable, extended area panel filters.
- B. Disposable panel filters.
- C. Filter frames.
- D. Washable permanent panel filters.
- E. Filter frames and housings.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. UL 900 - Standard for Air Filter Units.

1.04 SUBMITTALS

- A. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 FILTER MANUFACTURERS

- A. American Filtration Inc: www.americanfiltration.com.
- B. AAF International/American Air Filter: www.aafintl.com.
- C. Camfil Farr Company: www.camfilfarr.com.

2.02 DISPOSABLE, EXTENDED AREA PANEL FILTERS

- A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid by corrugated aluminum separators.
 - 1. Frame: Cardboard.
 - 2. Nominal size: 12 by 24 inches.
 - 3. Nominal thickness: 1 inch.
- B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE Std 52.2.
- C. Rating, per ASHRAE Std 52.2:
 - 1. Weight arrestance: 85 percent.
 - 2. Initial resistance at 500 FPM face velocity: 0.20 inch WG.
 - 3. Recommended final resistance: 0.9 inch WG.

2.03 DISPOSABLE PANEL FILTERS

- A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
 - 1. Nominal Size: 12 by 24 inches.
 - 2. Thickness: 1 inch.
- B. Performance Rating:
 - 1. Face Velocity: 500 FPM.
 - 2. Initial Resistance: 0.15 inch WG.
- C. Casing: Cardboard frame.
- D. Minimum MERV Rating:

1. Fan Coil Units, Unit Ventilators, Small Air Handling Units: MERV 8..
2. Packaged Units, Built-up Air Handling Units, Larger Packaged Units as capable: MERV 11.

2.06 FILTER FRAMES AND HOUSINGS

- A. General: Fabricate filter frames and supporting structures of 16 gage, 0.0598 inch galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.
- B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 by 24 inches filter media, minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.
- C. Side Servicing Housings: Flanged for insertion into ductwork, of reinforced 16 gage, 0.0598 inch galvanized steel; access doors with continuous gasketing and positive locking devices on both sides; extruded aluminum tracks or channels for primary secondary filters with positive sealing gaskets.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.
- D. Furnish air filters with all air handling units, fan powered VAV boxes, and other items noted to contain filters.

END OF SECTION 23-40-00

SECTION 23-74-14

PACKAGED WALL MOUNTED HEAT PUMP UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged wall mount unit.
- B. Unit controls.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

1.04 SUBMITTALS

- A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- B. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Filters: One set for each unit.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.07 WARRANTY

- A. Provide a five year warranty to include parts and labor coverage for entire unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers offering products for consideration subject to meeting requirements and job conditions, include but are not limited to
 - 1. Bard Manufacturing: www.bard.com.
 - 2. Marvair: www.marvair.com.

2.02 PERFORMANCE REQUIREMENTS

- A. Performance as scheduled on the drawings.

2.03 MANUFACTURED UNITS

- A. General: Roof mounted units having electric heating elements and electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, economizer exhaust fan, electric heating elements, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
- D. Electrical Characteristics:
 - 1. As scheduled on the drawings and verified with available building voltage.
- E. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26-27-17.
- F. Service Receptacle: Furnish the unit with a non-powered service receptacle suitable for field wiring.

2.04 FABRICATION

- A. Cabinet: Construction shall be a single, enclosed, weatherproof casing constructed of 20-gauge galvanized steel. Unit base is constructed of 16-gauge galvanized steel. Each exterior casing panel to be bonderized and finished with baked-on exterior polyester enamel paint prior to assembly. The baked-on cured paint finish shall pass the industry rub test with a minimum of 72 rubs MEK (Methyl, Ethyl Ketone) or standard rub test of a minimum of 100 rubs using Toluene, baked on paint, designed and tested to withstand 1000 hours of salt spray test per ASTM B117-03. Cooling section shall be fully insulated with a non-fiberglass material with heavy duty foil facing for durability and ease of cleaning. Fiberglass insulation is not acceptable. Openings shall be provided for power connections. Access openings appropriate for outside structure to all fan motors and compressor for making repairs and for removing internal components without removing unit from its permanent installation. Fresh air intake and outdoor coil shall be protected from intrusions by a sturdy metal grating with less than 1/4 inch openings.
- B. Insulation: Insulation shall be non-fiberglass material with foil faced for ease of cleaning. Insulation materials used shall not contain fiberglass or formaldehyde.
- C. Supply Fan: Forward curved centrifugal type, resiliently mounted with direct drive, high efficiency ECM variable speed motor. Isolated complete fan assembly.
- D. Air Filters:
 - 1. 2 inch thick glass fiber disposable media in metal frames. Filters shall be Minimum Efficiency Reporting Value of MERV 8 per ASHRAE Standard 52.2. Filters shall be readily available commercial sizes.
- E. Drain Pan: Drain pan shall be constructed with 20-gauge galvanized steel, bonderized and finished with baked-on exterior polyester enamel paint.
- F. Mounting Brackets: Full-length, side mounting brackets shall be an integral part of the cabinet. Bottom mounting bracket shall be provided with unit.

2.05 EVAPORATOR COIL AND MOTOR

- A. The evaporator coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes. Aluminum fins shall have hydrophilic coatings to aid in condensate drainage, inhibit mold growth and protect aluminum fins from oxidation.
- B. Indoor Blower shall be 5-speed twin wheels with forward curve blades. Motor shall be high efficiency ECM with overload protection.

2.06 REFRIGERATION SYSTEM

- A. Unit shall use a high efficiency hermetic scroll compressor. The compressor shall be covered by a 5-year parts warranty. The refrigeration circuit shall be equipped with factory installed high and low pressure controls, suction and liquid access valves, compressor control module and liquid line filter dryer. A refrigerant metering device shall be included. Compressor shall be mounted on rubber grommets. Unit shall be provided with R-410A (HFC) non-ozone depleting refrigerant.
- B. Five minute timed off circuit to delay compressor start.

- C. Outdoor thermostat to energize compressor above 35 degrees F ambient.
- D. Provide step capacity control by cycling compressors.

2.07 CONDENSER COIL

- A. The condenser coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors. The condenser fan, motor and shroud shall be of slide out configuration for easy access. Condenser fan motor shall be enclosed casing with ball bearings. Open winding motors are not acceptable.

2.08 VENTILATION CONFIGURATION

- A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position. Relief dampers may be gravity balanced.
- B. Gaskets: Provide tight fitting dampers with edge gaskets maximum leakage 5 percent at 2 inches pressure differential.
- C. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.

2.09 OPERATING CONTROLS

- A. The internal control circuit shall consist of a current limiting 24VAC type transformer with resettable circuit. The defrost circuit shall consist of a solid state electronic heat pump control. A 30-minute timer shall initiate a frost cycle if the outdoor coil temperature indicates the possibility of an iced condition. The thermistor sensor, speed-up terminal for service and a ten-minute defrost override shall be standard on the electronic heat pump control. To prevent rapid compressor short cycling, a five-minute time delay circuit shall be factory installed to prevent nuisance tripping during low temperature start-up. Provide terminal strip on unit for connection of operating controls under this contract. Control shall allow for three stages of heating and two stages cooling.
- B. Electric solid state microcomputer based programmable room thermostat, located in service zone.
- C. Low ambient control.
- D. Outdoor air thermostat.
- E. Filter differential pressure switch.
- F. Economizer
 - 1. The Economizer shall be internally mounted and allow outside air to be used for free-cooling when temperature and humidity conditions are favorable. The amount of exhaust air shall vary in response to the system controls and settings defined by the user. It shall include a built in exhaust air damper. The economizer is designed to provide free cooling when outside conditions are cool and dry enough to satisfy cooling requirements without operating the compressor, providing lower operating costs while extended the life of the compressor
 - 2. Fully modulating.
 - 3. 4 cfm/ft² or less damper leakage rate at 1" w.c. pressurization.
 - 4. Simple single blade design.
 - 5. Positive shut-off with non-stick gaskets.
 - 6. Electronic DB and Enthalpy sensors.
 - 7. Honeywell JADE electronic economizer module with precision settings and diagnostics.
 - 8. Honeywell hi-torque 44 lb.-in actuator.

2.10 HOT GAS REHEAT COIL FOR DEHUMIDIFICATION

- A. Provide copper tube aluminum fin coil assembly arranged to provide reheat to the supply airstream downstream of the cooling coil.
 - 1. Provide modulating capacity control.

2. The dehumidification circuit shall incorporate an independent heat exchanger coil in the supply air stream in addition to the standard evaporator coil. This coil shall reheat the supply air after it passes over the cooling coil and shall be sized to nominally match the sensible cooling capacity of the evaporator coil. Extended run times in dehumidification mode can be achieved using waste heat from the refrigeration cycle to achieve the reheat process, while at the same time, large amounts of moisture can be extracted from the passing air stream. Models that also have electric heaters installed shall have the electric heat inhibited during dehumidification mode, although it remains available for additional reheat during certain conditions. The dehumidification cycle shall be energized by a rise in relative humidity above set point. The unit shall energize in the cooling mode and also a two position valve will energize, allowing hot refrigerant gas to pass through the reheat coil, reheating the cold air leaving the evaporator coil. An electronic expansion valve (EEV) shall be utilized to help maintain a very low sensible capacity and consistent latent capacity. The dehumidification cycle shall have on/off capability. If the thermostat calls for cooling or heating during the dehumidification cycle, the unit shall drop out of dehumidification to satisfy the call from the thermostat.

2.11 HEATING

- A. Heat Pump: The heat pump operation shall operate reversing valve in coordination with defrost and electric heat with standard heating capacities.
- B. Electric Heat: Factory installed electric resistance heater designed specifically for application in the heat pump packages. Heater shall include automatic limit safety controls.

2.12 COOLING

- A. STANDARD COOLING: The heat pump operation shall function with standard sensible and latent cooling capabilities with high speed airflow.
- B. BALANCED CLIMATE COOLING: The heat pump shall function with enhanced latent capacity when BALANCED CLIMATE cooling mode is enabled. Unit shall include Y1 and Y2 low voltage terminal connections. A 2-stage thermostat shall be capable of operating BALANCED CLIMATE. Stage 1 cooling will operate with a preprogrammed and fully tested reduced fan speed. The reduction in fan speed increases latent capacity and reduces sensible capacity for increased runtime and increased latent capacity. If the 2 stage thermostat calls for second stage cooling, the unit shall shift to high speed blower and standard operation. BALANCED CLIMATE is achieved with a single stage compressor. Expanded rating in BALANCED CLIMATE mode shall be provided at time of submittal, and full factory performance data shall be available upon request

2.13 ELECTRICAL COMPONENTS

- A. Electrical components shall be easily accessible for routine inspection and maintenance through front service panels. Circuit breaker is standard on all 208/230 volt models and toggle disconnect standard on all 460 volt models. Circuit breaker/toggle disconnect access shall be through lockable access panel.

2.14 CONTROL CIRCUIT

- A. The internal control circuit shall include a current limiting 24VAC type transformer with resettable circuit. The defrost circuit shall include a solid state electronic heat pump control. A 30-minute timer shall initiate a frost cycle if the outdoor coil temperature indicates the possibility of an iced condition. The thermistor sensor, speed-up terminal for service and a ten-minute defrost override shall be standard on the electronic heat pump control. To prevent rapid compressor short cycling, a five-minute time delay circuit shall be factory installed to prevent nuisance tripping during low temperature start-up.
- B. Phase rotation protection and phase failure protection shall be standard factory on all equipment with three-phase power. If unit is wired incorrectly, phase monitor will lock out compressor operation and red warning light shall energize. Once power wiring is corrected at field power wiring location, a green light will energize on phase monitor. If a phase of power is lost, the phase monitor will also lock out system operation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.
- C. Coordinate dimensions required for framing to mount the unit to the framework. Ensure there is adequate blocking, studs, etc as required for securing unit to structure before exterior and interior finishes are applied.
- D. Install unit to structure in accordance with manufacturer installation instructions and recommendations.
- E. Install all flashing components, roof pan, etc and seal all gaps water tight with approved sealant.
- F. Lift unit only at points specified by the manufacturer. Follow all manufacturer's instructions for rigging the unit for lifting.
- G. Install supply and return duct sleeve connections in wall and install supply and return grilles to wall.
- H. Coordinate with electrical contractor for power connections.
- I. Install thermostat and make all low voltage connections with wiring in conduit.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

- A. Demonstrate operation to Owner's maintenance personnel.
- B. Replace filters after final building clean-up just prior to Owner occupancy.

3.05 MAINTENANCE

- A. Provide service and maintenance of packaged roof top units for one year from Date of Substantial Completion.
- B. Provide routine maintenance service with a two month interval as maximum time period between calls.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.
- D. Provide 24-hour emergency service on breakdowns and malfunctions.
- E. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION 23-74-1

SECTION 23 90-00
BUILDING MANAGEMENT SYSTEM

1.01 GENERAL

- A. This section describes the Integrated Building Management System (BMS) technical and/or products specification to be undertaken by the BMS Contractor.
- B. Portions of work described in this section but which may not be further detailed in other sections of the BMS specifications shall not relieve BMS Contractor his obligation to carry out the mentioned works. Conversely, the description of work in other sections of the BMS but which has not been described in this section is also deemed to be included in the scope of works.

1.02 SCOPE OF WORK

- A. Furnish and install BMS software and workstations compliant with the specifications herein consisting of:
 - 1. A BMS server computer with processor, memory and other requirements as specified.
 - 2. 120v power to controls panels and controls components requiring line power shall be obtained by this contractor from an available circuit breaker in a local panel. Coordinate location with site conditions.
 - 3. (1) Operator workstations (OWS) consisting of a client computer workstation computer with processor, memory and other requirements as specified.
 - 4. BACnet BTL Listed Advanced Workstation Software complying with the B-AWS profile Engineering Toolkit software meeting the requirements as specified from an approved manufacturer.
 - 5. Any and all wiring changes necessary in accordance with Part 3 (Execution) and Part 4 (Sequences of Operation) of these Specifications.
- B. INTEGRATION OF BACNET PRODUCTS PROVIDED BY OTHERS
 - 1. Furnish and install BACnet IP or BACnet MS/TP wiring trunk to the following BACnet gateways/interfaces provided by other contractors:
 - 2. Wireless Zigby Radio or EnOcean Gateways with BACnet Interface (Provided by this contractor as required.) The gateway shall enable bi-directional “wireless” communication between the gateway and downstream connected devices which may be “Zigby radio” or “EnOcean” technology wireless communication devices. The gateway shall include all power, antenna, communications, wireless devices, and other functions to seamless communicate the desired information in both directions as programmed. The wireless gateway will convert the downstream “points of interest” to applicable BACnet Analog Value (AV) or Binary Value (BV) objects and transmit them into the BMS system using either BACnet I/P or BACnet MS/TP communications
 - 3. Integrate BACnet objects provided by the gateway(s) of Section 1.2.C.1 into B-AWS graphical user interface displays, alarm routing, and control sequences as required and specified in the sequences of operation.
- C. CONTROL WIRING
 - 1. The BMS Contractor shall furnish all electrical control and interlock wiring connected to the controls and instrumentation systems.

2. All conduits in connection with the controls and instrumentation system shall be furnished and installed by this Contractor. Such works shall conform to the applicable requirements of the Electrical Wiring standards for this project.
3. The Control Contractor shall complete all sensing and control installations including electrical and electronic components, not the Mechanical Contractor, unless otherwise required.
4. Provide a comprehensive operator and technician-training program as described herein.
5. Provide as-built documentation, software, and all DDC control logic and all associated support documentation on approved media, which accurately represents the final installed system.

1.03 COORDINATION WITH OTHER TRADES AND DIVISIONS

- A. 110 VAC or greater voltage power wiring to main control panels (i.e. AHU's) as shown on the mechanical plans and/or specifications, shall be provided by the Electrical Contractor, and coordinated by this Contractor. Failure of the BMS Contractor to coordinate requirements with other Divisions shall result in the BMS Contractor to be responsible for any non-coordinated items.
- B. VAV terminal box manufacturer shall provide a line voltage to 24VAC transformer of minimum 40VA rating to supply control power to VAV terminal controls. The BMS manufacturer shall be responsible for all low voltage control wiring of the VAV terminal unit controllers and coordinate such wiring with the terminal unit manufacturer as necessary. Contractor.
- C. Control Valves for cooling or heating coil shall be furnished by the BMS contractor to the Mechanical Contractor for installation by the Mechanical Contractor.
- D. Thermowells for sensing of fluid temperatures by BMS sensors shall be furnished by the BMS contractor to the Mechanical Contractor for installation by the Mechanical Contractor.
- E. Motorized Smoke and Fire Control Dampers complete with damper operators shall be furnished and installed by the Mechanical Contractor as indicated on the drawings, conforming to the UL-555S Listing for such applications. Such damper operators shall be provided by the damper manufacturer complete with either a 0-10VDC analog or "end of travel" switch position indicator which shall be integrated by the BMS contractor to the BMS system in accordance with the Sequence of Operations and as indicated on the drawings.

1.04 MINIMUM SYSTEM REQUIREMENTS

- A. Subject to the provisions of the applicable individual types of equipment contained herein, furnish and install BACnet BTL Listed equipment, software, and devices compliant with the BACnet standard profiles indicated in the following minimum quantities specified as follows:
 1. BACnet Advanced Operator Workstation (B-AWS profile) – consisting of (1) Server(s) + (1) Workstation(s) software and accessories at the location(s) shown on the drawings.
 2. BACnet Advanced Operator Workstation (B-AWS profile) Engineering Toolkit – Provide all Engineering Workstation software from the BMS manufacturer necessary to allow the Owner complete access for the programming of additional points, sequences of operation, web graphical pages, and other tools needed to expand or modify the system as needed. Provide software copies or server workstation installation as needed to allow properly authorized users access to the software on designated "Engineering Workstations".
 3. BACnet Laptop Engineering Toolkit – Provide all Engineering Workstation software and network interface tools as needed from the BMS manufacturer necessary to allow the Owner complete access via a laptop computer for the programming, configuration, and modification of field controllers. Generation of new web graphics for this level of tool are NOT needed. Provide (1) licensed copy of this toolkit for each required laptop service tool according to the specifications.

4. BACnet Routers (B-RTR profile) – Install a minimum of (1) BACnet router per floor level and not more than 1 router per 62 MS/TP devices. If more than 31 MS/TP devices are connected to one router, than provide an MS/TP repeater device after every 31 MS/TP devices on the sub-network OR at every “T” in the MS/TP trunk wiring, whichever quantity is GREATER.
5. BACnet Building Controllers (B-BC profile) – Furnish and install a minimum of (1) B-BC for control of
 - a. Each central chilled water or hot water plant room exceeding 80 physical points of capacity. If co-located, one controller may be used for the entire plant room if capacity permits according to the points schedule.
 - b. For each AHU exceeding a total quantity of (80) physical connected points
6. BACnet Advanced Application Controllers (B-AAC profile) – Furnish and install a minimum of (1) BACnet Advanced Application Controllers (B-AAC) for the control of:
 - a. Lighting Systems 1 controller per lighting distribution board
 - b. Other controlled and monitored systems – 1 controller per each system interface location
7. BACnet Application Specific (B-ASC profile) – Furnish and install a minimum of (1) BACnet Application Specific Controllers for the control of EACH:
 - a. Packaged Unitary or Split system AHUs, typically < = 68KW (20 Ton) Capacity meeting the sequences of operation specified
 - b. Air and Water Source Heat Pump units meeting the sequences of operation specified.
8. Digital Room Sensors (DRS) with display – Furnish and install Manufacturer’s compatible Digital Room Sensors with LCD display at each location shown on the drawings or as specified in the points list. At a minimum, provide 1 DRS sensor Per VAV terminal, FCU, or packaged unitary equipment unit (if controller does not have built in equivalent display).

1.05 QUALIFICATION OF BMS SUPPLIERS/BRAND NAME REFERENCES

- A. Any reference in this Specification to brand names or to a specific manufactured product without the use of “or approved equal” is to be interpreted to mean that the specific article or product is the only one to be supplied or used.
 1. All approved bidders must be Systems Integrators and specialty control contractors in the business of installing BMS systems and direct digital temperature controls. Subject to the provisions of these specifications, provide an BMS/DDC/control system from one of the following manufacturers:
 - a. KMC Controls integrated by Systems Contractors
 - b. Trane Controls
 - c. Automated Logic
 2. Components used for this project including control damper actuators, control valves (including PIC-V valves if used), sensors, switching devices, and other accessories shall be provided from one of the manufacturers named above or the following listed manufacturers:
 - a. Control Actuators & Control Valves – Belimo
 - b. Room, duct, pipe, outside ambient temperature, pressure, humidity, and other gas concentrations – Greystone Energy, Mamac, Carlo Gavazzi, Automation Components
 - c. Power & Btu Meters – Veris, Dent, Kamstrup,

- d. PIC-V Control Valve body & assemblies – Griswold Controls, Flow Control Industries
3. Only vendors named in this specification or pre-approved by addendum shall be acceptable.
4. HVAC equipment manufacturers desiring to provide “packaged pricing” of HVAC equipment inclusive of the complete BMS/DDC controls system are specifically required to provide separate prices for the equipment less controls. The equipment vendor shall provide a separate proposal for the BMS inclusive of all HVAC equipment controllers, sensors, actuators, control valves, operator workstations and other devices necessary for a complete and functional BMS system as stated by the requirements of this specification. Any equipment supplier that will NOT break out the controls portion of his “package” bid price will be excluded from providing BOTH controls AND equipment.
5. Bidders must have a local engineering and service office within 100 miles of the job site and/or be able to remotely access a system via the internet within one working day to diagnose system problems or issues via the internet.

1.06 UNACCEPTABLE PRODUCTS

- A. LONMARK Products - LON devices or gateway devices shall not be acceptable.
- B. KNX products – KNX devices shall not be acceptable.
- C. GATEWAY Products – Other than those gateways specifically defined in Section 1.2.C.1, NO OTHER GATEWAY DEVICES SHALL BE ACCEPTABLE.
- D. PROPRIETARY Products – NO PROPRIETARY COMMUNICATION PRODUCTS SHALL BE ACCEPTABLE.
- E. HVAC EQUIPMENT MANUFACTURER FACTORY MOUNTED CONTROLS – HVAC Equipment manufacturers that desire to provide equipment with factory mounted controls shall only provide controls from one of the NAMED MANUFACTURERS OF SECTION 1.5.B.

1.07 MANDATORY SYSTEM & QUALITY REQUIREMENTS

- A. All BMS controllers installed under this contract shall strictly adhere to the following characteristics:
 1. The controller shall consist of native BACnet, direct digital control, microprocessor-based, real-time clock, peer-to-peer, networked, energy management, distributed devices utilizing the ASHRAE/ANSI standard 135 BACnet, communication protocol in an open, interoperable system. All controllers shall be BACnet Testing Laboratories (BTL) Listed at standard revision 2008 or later and PICs statements available on the BTL website.
 2. The BACnet operating stack must be embedded directly in every device at the board level and in all operator interface software packages.
 3. With the exception of those gateways identified in Section 1.2.C.1 no Gateways, Communication Bridges, Protocol Translator or any other device that translates any proprietary or other communication protocol to the BACnet communication protocol shall be permitted as a part of the installation pursuant with this specification section.
 4. Controllers and software used on this project shall be newly manufactured products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.
 5. Each of controller hardware shall be suitable for anticipated ambient conditions and rated for a minimum of 32 – 122F (0 – 50C).
 6. The BMS contractor must provide a PICS document showing the proposed & installed systems compliance level to the ANSI/ASHRAE Standard 135-2008 or later revision for all BACnet devices.

- B. Control Components & Accessories – All control components and accessories used for this project shall be newly manufactured and supplied by the BMS contractor from one of the named manufacturers of paragraph 1.5.C or as approved by Addendum in paragraph 1.5.E
- C. Quality Standards – As control devices and components shall meet the following quality and standards for use in commercial buildings as appropriate:
 - 1. Digital controllers and systems NOT used in “smoke control applications” - UL Standard 916, Category PAZX (Energy Management standard)
 - 2. Digital controllers and systems used in “smoke control applications” - UL Standard 864, Category UUKL (smoke control systems)
 - 3. Control components using voltages > 24VAC Nominal voltage – UL Standard 873 (Temperature Indicating and Regulating)
 - 4. Control components using voltages < = 24VAC Nominal voltage – UL 873 or UL Component recognized (ULR)
 - 5. FCC Part 15, Sub-Part A
 - 6. EMC Directive 89/336/EEC (European CE Mark)
 - 7. Uniform Building Code (UBC), including local amendments
 - 8. National Electrical Code (NEC)

1.08 SUBMITTALS

- A. Submit under provisions of this Section
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4.
- C. Drawings:
 - 1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.
 - 2. Drawings shall be submitted in the following standard sizes: 11 x 17 inch (ANSI B).
 - 3. 5 complete sets (copies) of submittal drawings shall be provided. Drawings shall also be submitted in electronic pdf format.
 - 4. Drawings shall also be furnished on Flash Drive
- D. System Documentation: Include the following in submittal package:
 - 1. System configuration diagrams in simplified block format.
 - 2. All input/output object listings and an alarm point summary listing.
 - 3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
 - 4. Complete bill of materials, valve schedule and damper schedule.
 - 5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
 - 6. Overall system operation and maintenance instructions-including preventive maintenance and troubleshooting instructions.

7. For all system elements-operator's workstations, building controllers, application controllers, routers, and repeaters-provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135.
8. A list of all functions available and a sample of function block programming that shall be part of delivered system.
9. Product Warranty – Submit Manufacturer's standard product warranty statement. Products NOT meeting the requirements of Paragraph 1.9 below shall be rejected OR the BMS contractor shall stipulate in his proposal that he fully complies with the cost provisions of paragraph 1.9 and he has included any additional replacement costs in his price.
10. Project Management: The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases.

1.09 Project Warranty

- A. Material Warranty – The selected manufacturer of BMS controllers and components shall be provided with a 5 year manufacturer's replacement warranty from the date of manufacture. BMS contractor shall not utilize any products with a warranty manufacture date of less than 4 years from the date of the start of construction of the project.
- B. Labor Warranty – The selected BMS contractor shall provide a full project warranty in accordance with the Warranty provisions of the General Conditions and Defects Liability Period of the project.

Part 2 PRODUCTS

201 General Requirements of Devices and BACnet networks of this section

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135/2008 or latest approved version, BACnet. Provide all communication media, connectors, switches, and routers necessary for the BACnet communication network.
- B. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- C. Workstations, Building Control Panels, and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.
- D. Operator Workstation information access shall use the BACnet protocol. Communication shall use the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol and communicate directly on the network as a native BACnet device by using the Read (Initiate) and Write (Execute) Services as defined in ANSI/ASHRAE Standard 135-2004.
- E. Each Building Controller shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
- F. BACnet routing shall be performed by B-BCs or other BACnet device routers that are BTL Listed as conforming to the BACnet B-RTR device profile. Such devices shall be implemented as necessary to connect BACnet I/P level devices to BACnet MS/TP level devices consisting of BACnet B-AAC, B-ASC, or B-SS profile devices.
 1. Each B-AAC and shall reside on a BACnet network at the BACnet I/P or BACnet MS/TP level.

- a. All B-AAC I/P level devices shall support a "Spanning Tree" I/P level "daisy chain" network that physically enables the "daisy chain" of the CAT5 connection between B-AAC devices through a "Spanning Tree" I/P level hub or switch. Such a network technology/topology ensures that no single point of communication failure will disable the entire daisy chain from communicating with the I/P level network.
 - b. If the IBMS vendor does NOT support the Spanning Tree daisy chain topology, then he shall additionally provide, furnish, and install additional I/P switches, hubs and routers at no less than one such switch or hub for every 4 I/P level B-AAC devices provided in his implementation of the Architecture of Section 1 as part of his proposal and include such items at no additional cost to the Owner. Furthermore, the IBMS contractor using this implementation must document his design as part of his proposal offering at time of tender to ensure fair evaluation by the Owner's Consultant prior to award of tender or sub-contract.
 - c. All B-AACs MS/TP level devices shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
2. Each B-ASC shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
 3. Each B-SS ASC shall reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
 - a. Internetwork operator interface and value passing shall be transparent to internetwork architecture:
 - b. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
 - c. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

202 BACnet Router (B-RTR)

- A. General: The BACnet router shall route BACnet traffic between BACnet networks, virtual and/or physical. The router shall be designed for both permanent installations as well as temporary use for BACnet device configuration and BACnet network troubleshooting. The BACnet Router shall be BTL Listed under the B-RTR device profile.
 1. Connections:
 - a. Power: The router shall be powered either from 24VAC AC (-15%, +20%) or from USB. The 24VAC connections shall be a removable terminal block accepting 12 to 22 AWG wire.
 - b. USB: A micro USB connections shall be provided, supporting both temporary device power and device communications.
 - c. Network Communication Ports: The controller shall have an on-board, 10/100bT Ethernet port and an EIA-485 port. The EIA-485 port shall be optically isolated and have integrated end-of-line (EOL) terminations. The EIA-485 port shall be a removable terminal block accepting 12 to 22 AWG wire.
 - d. Mounting: The router shall be capable of being flush mounted via mounting holes on 1" centers, or DIN rail, without the use of additional mounting accessories.
 - e. Configuration: The router shall be fully configured via integrated HTML5 based webpages, without the need for any specialized or PC based software. The router

configuration may be exported to/imported from a local file via the configuration webpages.

- f. Communications: The router shall be a native BACnet device, available as EIA-485 (MS/TP) or Ethernet/IP physical connections as required.
 - 1) MSTP: MSTP network baud rates between shall be selectable between 9600 and 115.2k baud. Segmentation shall be supported.
 - 2) Ethernet/IP: The following BACnet For devices enabled with Ethernet/IP connectivity, the user shall be able to select BACnet 8802-3, BACnet IP, BACnet BBMD, or BACnet Foreign Device. Segmentation shall be supported.
- g. Routing: The router shall support: one BACnet MSTP network, one BACnet 8802-3 network, and two BACnet IP networks, the IP networks selected able as IP, foreign devices or BBMD. The BBMD Foreign Devices table shall support up to 128 entries.
- h. Diagnostics
 - 1) Device Status: The router shall report the status of each MSTP device that is detected on the MSTP network. MSTP MAC address status shall be indicated with the following color coded categories: no devices detected (white), offline (grey), router MAC (blue), active device (green), errors or duplicate (red). Metrics shall indicate the total device count online, average token cycle time, and the average token time per device.
 - 2) Token Use: The router shall report state of the MSTP token. The status of the token as it is passed between MSTP devices shall be indicated with the following color-coded categories: passed in less than 100ms (normal, green), passed in more than 100 ms but less than the APDU timeout (slow, yellow), passed in longer than the APDU timeout (red). Poll for Master (PFM) shall be indicated in light blue.
- i. Route Status: The router shall report all the known BACnet networks, both directly connected and remote connected. The status of each BACnet network should be identified, indicating the following network states: active, busy, down/gone, or duplicated network, duplicated MSTP MAC, sole MSTP master, BBMD: Unknown, BBMD: Multiple, Foreign Devices NAK.
- j. MSTP Metrics: The following MSTP network metrics shall be indicated: Tx Frame Count, Tx Data Count, TX Error Count, Rx Frame Count, Rx Unexpected Frame Count, Wait for Reply Error Count, Duplicate MAC Count, Token Retry Count, Token Timeout Count, Rx Token Count, Token Error Count, Rx PRM Count, PFM Error Count, Rx Discard Count, Rx FB Reparse Count.
- k. Time Master: The router shall be a BACnet time sync master, capable of syncing BACnet network time to either local (PC) or a SNTP Time server. Both UTC and local time shall be supported.
- l. Firmware Upgrades: The router firmware shall be upgradeable for updates as future enhancements and expanded functionality. Firmware updates shall be supported via BACnet communications (over-the-network) and through the integrated configuration webpages.
- m. VAV Air Balancing Tool – To facilitate the rapid balancing of VAV terminals, the router shall additionally include a VAV terminal air balance tool that shall enable an operator to command a terminal to minimum and maximum flow, and enter flow readings at each end of travel. After the entering of a reading, the balancing tool shall automatically re-calculate the “K” Gain factor for airflow and store such value in the controller. Additionally, the balance tool shall create and maintain a file for each

terminal that indicates desired flow min and max settings in both cooling and heating modes and the actual measured values after re-calibration. Upon completion of the balancing of each terminal unit, the tool shall create a "balance report" that may be printed out for submission as a commissioning report. The report shall indicate the room or terminal number, MAC/Network address of the terminal and all settings and measured values. The report information shall be automatically uploaded and maintained as part of the IBMS System Audit Log for future testing and reference.

203 BACnet BUILDING CONTROLLER (B-BC)

- A. BACnet Building Controllers (B-BC) shall combine both network routing functions and control functions into a single unit. BC's shall route communications between the BACnet/IP network, the BACnet 8802.3 network, BACnet PTP network and the BACnet MS/TP network. The BACnet operating stack must be embedded directly in every device at the board level.
- B. The operating system and the application programs for the B-BC shall be stored in non-volatile FLASH memory. The B-BC shall support up to 64 MB Flash memory and up to 256 MB of RAM.
- C. Each B-BC shall be classified as a "native" BACnet device, and conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE Standard 135-2008, BACnet Annex L, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
- D. Each B-BC shall provide communication to both the Workstation(s) and the field buses. The B-BC shall have on-board a 10/100 Mbps Ethernet port, an EIA-232 Port and two EIA-485 BACnet MS/TP ports. It shall support communications to a maximum of 127 BACnet MS/TP devices.
- E. Each B-BC shall have 16 on-board Universal Inputs (UI) with a minimum of 12-bit analog to digital conversion. Each input shall have over-voltage protection.
- F. Each B-BC shall have 16 on-board Universal Outputs with a 12-bit digital to analog conversion. Each output shall have optional three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall provide feedback to the controller so that the Auto or non-Auto position of the override switch can be obtained through software. In addition, each analog output manual override switch shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3-position manual override switch is placed in the ON position.
- G. Each B-BC shall employ a modular I/O field interface (sensors, actuators, etc.) design to allow easy expansion of the field interface device Input and Output capacity. It shall be possible to add up to I/O expansion modules as desired to meet the I/O requirements (maximum total of 128 inputs and 72 outputs) for individual control applications. These modules shall be capable of being installed up to 200 feet from the B-BC and connected via standard shielded twisted pair cable.
- H. Each B-BC shall include a battery or capacitor backed, real time clock for 72 hours, accurate to 1.5 minutes per month. The Real Time Clock (RTC) shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years.
- I. Each B-BC shall include an on-board battery to back up the controller's RAM memory. In the case of a power failure, the B-BC shall first try to restart from the RAM memory.

If that memory is corrupted or unusable, then the B-BC shall restart itself from its application program stored in its FLASH memory.

- J. Power supply for each B-BC shall be 24 volts AC (-15%, +20%, 25 VA max.) power. Line voltage below the operating range of the system shall be considered outages. The B-BC shall have over voltage surge protection without additional AC power signal conditioning.
- K. Each B-BC shall contain FLASH memory to store both the resident operating system and application programming. Each B-BC shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, routing communications, etc.
- L. Automatic Restart after Power Failure: Upon restoration of power after an outage, the B-BC shall automatically and without human intervention: update all monitored functions; resume operation based on current synchronized time and status, and implement special start-up strategies as required.
- M. Router Function: Each B-BC shall be capable of routing traffic between two BACnet MS/TP ports, one BACnet PTP (Point to Point) port, four (logical) BACnet IP ports and one (logical) BACnet Ethernet port. The B-BC shall support BACnet IP Foreign Device Registration and BACnet Broadcast Management Device (BBMD). The B-BC shall support PTP modem communications and perform IP Packet Assembling/Disassembling (PAD) Routing for up to four BACnet IP PAD networks.
- N. Embedded Web Server: As required to meet the application for buildings of typically < 10,000M2 (100K Sq. Ft.) where an on site IBMS workstation is not provided or required, each B-BC shall have an embedded Web Server and shall serve customized web pages containing any desired I/O values from the entire IBMS. The B-BC shall be capable of being configured over the IP network by using a standard Internet Browser without any additional software.
- O. User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and set-points. The source program shall be English language-based and programmable by the user. The language shall be structured to allow for the easy configuration of control programs and mathematical calculations. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program.
 - 1. The programming language shall support conditional statements (IF/THEN/ELSE/ ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - 2. The programming language shall support floating-point arithmetic using the following operators: +, -, ÷, ×, and square root. The following mathematical functions also shall be provided: absolute value and minimum/maximum value.
 - 3. The programming language shall have predefined variables that represent time of day, day of the week, month of the year, and the date. Other predefined variables shall provide elapsed time in seconds, minutes, hours, and days. These elapsed time variables shall be able to be reset by the language so that interval-timing

functions can be stopped and started within a program. Values from all of the above variables shall be readable by the language so that they can be used in a program for such purposes as IF/ THEN comparisons, calculations, etc.

4. The language shall be able to read the values of the variables and use them in programming statement logic, comparisons, and calculations.
5. Each B-BC software application shall reside and operate in the B-BC. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.
6. Each B-BC programming language shall have predefined variables representing the status and results of the system software and shall be able to enable, disable, and change the set-points of the controller software described below:
 - a. Scheduling: Provide the capability to execute control functions according to a user created or edited schedule. Each schedule shall provide the following schedule options as a minimum:
 - b. Weekly Schedule. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
 - c. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system shall discard and replace the exception schedule with the standard schedule for that day of the week.
 - d. Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator shall be able to define the length of each holiday period.
 - e. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.
7. Alarms.
 - a. Binary Alarms. Each binary object shall have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
 - b. Analog Alarms. Each analog object shall have both high and low alarm limits. The operator shall be able to enable or disable these alarms.
 - c. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.
8. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, set-point, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters shall be adjustable by a user with the correct security level.

9. Staggered Start. System shall stagger controlled equipment restart after power outage without the operator intervention. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
10. Anti-Short Cycling. All binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.
11. On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a set-point. The algorithm shall be direct-acting or reverse-acting.
12. Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit.
13. The B-BC shall provide sufficient memory and resources to contain the following quantities of BACnet objects and services. In the case where these quantities of objects are not provided in each B-BC, provide additional B-BCs in the quantities necessary to fulfill the object # requirements OF EACH object so that the total minimum number of B-BCs required in paragraph 1.2.8 multiplied by the objects of each type supported by a B-BC meet or exceed the extended quantities calculated for the minimum. Failure to provide a PIC statement or datasheet that indicates the number of each type of object supported shall be grounds for disqualification of the vendor's products from consideration for this project:
 - a. 112 total input objects consisting of any combination of AI, BI, and AC accumulator objects.
 - b. 72 total output objects consisting of any combination of AO and BO objects.
 - c. 1 Device object.
 - d. 8 Control Basic "custom table" objects.
 - e. 16 Custom table objects for use in non-linear sensors or other specialty "lookup" table function.
 - f. 1000 Analog Value (AV) objects.
 - g. 1000 Binary Value (BV) objects.
 - h. 256 Multi-State (MS) objects.
 - i. 128 PID loop control objects.
 - j. 32 Control Program objects. (If the controller does not support Control Basic or similar "line-by-line" program objects, the controller shall support a minimum of 32 "graphical object programs/wire sheets that provide the "self-documenting" functions described elsewhere in this document.
 - k. 100 Schedule Objects.
 - l. 32 Calendar Objects.
 - m. 256 trend objects, each object capable of 256 samples.
 - n. 128 Event Notification objects.
 - o. 512 Event Enrollment objects.

14. History Logging: Each B-BC shall be capable of locally logging any input, output, calculated value, etc. over user defined time intervals (1 second minimum time). Up to 256 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the B-OWS and/or B-AWS for long term archiving based upon user-defined time intervals, or manual command.
15. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the B-BC and can result in the display of one or more alarm messages or reports. Up to 8 alarms can be configured for each point in the controller. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the B-BC. When communications return, the alarm will be transmitted to the B-OWS. Alarms must be capable of being routed to any B-OWS that conforms to the B-OWS device profile and uses the BACnet/IP protocol.
16. Energy Management Applications; Each B-BC shall have the ability to perform any or all of the following energy management routines:
 - a. Time of Day Scheduling.
 - b. Calendar Based Scheduling.
 - c. Holiday Scheduling.
17. Regulatory:
 - a. CE compliant.
 - b. UL 916 Energy Management Equipment
 - c. FCC Class B, Part 15, Subpart B
 - d. BACnet Testing Laboratory (BTL) listed.
 - e. The system contractor must provide a PICS document showing the proposed systems compliance level to the ANSI/ASHRAE Standard 135-2008.

204 BACnet Advanced Application Controllers (B-AAC) Profile, with Associated Digital Room Sensor (DRS)

- A. General: Conquest Controllers shall be responsible for monitoring and controlling directly connected HVAC equipment such as RTUs, HPUs, AHUs, Chillers, Boilers, VAV Terminals, FCU Terminals, Chilled Beams, Cooling Towers, Pump Systems, Unit Ventilator, and/or other building automation systems as required. Each controller shall be classified as a "native" BACnet device, supporting the BACnet Advanced Application Controllers (B-AAC) profile. Controllers that support a lesser profile such as B-ASC are not acceptable. Controllers shall conform to the BACnet Advanced Application Controller (B-AAC) profile.
- B. Software Specifications
 1. General: The controller shall contain non-volatile memory to store both the resident operating system and application programming. Any program may affect the operation of any other program. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, extraction of the program for storage, routing communications, etc.
 2. Automatic Restart after Power Failure: Upon restoration of power after an outage, the controller shall automatically and without human intervention update all monitored

functions; resume operation based on current synchronized time and status, and implement special start-up strategies as required.

3. User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. Controllers shall be capable of utilizing both line code based programming and Graphical Function Block programming interfaces.
 - a. Programs shall be generated by an English-language based (line) editor or a Graphical Function Block interface.
 - b. The language shall be structured to allow for the easy configuration of control programs and mathematical calculations.
 - c. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.
 - d. Controllers that use non-editable factory programming only method will not be accepted.
4. Control Algorithms: The controller shall have the ability to perform the following control algorithms:
 - a. Proportional, Integral plus Derivative Control (PID)
 - b. Two Position Control
 - c. Digital Filter
 - d. Ratio Calculator
 - e. Equipment Cycling Protection
5. Mathematical Functions: Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, trigonometric functions, Boolean logic statements, or combinations of all. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.
6. Energy Management Applications: The controller shall have the ability to perform any or all of the following energy management routines:
 - a. Time of Day Scheduling.
 - b. Calendar Based Scheduling.
 - c. Holiday Scheduling.
 - d. Exception Scheduling.
 - e. Temporary Schedule Overrides .
 - f. Optimal Start
 - g. Optimal Stop
 - h. Night Setback Control
 - i. Enthalpy Switchover (Economizer)
 - j. Peak Demand Limiting, Load Shed
 - k. Temperature Compensated Duty Cycling
 - l. CFM Tracking
 - m. Heating/Cooling Interlock

- n. Hot/Cold Deck Reset
 - o. Free Cooling
 - p. Hot Water Reset
 - q. Chilled Water Reset
 - r. Condenser Water Reset
 - s. Chiller Sequencing
 - t. Demand Ventilation.
7. History Logging: Each controller shall be capable of locally logging any input, output, calculated value, etc. over user defined time intervals (1 second minimum time). Up to 128 values shall be stored in each log. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, COV notification or manual command.
 8. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan and can result in the display of one or more alarm messages or reports. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the controller. When communications return, the alarm will be transmitted to the Operator Workstation. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile.
 9. Communications: The controllers shall be a native BACnet communications, available as EIA-485 (MS/TP) or Ethernet/IP physical connections as required. The controller shall be capable of communication to both the Workstation(s) and the field buses. The controllers shall meet or exceed the specifications in the ANSI/ASHRAE BACnet Standard 135-2010 for BACnet Advanced Application.
 - a. MS/TP Devices: For devices with MS/TP connectivity, baud rates between 9600 and 115.2k baud shall be selectable. Segmentation shall be supported. Auto-baud functionality shall be supported.
 - b. Ethernet/IP Devices: For devices enabled with Ethernet/IP connectivity, the user shall be able to select BACnet 8802-3, BACnet IP, or BACnet Foreign Device. Segmentation shall be supported.
 10. Dedicated Room Sensor Port: The controller shall have a Dedicated Room Sensor port for direct interface to a Digital Room Sensor or Discrete Room Sensor. The controller shall have the ability of detecting if a sensor has been connected to the port and identify its type. Sensor information via the ports shall not consume any of the devices terminated input capacity.
 11. Configuration: The controller shall be configurable via the following methodologies:
 - a. Software
 - b. Digital Sensor
 - c. Mobile Device
 - d. Configuration via a Mobile device shall be supported when the controller is unpowered and/or still contained in factory packaging.
 - e. Integrated Webpage (IP models)
 12. Programmability: The controller shall be fully programmable via a dedicated configuration software tool and/or modules integrated into the Niagara Framework. The Niagara configuration toolset shall be integral to Workbench software and not function outside of

the Workbench environment. The Niagara toolset shall be able to full program the controllers, including the ability to select, configure, and deploy standard HVAC equipment applications.

13. Firmware Upgrades: The controller firmware shall be upgradeable for updates as future enhancements and expanded functionality. Firmware updates shall be supported via BACnet communications (over-the-network).
14. Object Counts: The object count shall be dynamic. The controller shall have a minimum of the following BACnet objects:
 - a. Shall support up to 120 Analog Value Objects.
 - b. Shall support up to 80 Binary Value Objects.
 - c. Shall support up to 40 Multi-state Value Objects.
 - d. Shall support up to 10 Event Enrollment Objects.
 - e. Shall support up to 5 Notification Class Objects.
 - f. Shall support up to 10 Loop Objects (PID).
 - g. Shall support up to 10 Program Objects.
 - h. Shall support up to 2 Schedule Objects.
 - i. Shall support up to 1 Calendar Objects.
 - j. Shall support up to 10 Trend Objects.
15. Hardware Platform Features:
 - a. Processor: The controller shall employ at minimum a 32-bit microprocessor.
 - b. Memory: The operating system and the application programs for the controller shall be stored in non-volatile FLASH memory. The controller shall support up to 8 MB Flash memory and up to 2 MB of RAM. The controller shall include an on-board capacitor to back up the controller's RAM memory for a period of at least six hours. In the case of a power failure, the controller shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the controller shall restart itself from its application program stored in its FLASH memory.
 - c. Network Communication Ports: The controller shall have on-board, dual 10/100bT Ethernet port or an EIA-485 port. The dual Ethernet connections shall function as an Ethernet hub, allowing daisy-chained Ethernet topologies. The EIA-485 port shall have network protection bulbs and integrated end-of-line (EOL) terminations.
 - d. Dedicated Room Sensor Port: The controller shall have a dedicated room sensor port to directly connect a Digital Room Sensor or Discrete Room Sensor (supporting both room temperature and room setpoint). Sensors shall be hot-swappable without powering down the controller. User points and sensor data from the Digital Room Sensor shall be mapped to internal variables and not consume the input points of the host controller.
 - e. Inputs: The controller shall have on-board universal inputs with a minimum of 16-bit analog to digital conversion. Each universal input shall have over-voltage protection. Universal inputs shall have the following integrated, software selectable terminations: 1K pullup, 10K pullup, 0-12VDC, 0-20mA. Each universal input shall be software selectable as analog or binary. Manually set, hardware configuration jumpers shall not be necessary.
 - f. Outputs: The controller shall have on-board universal outputs with a 12-bit digital to analog conversion. Analog outputs shall be capable of sourcing 100 mA per channel

and be short circuit protected. Each universal outputs shall be software selectable as analog or binary.

- g. Local Status Indicator Lamps: Provide as a minimum, LED indication of CPU status, Ethernet LAN status, MS/TP LAN Status, and Expansion I/O field bus status. For each output module with an optional override card, provide an LED that gives a visual indication of what state it is in (ON/OFF) and markings to indicate the switch setting (H-O-A).
 - h. Real Time Clock (RTC): Each controller shall have an integrated real-time clock, accurate to 1.5 minutes per month. Optionally, to maintain through an intermittent power failure, the RTC may be capacitor backed, maintaining time for at least 72 hours. The RTC shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years.
 - i. Terminal Block Connectors: The controller shall have removable screw terminal blocks that can accommodate wire sizes 14-22 AWG. Terminals shall be color coded: black terminals for power, green terminals for input and outputs, and grey terminals for twisted-shielded-pair communication.
 - j. Power Supply: The power supply for the controller shall be 24 volts AC (-15%, +20%) power. Voltage below the operating range of the system shall be considered an outage.
16. VAV Specific Features:
- a. Integrated Actuator: The controller shall have an integrated actuator with the following features:
 - 1) The actuator shall be rated at 40 in-lbs.
 - 2) Connection to the damper shall be with a v-bolt clamp, accepting 3/8" to 5/8" damper shaft sizes.
 - 3) The actuator shall travel 0 to 95 degrees with adjustable end stops at 45 and 60 degrees of rotation.
 - 4) The actuator shall travel at a rate of 90 degrees per 90 seconds if supplied by 60 Hz power; 90 degrees per 108 seconds if supplied by 50 Hz power.
 - 5) The actuator shall have an integrated gear disengagement mechanism.
 - b. Integrated Pressure Sensor: The controller shall have an optional integrated pressure sensor for airflow measurement. The sensor shall have a range of 0-2"wc, consuming and accurate to 4.5% of reading or 0.0008"wc, whichever is greater.
 - c. Inputs: The controller shall have at the following inputs:
 - 1) Two dedicated inputs for room temperature and room setpoint from discrete wall sensor.
 - 2) Four universal inputs, software configurable as analog or binary.
 - 3) Actuator position feedback, via a potentiometer mechanically tied to the output coupler. Position information should be accurate even when the damper is moved manually (gear disengagement lever is depressed).
 - d. Outputs: The controller shall have the following outputs:
 - 1) Damper Actuator, Clockwise and Counter-clockwise
 - 2) Three universal outputs, 0-12VDC software configurable as analog or binary. Each output shall be capable of supplying 100 mA with a limit of 100 mA for all universal outputs combined.

- 3) Four binary outputs, each zero-crossing triacs. Each output channel shall be capable of being manipulated individually, exclusive to any other output.
 - 4) The outputs shall be supplied externally via a common terminal and shall be capable of switching either phase or common.
- e. VAV Application:
- 1) The VAV controller shall have integrated applications for Single Duct and Dual Duct terminal boxes, including Cooling Only, Cooling/Heating with Changeover and Morning Warmup, Fan Powered, Cooling with Reheat, and Dual Duct Mixing and Non-Mixing.
 - 2) Integrated applications shall support both English, Metric, and Mixed units.
 - 3) Applications shall be capable of being configured from the Digital Room Sensor or BACnet.
 - 4) VAV Balancing: The VAV controller shall be capable of being balanced from the Digital Room Sensor without any specific pc-based software.
- f. Unitary Specific Features:
- 1) Mounting: The controller shall be able to be mounted on standard DIN rail or to a panel using integrated mounting holes on 1" centers.
 - 2) Integrated Pressure Sensor: The controller shall have an optional integrated pressure sensor for airflow measurement. The sensor shall have a range of 0-2"wc and accurate to 4.5% of reading or 0.008"wc.
 - 3) Inputs:
 - a) Two dedicated inputs for room temperature and room setpoint from discrete wall sensor.
 - b) Six universal inputs, software configurable as analog or binary.
 - 4) Outputs:
 - a) Four universal outputs, 0-12VDC software configurable as analog or binary. Each output shall be capable of supplying 100 mA with a limit of 100 mA for all universal outputs combined.
 - b) Six binary outputs, each zero-crossing triacs. Each output channel shall be capable of being manipulated individually, exclusive to any other output.
 - c) The outputs shall be supplied externally via a common terminal and shall be capable of switching either phase or common. Four triacs shall share an external supply; two additional triacs shall share a second external supply.
 - 5) Unitary Application:
 - a) The Unitary controller without integrated pressure sensing shall have integrated applications for Rooftop Units, Heat Pump Units, 2-pipe Fancoil Units, and 4-pipe Fancoil Units.
 - b) The Unitary controller with integrated pressure sensing shall have integrated applications for Rooftop Units, Heat Pump Units, and Single Duct VAV.
 - c) Integrated applications shall support both English and Mixed units for Rooftop and Heatpump Applications, and English, Metric, and Mixed units for VAV Applications.
 - d) Applications shall be capable of being configured from the Digital Room Sensor or BACnet.

- 6) General Purpose Specific Features:
 - a) Mounting: The controller shall be able to be mounted on standard DIN rail or to a panel using integrated mounting holes on 1" centers.
 - b) Inputs:
 - (1) Two dedicated inputs for room temperature and room setpoint from discrete wall sensor.
 - (2) Eight universal inputs, software configurable as analog or binary.
 - c) Outputs:
 - (1) Eight universal outputs, 0-12VDC software configurable as analog or binary. Each output shall be capable of supplying 100 mA with a limit of 300 mA for all universal outputs combined.
 - (2) Each universal output shall accept an Override Module.
 - d) Output Override Module: Each output shall accept an optional Output Override Module with integrated Hand-Off-Auto (HOA) function.
 - (1) Hardware Outpoint Configuration: The Output Override Module shall be configure the controller hardware for the following types of electrical outputs:
 - a. Zero Crossing Triac
 - b. N.C. Form A Relay
 - c. N.O. Form A Relay
 - d. 4-20ma with Override Potentiometer
 - e. 0-10VDC with Override Potentiometer
 - e) Output Indicator: The Output Override Module shall provide a LED indication of output status. If the output is an analog signal, the LED brightness shall be proportional to the output signal.
 - f) Hand-Off-Auto: The HOA switch shall allow the user to select ON (Hand), OFF, or AUTO output state. These switches shall be supervised by the controller to provide feedback so that the AUTO or non-AUTO position of the override switch can be obtained through software. In addition each analog output manual override switch shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.
 - g) Modules shall be capable of being added or removed while the host controller remains powered.
- 7) Modular Expandability: The controller shall allow expansion of the device Input and Output capacity via Expansion Modules, making it possible to add I/O as desired to meet the requirements for individual control applications.
 - a) The controller shall support up to four expansion I/O modules of any combination.
 - b) Expansion modules of 8 inputs x 8 outputs and 16 inputs x 0 output shall be available. (Nominally 42 inputs x 40 outputs or 74 inputs x 8 outputs, maximum)
 - c) The controller shall communicate to expansion modules via a private CAN bus over a twisted, shielded pair wire.
 - d) These modules shall be capable of being installed up to 200 feet from the controller.

205 BACnet Advanced Application Controller, Digital Room Sensor (DRS)

- A. General: The Digital Room Sensor shall provide the following types of functions and be field programmable:
 - 1. Space condition measurements and indications, including temperature, humidity, local motion/occupancy, and CO2.
 - 2. User setpoint adjustments
 - 3. Equipment status and mode indication
 - 4. Outside air temperature indication
 - 5. Capability to view the value of any input or output in the system
 - 6. Capability to change the value of any input, output or software point in the system.
- B. Interface to Controller: The Digital Room Sensor shall connect directly to the controller and shall not utilize any of the hardware I/O points of the controller. The Digital Room Sensor shall be able to be located up to 150' from the controller.
 - 1. Temporary Network Interface: The Digital Room Sensor shall provide a Temporary Network Interface jack, field accessible without uninstalling the sensor, for connection to the BACnet MS/TP communication trunk to which the BACnet AAC is connected. The Digital Room Sensor, the connected controller, and all other devices on the BACnet network shall be accessible through the temporary communication jack. Microprocessor based sensors whose port only allows communication with the controller to which it is connected shall not be acceptable.
 - 2. Integrated Sensors: The Digital Room Sensor shall have integrated sensors for temperature, humidity, motion/occupancy, and CO2.
 - 3. User Indicators: The Digital Room Sensor shall be capable of indicating the following.
 - a. Fahrenheit, Celsius
 - b. CFM, LPS
 - c. Fan Status, Fan Speed (Low, Medium, High), Auto Fan, Heat Mode, Cool Mode, Auto Mode, Occupancy Mode, Override Mode
 - d. Outside Air Temperature, Part Per Million, %, % Relative Humidity, Time (AM/PM)
 - e. Rotational Values – Multiple values may be configured for display in the numeric display fields. If multiple values are configured, the display shall rotate through each point as a configurable rate.
 - 4. User Setpoints: User/Occupant setpoints may be manipulated via the Digital Room Sensor. Single and/or multiple setpoints shall be supported and field configurable. Unique setpoint sequences shall be configurable and presented to the user based on a mode condition.
 - 5. Configuration Menus: The Digital Room Sensor shall have configuration menus allowing access to communication and application parameters.
 - 6. Password Protection: The DIGITAL ROOM SENSOR shall have two levels of password protection: one level to protect user setpoint adjustment, and one level to protect configuration menu parameters. Passwords shall be at least 4 digits in length.

206 BACnet Advanced Application Room Unitary Controller (B-AAC) with Digital Display

- A. BACnet B-AAC's with integral digital LCD displays, designed specifically for ROOM control of packaged unitary HVAC equipment including AHUs < 20 Ton capacity, FCUs, RTUs, heat pumps, and other unitary equipment shall be provided as indicated or required on the drawings. These devices shall have the following standard features:

1. Color: Models shall be available in with white or light almond colored cases. Other architectural colors shall be available at additional special cost of production and set up, subject to manufacturer's pre-approval, and approval of Architect on final color selection.
2. BACnet Communications: Standard models shall be available with BACnet MS/TP communication or BACnet IP communications as required by the application and project design. BACnet IP models shall support BACnet IP communication and BACnet "Foreign Device Registration".
3. Real Time Clock (RTC): Each controller shall have an integrated real-time clock, accurate to 1.5 minutes per month. Optionally, to maintain through an intermittent power failure, the RTC may be capacitor backed, maintaining time for at least 72 hours. The RTC shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years.
4. Analog Inputs: All analog inputs shall have 12 bit resolution.
5. Device Inputs: Each model shall be provided with a minimum of 6 Universal Inputs that are software selectable as analog or digital with standard and custom ranges. Pulse counting shall be available for all inputs up to 16Hz frequency.
6. Standard Sensor Models & Characteristics: Models shall include integral onboard sensors for the following sensors:
 - a. Room Temperature
 - b. Room Temperature, Room Humidity
 - c. Room Temperature, Room Humidity, Room Occupancy
 - d. Room Temperature, Room Humidity, Room Occupancy, CO2 Sensor
 - e. Room Temperature, Room Humidity, Room Occupancy, Self-calibrating, Dual channel CO2 Sensors.
7. Each applicable sensor shall contain the following performance parameter.
 - a. Room Temperature sensor shall be 10,000 ohm, Type II thermistor with +/- 0.2C sensing accuracy
 - b. Device shall have standard on-board sensor.
 - c. Device shall have optional "remote sensor" capability to use a standard Type II remote sensor in place of the on-board room sensor. It shall be possible to change from on-board to remote sensing by either a switch, jumper selection, software selection, or removal of the on-board sensor and connection of a remote sensor at a terminal strip.
 - d. Optional Room Humidity sensor shall provide +/- 2% sensing accuracy and be +/- 3% accuracy over operating range of 10 – 90% RH.
 - e. Optional Room Occupancy sensor shall be PIR type, with 33' (10 meter) sensing range over spherical 160 degree sensing window. Response time to occupancy change shall be < 1 second.
 - f. Single channel CO2 sensor models shall have
 - 1) Non-dispersive, IR type sensor with CO2 measurement accuracy of +/- 35ppm @ 500ppm, +/- 60ppm @ 800 ppm, +/- 75ppm @ 1000ppm, and +/- 90ppm @ 1200 ppm concentrations.
 - 2) Altitude compensation adjustment
 - 3) Response time of < 2 minutes for a 90% step change in atmospheric concentration of CO2 gas
 - 4) The sensor shall provide stability and repeatability for a period of not less than 5 years and fully comply with CA Title 24, Section 121(c) and not require replacement or recalibration for a minimum period of five years.

- 5) Measurement accuracy range of 400ppm (background) – 2000ppm
 - 6) Utilize ABC (Automatic Background Compensation) Logic to determine background levels in variable occupancy applications.
- g. Dual channel CO2 sensor models shall have
- 1) Non-dispersive, IR type sensor with CO2 measurement accuracy of +/- 35ppm @ 500ppm, +/- 60ppm @ 800 ppm, +/- 75ppm @ 1000ppm, and +/- 90ppm @ 1200 ppm concentrations.
 - 2) Altitude compensation adjustment
 - 3) Response time of < 2 minutes for a 90% step change in atmospheric concentration of CO2 gas
 - 4) The sensor shall self calibrate every 24 hours and maintain the accuracies specified above.
 - 5) Measurement accuracy range of 400ppm (background) – 2000ppm.
- h. Dual Channel CO2 sensor models shall be used in all zones requiring continuous occupancy for demand control ventilation control.
- i. Analog Outputs: All analog outputs shall have 8 bit resolution. Analog outputs shall be capable of providing a 0 – 12VDC signal at 20mADC maximum. Universal Outputs shall be software selectable for analog or digital with standard and custom ranges.
- j. Standard models shall be available with integral outputs in the following configurations:
- 1) (3) Form “A”, Dry contact outputs rated at 24VAC/VDC @ 1Amp.
 - 2) (6) Dry Contacts as above, (3) Universal Outputs
 - 3) (3) Dry Contacts as above, (6) Universal Outputs
 - 4) (5) Dry Contacts as above, (1) Triac output as above for direct control of a Copeland variable capacity Digital Scroll Compressor, (3) Universal Outputs.
- k. BACnet Objects:
- 1) 100 BV objects
 - 2) 100 AV objects
 - 3) 40 Multi-State Variables objects minimum
 - 4) BACnet PID Loop Objects. Minimum of 1 Loop Object for each output.
 - 5) Retains Last To Normal/To Off Normal Event for each object
 - 6) 10 User definable Control Basic program areas
 - 7) 8 Trend Log Objects, minimum sample interval of 1 second, each holding up to 256 samples
 - 8) 2 BACnet Schedule Objects
 - 9) 1 BACnet Calendar Objects
- l. BACnet Intrinsic Alarm Reporting
- 1) 10 Event Enrollment class objects
 - 2) 5 Notification Class objects
- m. Sensor conversion tables for creating linear or non-linear curves.

- n. LCD Display: The device shall be provided with an integral 64 x128 pixel dot matrix LCD display. This display shall be used to display operating parameters including but not limited to the following items:
 - 1) Room temperature, room humidity, room CO2 levels, BACnet object variable and occupancy status for appropriate models.
 - 2) Current operating setpoints for heating, cooling, occupancy, and fan conditions.
 - 3) Alarm status conditions
 - 4) Programming of schedules, holidays, and other operating and configuration parameters.
 - 5) The display shall support an English (or optional foreign) language menu structure system that is accessed using the 5-button keypad and proper security passwords.
 - 6) The display shall provide the ability to display programmed BACnet alarm messages to the user.
 - 7) Display and entry of 3 levels of security passwords.
 - 8) The LCD display shall optionally display real-time trended information of up to two simultaneous variables such as the room temperature vs. room operating setpoint through an appropriate security protected window for use by service technicians or other authorized personnel.
- o. The device shall be provided with a minimum of 5 user push buttons for the entry of configuration parameters, setpoint values, and other operating data as required by the prompted user menus displayed on the LCD display.
- p. BACnet Room Unitary controllers are generally BACnet AAC's designed specifically for package HVAC equipment. The following shall apply in addition to the standard features listed above:
 - 1) These controllers shall be pre-configured at the factory for applications like single zone central station air handling units, packaged HVAC equipment including, but not limited to, rooftop package air conditioners, split system heating/cooling units, heat pumps, or fan coil units, and other systems as specified on the drawings.
 - 2) In addition, each BACnet Room Unitary Controller shall have programmable Control Basic that may be changed using the manufacturer's Engineering Workstation software & BACnet programming toolkit to allow customizing of the supplied application programs to suit the desired sequences of operation described later in this document, and possible changes to adapt to changing building conditions. The ability to only change operating parameters or substitute between configurable applications shall not be considered acceptable or equivalent by any other manufacturer considered for these applications.
 - 3) Standard models equipped with (1) Triac output shall provide variable compressor capacity control of an Emerson/Copeland Scroll Digital Compressor. Controller shall contain all integral sequencing, start-up, and shut down protection features without any external safety modules to effectively control the compressor over a 10 – 100% capacity range in DX cooling or heat pump cooling and heating applications. In multi-stage applications, the variable capacity compressor shall be controlled as the 1st stage and the 2nd stage shall be automatically sequenced as required to provide a total variable capacity range of 5 – 100% of total system capacity.
- q. BACnet Room Unitary Controller Packaging and Environment
 - 1) BACnet Room Unitary Controllers shall be provided with a 2-piece construction for wall mounted applications.

- a) A wiring sub-base shall be provided with screw connection terminals for the landing of all field wiring. Terminals shall be capable of accepting 18AWG wire sizes. The wiring base shall mount on a standard 2x4 electrical box or an equivalent 100 x 100mm DIN termination box with an adaptor plate for international applications.
- b) An electronics package consisting of a plug-in assembly mounted in an attractive room controller housing that mates with the wiring sub-base shall contain all electronics, the display and a 5-button keypad.
- 2) The panel, when required, must functionally operate over a temperature range of 32 degrees F to 120 degrees F, and a humidity range of 0 - 95% non-condensing.
- 3) The device shall be powered by 24VAC, Class 2 electrical power. The electrical requirements shall be identified and coordinated by the Controls Contractor.
 - a) Provide and install as-built wiring diagrams to indicate the control points on all equipment. Also provide laminated point lists in all control panels.

207 BACnet Application Specific (B-ASC) Controllers for Packaged Unitary Equipment with Integral Color Display

- A. Application Specific Controllers shall be microprocessor based BACnet Application Specific Controllers (B-ASC) in accordance with the ANSI/ASHRAE Standard 135-2008. B-ASC controllers shall only be utilized for single duct VAV, FCU, and small packaged unitary HVAC applications as described in Section 1.4 Minimum System Requirements. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. The system supplier must provide a PICS document showing the installed systems compliance level to the ANSI/ASHRAE Standard 135-2008.
1. All Native BACnet B-ASC's shall be fully application configurable and shall at all times maintain their BACnet compliance. All control sequences within or programmed into the BACnet B-ASC's shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. When integrated as part of the IBMS system, these controllers may be used to optimize the energy consumption by implementing various Energy Management strategies such as demand limiting, duty cycling, outside air optimization, temperature setup/setback, optimum start/stop routines, etc.
 2. Application Specific Controllers (B-ASC) shall be used to provide direct digital control of HVAC equipment and other connected equipment in a stand alone manner as described in this section.
 3. In addition to their standalone capabilities to execute the operating sequences described later in this document, they shall also be capable to be networked in a peer-to-peer, BACnet MS/TP field network to other BACnet B-ASCs, B-AACs, B-BCs, or as part of a complete facilities management system which integrates multiple field networks.
 4. Real Time Clock (RTC): Each controller shall have an integrated real-time clock, accurate to 1.5 minutes per month. Optionally, to maintain through an intermittent power failure, the RTC may be capacitor backed, maintaining time for at least 72 hours. The RTC shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years.
 5. Standard features for all field devices features shall include:
 - a. Stand-alone or networked peer-to-peer capabilities as MS/TP Masters; slave devices are not acceptable
 - b. BACnet MS/TP LAN with configurable baud rate from 9600 to 76.8k baud
 - c. Each B-ASC model shall have a combination of dedicated passive or active inputs defined for the specific application.

- d. Each B-ASC model shall have a combination of analog and/or binary outputs defined for the specific application.
- e. Each B-ASC shall be provided with a listing of dedicated AI, BI, AV, BV, and/or MSV BACnet object types that are defined and listed for the specific application. At a minimum, it shall be possible to write to all control setpoints and read all objects listed for the controller.
- f. The device shall be provided with a color LCD user interface that provides a user with color icons indicating the mode of operation (cooling/heating, ON/Off/Auto), fan speed and other features. The interface shall be provided with a minimum of 3 levels of password protected access (user, technician, and configuration.) At a suitable level of access, a user shall be able to access all system information that is required to change setpoints, configure the device for sequence operation, set or change MAC addresses and device instances, and otherwise enter all parameters and adjustments required at the room sensor. No external device such as a PC or hand held operator interface device should be required. As a minimum, the following functions and readouts shall be available for use at the room sensor:
 - 1) Room temperature input value
 - 2) Current space setpoint (heating or cooling)
 - 3) Fan Operation and speed (On/Off/Auto, Low/Medium/High)
 - 4) Occupancy Mode (Occupied/Unoccupied/Standby).
- g. BACnet B-ASC's designed specifically for packaged unitary HVAC equipment include AHUs < 20 Ton capacity, FCUs, RTUs, heat pumps, and other unitary equipment. For these types of equipment, the following shall apply in addition to the standard features listed above:
 - 1) These controllers shall be designed for applications like zone devices and packaged type including, but not limited to, rooftop package air conditioners, heat pumps, or fan coil units.
 - 2) The controllers shall provide for automatic control of a device's fan with automatic heat/cool changeover, economizer, fan speed control, occupied, unoccupied, and "stand by" mode control when utilizing occupancy sensors.
 - 3) The device shall be provided with optional humidity and/or PIR type occupancy sensors according to the required sequence of operation. When equipped with a humidity sensor, the sequences shall automatically provide for dehumidification of the space based on humidity control setpoint. When provided with a PIR type occupancy sensor, the sequences shall automatically provide for a "standby mode" of operation that will automatically adjust the cooling setpoint up by 2F (1C) and heating setpoint down by 2F (1C) during the occupied mode if no motion is sensed within the space after an adjustable "standby" timer has elapsed.
 - 4) B-ASC controllers for FCU and unitary applications shall be mounted in the room for room control of connected equipment. The device shall provide for the optional utilization of a passive room temperature sensor for panel mounted or remote room sensing control applications.

208 BACnet Application Specific Controller for Single Duct VAV Applications with Remote Digital Room Sensor (DRS)

- A. General: Single Duct Pressure Independent or Pressure Dependent Type VAV terminal unit controllers conforming to the BACnet Application Specific Controller (B-ASC) device profile. Optional remote Digital Room Sensor or discrete passive room sensors to meet application requirements. Pressure Dependent (PD) type VAV terminal unit controllers shall contain all features of this section with the exception of functions required for pressure independent

operation. PD terminals shall cause the primary air damper to modulate in response to room temperature deviation from setpoint instead of airflow deviation from air flow setpoint.

1. Software Specifications

- a. General: The controller shall contain non-volatile memory to store both the resident operating system and application programming. Execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, extraction of the program for storage, routing communications, etc.
- b.
- c. Automatic Restart after Power Failure: Upon restoration of power after an outage, the controller shall automatically and without human intervention update all monitored functions; resume operation based on current synchronized time and status, and implement special start-up strategies as required.
- d.
- e. Program Configuration: The application software shall be user configurable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints.
- f.
- g. Control Algorithms: The controller shall have the ability to perform the following single and dual duct VAV applications:
 - 1) Cooling Only
 - 2) Cooling/Heating with Changeover and Morning Warmup
 - 3) Series or Parallel, Fan Powered
 - 4) Cooling with staged, proportional or floating Reheat
 - 5) Dual Duct Mixing and Non-Mixing.
 - 6) Integrated applications shall support both English, Metric, and Mixed units.
 - 7) Applications shall be capable of being configured from the Digital Room Sensor or BACnet.
 - 8) Smoke Control operation meeting UL864 UUKL Listing (separate model required).
- h. VAV Balancing: The VAV controller shall be capable of being balanced from the Digital Room Sensor without any specific pc-based software.
- i. Energy Management Applications: The controller shall have the ability to perform any or all of the following energy management routines:
 - 1) Supply Air Temperature reset feedback (Warmer or Colder primary air required)
 - 2) Request More/Less Primary Supply Air
 - 3) Occupied/Stand By/Unoccupied Mode switching.
- j. Damper Position “feedback”: The controller shall provide one of the following two methods of feedback for upstream “AHU supply air optimization”.
 - 1) Separate binary value objects shall be available to the IBMS AHU controller to tell the upstream AHU must
 - a) supply Colder or warmer air
 - b) Increase/decrease of static pressure (more/less air)

- 2) Operation (override) required.
 - a) Physical damper position feedback potentiometer that provides a true 0 – 100% feedback signal
 - b) Any of these modes of operation shall be sufficient to supply upstream optimization of both the quantity of primary air and temperature of the primary air to minimize energy supply requirements to each zone of VAV.
 - c) **Note: Controllers that provide damper position via “Calculated” damper feedback position shall NOT be allowed due to inaccuracies of such calculations and their impact on the overall efficiency of the BMS system as a result.**
- k. Occupancy Mode Control – Each controller when equipped with a Digital Room Sensor with integral occupancy sensor and DAT sensor shall automatically switch between occupied, standby, and unoccupied modes without communications from an upstream BACnet device. When integrated into a building wide IBMS system, occupancy mode can/shall be commanded by the schedule/override status of the local zone or upstream AHU according to the BACnet priority array.
- l. Communications: The controllers shall be a native BACnet EIA-485 (MS/TP) communications device supporting selectable baud rates between 9600 and 115.2kbps. Segmentation shall be supported. Auto-baud functionality shall be supported.
- m. Dedicated Room Sensor Port: The controller shall have a Dedicated Room Sensor port for direct interface to a Digital Room Sensor or Discrete Room Sensor. The controller shall have the ability of detecting if a sensor has been connected to the port and identify its type. Sensor information via the ports shall not consume any of the device terminated input capacity.
- n. Configuration: The controller shall be configurable via the following methodologies:
 - 1) Software using the IBMS Engineering or Laptop Engineering Workstation Software
 - 2) Digital Sensor
- o. Objects Counts: The object count shall be fixed for the B-ASC single duct VAV applications provided by the IBMS manufacturer. The controller shall have a minimum of the following BACnet objects:
 - 1) Heating & cooling Min/max airflows and “K” factor
 - 2) Heating and cooling occupied & unoccupied setpoints
 - 3) Fan Powered operating setpoints
 - 4) AHU operation required
 - 5) Demand for more Air
 - 6) Demand for colder air
 - 7) Demand for warmer Air
 - 8) Local timed override enabled
 - 9) Local motion sensor override enabled
- p. Hardware Platform Features:
- q. Processor: The controller shall employ at minimum a 32-bit microprocessor.

- 1) Memory: The operating system and the application programs for the controller shall be stored in non-volatile FLASH memory of sufficient size for the operation of the microcontroller. In the case of a power failure, the controller shall restart itself from its application program stored in its FLASH memory.
 - 2) Network Communication Ports: The controller shall have on-board an EIA-485 port. The EIA-485 port shall have network protection bulbs and integrated end-of-line (EOL) terminations.
 - 3) Dedicated Room Sensor Port: The controller shall have a dedicated room sensor port to directly connect a Digital Room Sensor or Discrete Room Sensor (supporting both room temperature and room setpoint). Sensors shall be hot-swappable without powering down the controller. User points and sensor data from the Digital Room Sensor shall be mapped to internal variables and not consume the input points of the host controller.
 - 4) Inputs:
 - a) All models - The controller shall have passive inputs for a 10Kohm Type II thermistor DAT sensor.
 - b) Dual Duct – 0 – 5VDC position feedback of slave duct actuator
 - c) Damper Position Feedback – 0 – 100% travel (UL864 UUKL model only)
 - 5) Outputs:
 - a) Cooling Only model – No additional outputs
 - b) Reheat Model – 4 pilot duty triac outputs for the control of series/parallel fan start/stop and up to 3 stages of reheat plus 1 0-10VDC modulating output for proportional reheat.
 - c) Dual Duct – 2 additional triac floating outputs to drive slave duct floating actuator.
 - 6) Local Status Indicator Lamps: Provide as a minimum, LED indication of CPU status and MS/TP LAN Status.
 - 7) Terminal Block Connectors: The controller shall have screw terminal blocks that can accommodate wire sizes 14-22 AWG. Terminals shall be color coded: black terminals for power, green terminals for input and outputs, and grey terminals for twisted-shielded-pair communication.
 - 8) Power Supply: The power supply for the controller shall be 24 volts AC (-15%, +20%) power. Voltage below the operating range of the system shall be considered an outage.
- r. Integrated Actuator: The controller shall have an integrated actuator with the following features:
- 1) The actuator shall be rated at 40 in-lbs.
 - 2) Connection to the damper shall be with a v-bolt clamp, accepting 3/8" to 5/8" damper shaft sizes.
 - 3) The actuator shall travel 0 to 95 degrees with adjustable end stops at 45 and 60 degrees of rotation.
 - 4) The actuator shall travel at a rate of 90 degrees per 90 seconds if supplied by 60 Hz power; 90 degrees per 108 seconds if supplied by 50 Hz power.
 - 5) UL 864 UUKL smoke control model shall be 60 seconds rotation for 90 degrees if supplied by 60Hz power and 72 seconds if supplied by 50Hz.

- 6) The actuator shall have an integrated gear disengagement mechanism.
- s. Integrated Pressure Sensor: The controller shall have an optional integrated pressure sensor for airflow measurement. The sensor shall have a range of 0-2"wc, consuming and accurate to 4.5% of reading or 0.0008"wc, whichever is greater.
- t. Digital Room Sensor for B-ASC VAV controller. Room display shall have multi-line LCD display that provides:
 - 1) Minimum three levels of password protected access
 - 2) Setpoint change capability
 - 3) Configuration of controller capability
 - 4) Air Balancing of connected VAV terminal
 - 5) Display of VAV terminal information in selectable English or Metric Units
 - 6) Full capability to configure and commission an associated VAV terminal including:
 - a) MAC address & device instance
 - b) Communication data rates
 - c) Sequence selection
 - d) Programming of all sequence parameters including setpoints, operating min/max flow setpoints, occupied and unoccupied temperature setpoints, reheat configuration, local override time period, heat/cool changeover setpoint.
 - e) Execute an automatic VAV terminal air balancing program that results in the terminal being calibrated to rated flow +/- 5% at both minimum and maximum flow setpoints.
- u. Models
 - 1) Temperature
 - 2) Temperature + Occupancy Sensor.
- v. Occupancy Sensor operation.
 - 1) Detects presence of occupancy in space within 160° radius of sensor up to a distance of 10m.
 - 2) Automatically changes mode of controller from occupied to standby setpoints when no motion is detected within sensing range after occupancy time expires. Automatically changes from standby mode to occupancy and resets occupancy timer when motion is sensed within occupancy cone of detection.

209 BACnet Application Specific Controller for Power Monitoring and sub-metering Applications

- A. General: BACnet Power Metering device complying with BACnet I/P or BACnet MS/TP device profile.
- B. Physical Characteristics:
 - 1. Regulatory Listings – UL 61010-1/ICE 61010-1 Listed, CE Marked.
 - 2. Panel or wall mounted.
 - 3. With or without integral LCD display as indicated on project drawings
 - 4. Supports 4-wire "Y" or 3-Wire "Delta" power configurations from 80 – 346VAC Line-to-Neutral and 600 VAC line-to-line, 50/60 Hz operation.

5. Maximum input current rating – 158% of rated current transducer rating (mV CTs) to maximum of 4000A rated CTs
6. Accuracy of measurements - 0.2% ANSI C12.20-2010 Class 0.2
7. Resolution - 0.01 Amp, 0.1 Volt, 0.01 Watt, 0.01 VAR, 0.01 VA, 0.01 Power Factor depending on scalar setting
8. Measurements - Volts, Amps, kW, kVAR, kVARh, kVA, kVAh, aPF, dPF. All parameters for each phase and system total of each circuit measured.
9. Models for single or multi-circuit monitoring – Provide minimum Power sub-metering as indicated on Points list. Utilize not less than one BACnet Power meter per Electrical Distribution panel at sub-main level or as indicated in points list.
10. Current transformer types.
 - a. Split or solid core CTs (mV type).
 - b. Rogowski (rope) CTs (mV type).

210 BACnet Application Specific Controller for BTU Monitoring and sub-metering Applications Onicon System-10

- A. Niagara Framework “Network” Controllers (JACE).
 1. JACE 8000 Series, Niagara 4 level or latest available release.
 2. Pre-loaded” Communications drivers – BACnet I/P, BACnet Ethernet (8802.3), BACnet MS/TP, LONMark protocol, MODbus I/P, MODbus RTU, “proprietary legacy” protocols as required to meet design intent of the project and interface to existing systems.
 3. It is the owner’s intent to purchase an open system capable of being serviced and expanded by any acceptable system integrator that has and maintains certification (TCP) to work on Niagara Framework systems. The Niagara Compatibility Statement (NICS) for all Niagara Software shall allow open access and be set as follows: accept.station.in=“*” accept.station.out=“*” accept.wb.out=“*” accept.wb.in=“*”. In any case, the Owner shall maintain the right to direct contractor to modify any software license, regardless of supplier, as desired by the Owner . The Contractor shall not install any “brand specific” software, applications or utilities on Niagara Framework based devices.
 4. All “New” DDC controllers shall be integrated using one of the accepted BACnet protocols through the JACE Network Controller(s). NO EXCEPTIONS WILL BE ALLOWED.

Part 3 EXECUTION

3.01 INSTALLATION

- A. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the Intelligent Building Management System manufacturer or its factory authorized installing contracting field office (representative). The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company’s relationship with the manufacturer. Supervision, calibration and checkout of the system shall be by the employees of the local factory authorized temperature control contracting field office (branch or representative).
- B. Install system and materials in accordance with manufacturer’s instructions, and as detailed on the project drawing set.
- C. Drawings of Intelligent Building Management Systems are diagrammatic only and any apparatus not shown, such as relays, accessories, etc., but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.

- D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the BMS sub-contractor in accordance with these specifications.
- E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the BMS sub-contractor.
- F. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.02 WIRING

- A. All electrical control wiring and power wiring to the control panels shall be the responsibility of the BMS contractor.
- B. The Electrical Contractor (Div. 26) shall furnish all power wiring to electrical starters and motors.
- C. The structured cabling (I/P level) infrastructure wiring including all I/P wiring, switches, hubs, fiber optic cable and interfaces shall be provided by the Structured Cabling or Low Voltage Sub-contractor. The Structured cabling sub-contractor shall provide an I/P level switch/communications port within no more than 10m from any BMS control panel located within a mechanical plant room.
- D. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All BMS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 26) unless otherwise allowed by the National Electrical Code or applicable local codes. Where BMS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.03 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance. Manufacturer shall provide a warranty for all provided BMS Controllers of 5 years to the original owner of the BMS system through the Manufacturer's authorized installing contractor.
- B. Within this period, upon notice by the Owner, any defects in the BMS due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the BMS sub-contractor at no expense to the Owner for materials for (1) year. Additionally, no cost of materials for (5) years of materials from date of installation.

3.04 WARRANTY ACCESS

- A. The Owner shall grant to the BMS sub-contractor, reasonable access to the BMS during the warranty period. The owner shall allow the contractor to access the BMS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.05 ACCEPTANCE TESTING

- A. Upon completion of the installation, the BMS sub-contractor shall load all system software and start-up the system. The BMS sub-contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. The BMS sub-contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's

Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

- D. System Acceptance: Satisfactory completion is when the BMS sub-contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.06 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the BMS hardware and software has been established, the BMS sub-contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The BMS sub-contractor shall provide 40 hours of instruction to the owner's designated personnel on the operation of the BMS and describe its intended use with respect to the programmed functions specified. Operator orientation of the BMS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.
- C. The training shall be in three sessions as follows:
1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
 2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
- D. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the owner during the one year warranty period. These sessions shall cover topics as requested by the owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

END OF SECTION 23-09-00

SECTION 26-00-10

COMMON ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General project related items that apply to all Division 26 sections. The provisions included in this section are complementary to and amendatory of the Division 1 sections of these project specifications - they do not replace them.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections apply to this section. Where conflicts may exist between Division 1 Specifications Sections and Division 26 Specification Sections, the Division 1 provisions shall take precedence except for when the Division 26 provisions expand, enhance, or extend the project, material or equipment requirements.

1.03 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual.
- B. NEMA MG 1 - Motors and Generators.
- C. NFPA 70 - National Electrical Code.
- D. SSPC-Paint 15 - Steel Joist Shop Paint; Steel Structures Painting Council.
- E. North Carolina State Building Code (All Volumes)

1.04 DEFINITIONS

- A. Building Code: Collectively, the current editions of all applicable codes whose requirements must be met in order for the Building Owner to be granted an Occupancy Permit by the authorities having jurisdiction over the building. These codes shall include but not be limited to the following specific volumes as well as any additional codes or standards referenced in these publications:
 - 1. General Construction.
 - 2. Administrative.
 - 3. Accessibility.
 - 4. Plumbing
 - 5. Mechanical.
 - 6. Electrical.
 - 7. Fire Prevention.
 - 7. Fuel Gas.
 - 8. Energy Conservation.
- B. Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing work or offering to perform work. The term "Contractor" shall apply to such entity regardless of whether the entity is working as a Prime Contractor or as a Sub Contractor on the project.
 - 1. Prime Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing or offering to perform work and who is awarded a contract with the Owner for work on this project.
 - 2. Sub Contractor: A licensed individual, partnership, corporation or other business entity duly licensed in the State for the trade in which he is performing or offering to perform work and who is working on the project under contract with a Prime Contractor.
- C. Building Related Laws: Collectively, the current editions of all applicable laws whose requirements must be met in order for the Building Owner to provide access to the public and to

occupy and conduct business lawfully including any additional laws, codes or standards referenced in these laws. These laws include but are not limited to the following:

1. Americans With Disabilities Act.
 2. Energy Policy Act.
- D. Provide: When used in these specifications or on the drawings, the term "provide" shall mean to furnish, install, and adjust as required for safe and efficient operation.
- E. Supply: When used in these specifications or on the drawings, the term "supply" shall mean to furnish with all required appurtenances for a complete installation and advise the installing contractor on details relating to the installation as needed.

1.05 GENERAL PROJECT REQUIREMENTS

- A. The plans and specifications for this project are prepared to represent the general project requirements and intent. They are diagrammatic in nature and are not intended to show each and every fitting, offset, or other modifications or minor devices that may be required in the field to provide a complete system that is safe, efficient and effective in operation. Minor components or modifications that are required to provide a safe, efficient and effective system shall be included in the bid price whether or not they are specifically called for on the plans or in these specifications. It is understood that the contractors bidding this project are required to be licensed in their respective trade and are therefore knowledgeable in the trade in which they are licensed.
- B. The Contractor shall provide all contingencies and supply all tools, fixtures, transportation, etc. as well as materials necessary for installation. In all its details, the work and materials shall be subject to the approval of the Architect or Engineer whose decision on all points of difference shall be final and binding on this Contractor.
- C. The Contractor shall secure and pay for all necessary approvals, permits, inspections, certificates etc.. required by state or local codes or statutes, rules, or regulations and pay all fees required unless specifically noted otherwise. The Contractor shall notify the local Electrical Inspector and schedule required inspections.
- D. All work and materials are required to be in compliance with State and Local Codes. Any conflicts between the plans and State or Local Codes, Rules, Statutes, or Regulations shall be brought to the Architect's or Engineer's attention in writing immediately.
- E. Plans are diagrammatic in nature and show the general design and arrangement of the systems. They are not intended to show each and every offset or fitting required for installation of work under this contract. This Contractor, as a licensed professional, is required to be proficient and knowledgeable in his trade and is required to include all such items and contingencies in his bid. The plans are not to be scaled for rough-in dimensions nor are they to be used for shop drawings.
1. Where dimensions are given on the plans, they must be verified with actual field measurements taken on the project site. This Contractor shall take such field measurements as required to coordinate the installation of his work or to prepare shop drawings.
 2. Slight relocation of fixtures, equipment, devices and other items may be made by this Contractor as required to fit his work to casework, trim, brick coursing, etc. as long as such relocation does not interfere with work of any other Contractor.

1.06 SYSTEM DESCRIPTION

- A. Provide limited electrical demolition, disconnection, reconnection, and new circuits for new equipment as required.
1. Disconnect power wiring from all existing equipment that is to be removed, demolished or salvaged.
 2. Remove and temporarily support the following items from existing ceilings that are to be removed for access to piping and equipment above the ceilings:

- a. Light fixtures: Remove attachments to ceiling grid and support fixtures from existing structure 2" above the elevation of the ceiling. Re-attach to new ceiling grid when installed.
 - b. Speakers: Detach from existing ceiling. Temporarily support above the ceiling elevation until the new ceiling is installed - then reinstall in new ceiling.
 - c. Smoke Detectors: Detach from existing ceilings. Provide dust cover for each detector and support 2" above ceiling elevation. Reinstall in new ceilings, then remove covers after building cleanup is completed.
 - d. Wireless access points: Detach from existing ceilings. Provide dust cover for each unit and support 2" above ceiling elevation. Reinstall in new ceilings, then remove covers after building cleanup is completed.
 - e. Cameras: Detach from existing ceilings. Provide dust cover for each camera and support 2" above ceiling elevation. Reinstall in new ceilings, then remove covers after building cleanup is completed.
 - f. Motion Detectors: Detach from existing ceilings. Provide dust cover for each detector and support 2" above ceiling elevation. Reinstall in new ceilings.
3. Remove existing duct smoke detectors from existing ducts that are removed. Provide bag cover for sample tubes and detector housing. Temporarily support detectors to minimize exposure to damage from new duct and equipment installation. Reinstall detectors in ductwork after duct and equipment installation is completed.
 4. Remove existing starters for pumps, air handling units, fans, etc. that re removed. Connect to new starter or VFD for new equipment and wire from starter/VFD and connect to the new equipment.
 5. Connect existing power wiring to replacement equipment installed under this contract.
 6. Provide new circuits for new equipment installed under this contract.

1.07 COORDINATION OTHER DIVISIONS (AND COORDINATION DRAWINGS)

- A. Requirements noted in this division are intended to be supplementary to Division 1 requirements. Where Division 1 requirements exceed the requirements in this section, the Division 1 requirements shall govern. Where requirements in this section exceed Division 1 requirements, the requirements in this division shall govern. This Contractor is required to review the Division 1 requirements as well as other Divisions to allow coordination of his work with other trades.
- B. Coordinate with other contractors (Division 22 and Division 23 contractors other equipment installers) to locate point of electrical connection for each piece of equipment and to identify location for point of demarcation from Division 26 contractor wiring. Note that connections to monitoring or switching related devices such as flow and tamper switches, contactors, etc. are to be made under this contract.

1.08 PERFORMANCE REQUIREMENTS

- A. All equipment installed in fire rated walls, ceilings, or other partitions shall be listed to maintain the fire rating and shall be installed to maintain the rating.
- B. Materials (such as conduit) passing through fire rated walls, ceilings or other partitions shall be suitably firestopped using only approved materials and methods to maintain the fire rating of the assembly.
- C. Schedule all required inspections by State and Local Authorities, and make all corrections as required by such inspections.

1.09 SUBMITTALS

- A. Submit Coordination Drawings in accordance with Division 1 requirements.
- B. Shop Drawings: Submit shop drawings as specified in the respective specification section. When equipment, materials or systems other than the one specified are submitted, this Contractor shall be required to clearly mark differences between the items submitted and the items specified. This Contractor shall be responsible for all changes required (including but not

limited to piping, wiring, mounting, clearances, etc.) under this and other divisions due to the use of items other than those specified.

1. Submit shop drawings in one complete package and not at intervals.
 2. The Contractor shall check each submittal for accuracy and completeness prior to submitting the shop drawings to the Engineer. The Contractor shall stamp and sign the documents accordingly
 3. Each item being submitted for review shall be clearly identified in the submittal. In the event that multiple items are cataloged in a section and a single item is not clearly identified as the one that is being submitted, the Engineer may at his discretion select any suitable item from the page that meets or exceeds the requirements for the project.
- C. Test Reports: Indicate results of all testing.
- D. Operation and Maintenance Manuals: Submit quantities as required in Division 1 sections (but not less than 3 sets) bound and tabbed in three ring binders with the project name, the contractors name and contact information and relevant installation, operating and maintenance data for all equipment installed on the project.

1.10 QUALITY ASSURANCE

- A. Perform in accordance with state and local building codes, laws and ordinances.
- B. Obtain and pay for all inspections, permits, and fees required for work under this contract.
- C. Substitutions: Substitutions shall be made in accordance with the procedures given in the applicable Division 1 sections. The following procedures shall supplement the procedures given in Division 1. In the event that there are not substitution procedures given in Division 1, these procedures shall be used for all Division 22, 25 and 26 items.
1. When equipment, materials or systems other than the one specified are submitted, this Contractor shall be required to clearly mark differences between the items submitted and the items specified. This Contractor shall be responsible for all changes required (including but not limited to piping, wiring, mounting, clearances, etc.) under this and other divisions due to the use of items other than those specified. The costs for these required changes shall be borne by the Contractor making the substitution at no additional costs to the Owner. The Engineer's decision on the acceptability of substitute equipment shall be final and binding under this contract. The acceptance of substitute items shall in no way relieve the Contractor from meeting any of the project requirements.
 2. Items that are to be substituted for a specified item shall be equal in quality, performance, capacity, size, construction, utility requirements, appearance, etc. to the item specified.
 3. Substitutions may be made for all items specified using the term "or equal". Where an item is specified without the use of the term "or equal" that item must be used for the project bid. No substitutions may be made for items that are specified without the "or equal" term.
 4. Items exceeding the performance, efficiency, quality, etc. may be used when approved by the Engineer, but no additional money will be paid under the contract for such features.
 5. The Engineer may consider qualities and characteristics of the specified item which may or may not have been specifically called out in the schedules or specifications when evaluating the suitability of a substitute item. The Engineer's decision regarding the acceptability of substitute items shall be final and binding under this contract.
- D. Provide testing of the following components of the electrical system. Document each test to indicate the time of day, the date, temperature, person performing the tests and all pertinent test information to the particular test. Submit documentation of each of the tests prior to and as one of the prerequisites for final acceptance of the project.
1. Ground System Testing: Upon completion of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. Take corrective action to reduce the resistance to ground to a value of 25 ohms or less as part of work included under this contract (including driving additional ground rods if required). Retest and implement corrective measures as required until the resistance to ground is 25 ohms or less.

2. Feeder Insulation Resistance Testing: Test with a 500 volt megger.
 - a. Test all current carrying phase conductors and neutrals after installation in raceways and before connections to gear or other equipment are made. Minimum values shall be 1,000,000 ohms for #6 AWG and smaller; 250,000 ohms for #4 and larger conductors measured between conductors and between the conductors and grounding conductor.
 - b. After all fixtures, devices and equipment are installed and all connections completed to each panel, disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, disconnect the branch circuit neutral wires from the neutral bar, then test each one separately until the low reading conductors are found. Correct the indicated troubles, reconnect and re-test until each conductor measures at least 250,000 ohms from the neutral bar to the grounded panel enclosure with the neutral feeder disconnected.
 - c. At final inspection, furnish a megger and demonstrate to the Engineer and State Construction Office representatives that the panels comply with the above requirements. Also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.
 3. Circuit Breaker Tests: Perform the following tests for services 1000 amperes and larger. Tests shall be performed on the service circuit breakers and the distribution circuit breakers. Testing shall be performed by a qualified factory technician at the jobsite. All readings shall be clearly tabulated and documented.
 - a. Phase Tripping Tolerance - Demonstrate tolerances (amps) are within 20% per UL requirements)
 - b. Trip Time (per phase) - in seconds.
 - c. Instantaneous Trips (amps) per phase.
 - d. Insulation Resistance (in megaohms) at 100 volts (phase to phase and line to load).
 4. Ground Fault Protection System
 - a. Performance Testing for proper operation and properly calibrated and set for the project conditions.
- E. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and properly licensed to perform the work.

1.11 DELIVERY, STORAGE, AND PROTECTION

- A. Store materials and equipment under cover and elevated above grade until ready for installation.
- B. Deliver materials and products to project site in their original shipping containers.

1.12 PROJECT CONDITIONS

- A. Coordinate equipment installation with size, location and installation of service utilities.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.13 WARRANTY

- A. See Division 1 Sections for additional warranty requirements.
- B. All labor, materials, and products supplied on this project shall have a minimum of 1 year parts and labor replacement warranty.
- C. Consult individual specification sections for additional warranty requirements. Warranty requirements stated in the subsequent specifications sections are supplemental to requirements in this warranty section.
- D. Correct defective Work within a one-year period after Date of Final Acceptance unless a different date is given in Division 1 specifications sections. Provide all materials, labor, supplies etc. as required to remove, disassemble, replace, reassemble, etc. failed or otherwise defective parts that are covered under the warranty terms.

PART 2 PRODUCTS

2.01 MATERIALS AND PRODUCTS

- A. All materials and products shall be new and shall comply with the requirements of the North Carolina State Building Code and the NFPA 70 (National Electrical Code) with North Carolina Amendments.
- B. All materials and products shall be UL or other acceptable listing agency listed where such listing is available for the material used. Where a listing is not available, materials shall be appropriately selected for their intended use.
- C. All materials and products shall be the appropriate type for the installed location.
- D. Hazardous (Classified) locations: In accordance with the appropriate section of Article 500 of NFPA 70.
- E. Where not specifically noted otherwise on the plans, enclosures for electrical equipment shall be as follows:
 - 1. Indoors, in clean environments: NEMA 1 rated.
 - 2. Outdoors, or otherwise exposed to the weather or moisture: NEMA 3R rated.
 - 3. Hazardous (Classified) locations: In accordance with the appropriate section of Article 500 of NFPA 70.
- F. Lighting fixtures shall be supplied complete with lamps, ballasts, lenses (unless the fixture specified is an open type fixture), thermal protection, trim appropriate for the surface that the fixture is mounted on or in and supports as required to support the fixture from the building structure - independent of the ceiling grid.
- G. Control devices (starters) shall be supplied complete with thermal overload elements, Hand-Off-Auto switches, control coils of the appropriate coil voltage for the application, enclosure, fuses (when the starter is part of a combination starter/disconnect unit), and indicating lights indicating when the load is energized.
- H. Non-fusible disconnect switches shall be furnished complete with operator handles, enclosures, sized for the load or the nameplate data of the equipment supplied,
- I. Fusible disconnect switches shall be furnished complete with operator handles, enclosures, fuses sized for the load or the nameplate data of the equipment supplied,

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the building and site conditions are in the proper stage of construction for the installation of electrical materials and equipment prior to installing such equipment. Do not install electrical equipment when it would be subject to damage from the elements or vandalism due to an unsecured building.
- B. Verify that proper installation and service clearance is available in the intended location of electrical equipment prior to installing equipment.
- C. Schedule all required inspections by State and Local Authorities, and make all corrections as required by such inspections.

3.02 INSTALLATION

- A. Install all equipment and materials in accordance with manufacturer's instructions, the UL listing, and all State and Local codes and Ordinances.
- B. Coordinate rough-in of convenience outlets, light switches, fire alarm devices, etc. with the requirements of the Americans With Disabilities Act requirements.
- C. Identify all panelboards, disconnect switches, starters, etc. with labels screw or rivet attached to the enclosure.
- D.

3.03 INTERFACE WITH OTHER WORK

- A. This Contractor shall coordinate his work with that of all other Contractors on the project and shall consult the drawings and specifications of the other trades to determine the nature and effect of work by others. This Contractor shall be responsible for all his work fitting in place with in an approved manner, and shall consult with others as required for drawings, dimensions, elevations, actual building measurements, etc. as necessary to ensure that his work does fit properly and does not conflict with other trades.
- B. In the event that interferences develop, this Contractor shall cooperate with others to eliminate the interference. Should pipes, ductwork, conduit, equipment or other items have to be relocated, the Architect's or Engineer's decision will be the final authority as to which Contractor shall relocate his work.
- C. Consult with other contractors for equipment electrical requirements and to determine exact rough-in and connection locations. Instruct these contractors on materials and methods required to comply with Division 26 requirements when making final electrical connections to the equipment.
- D. Coordinate actual devices to be supplied for connection to equipment installed by other Contractors, Subcontractors or Owner on the project.
- E. Coordinate voltage and current characteristics of all equipment installed by other Contractors, Subcontractors or Owner on the project. Coordinate with the actual equipment that is installed.
- F. Make power connections to all equipment installed by other Contractors, Subcontractors or Owner on the project.
- G. Provide additional intermediate steel members and attach the steel to the building structure as required to provide structurally sound point of attachment for conduit, lighting fixture and equipment supports. Install intermediate steel at approved panel points on bar joists. Do not attach to cross bracing that is attached to bar joists. Attach to bar joists at panel points only. Do not attach to bar joists at any point or in any manner that is not approved by the bar joist manufacturer. Paint all bare steel surfaces of supporting steel to prevent rust. Relocate all attachments that are found to be made in unapproved locations.

3.04 STARTING EQUIPMENT AND SYSTEMS

- A. Provide manufacturer's field representative to prepare and start equipment and systems where so specified. Where not specified, start equipment and systems in accordance with the manufacturer's instructions and recommendations. Provide all test instruments, power, personnel and materials as required to start the equipment and systems.
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner 's designated representative.

3.05 ADJUSTING

- A. Adjust equipment and systems for safe and efficient operation.

3.06 CLEANING

- A. Clean all equipment prior to substantial completion.
- B. Protect installed equipment and materials from subsequent construction operations.
- C. Do not permit traffic over unprotected floor surface.

END OF SECTION 26-00-10

SECTION 26-05-05

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate any utility service outages with utility company and with Owner.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service while additions and modifications to the existing system are being made. Energize new gear, circuits, etc. only after they are fully installed and ready for service. Disable system only as required to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 48 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Fire Alarm System: Maintain existing system in service until new portions of the system are accepted. Do not disable system unless necessary for reprogramming or connection of new circuits.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 48 hours in advance.
 - 4. Make temporary connections to maintain service in areas adjacent to work area.
- G. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner at least 48 hours before partially or completely disabling system.
 - 2. Notify telephone utility company at least 24 hours before partially or completely disabling system.
 - 3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove abandoned panelboards and distribution equipment.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Provide typed directories as required for all existing panelboards. New directories will be required to conform with revised room numbers even though no work may have been performed in these areas.

END OF SECTION 26-05-05

SECTION 26-05-19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Manufactured wiring systems.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Wire pulling lubricant.
- G. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 07-84-00 - Firestopping.
- B. Section 26-05-26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26-05-53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- J. NFPA 70 - National Electrical Code.
- K. UL 44 - Thermoset-Insulated Wires and Cables.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables.
- M. UL 183 - Manufactured Wiring Systems.
- N. UL 486A-486B - Wire Connectors.
- O. UL 486C - Splicing Wire Connectors.
- P. UL 486D - Sealed Wire Connector Systems.
- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.
- H. Manufactured wiring systems are permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. For branch circuits where concealed under raised floors, where concealed above accessible ceilings for lighting, and in open ceiling areas for lighting.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
 2. In addition to other applicable restrictions, may not be used:
 - a. Where exposed to damage.

- b. For damp, wet, or corrosive locations.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26-05-26.
- I. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B (High-Leg): Orange.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - d. 240/120 V, 1 Phase, 3 Wire System:
 - 1) Phase A: Black.

- 2) Phase B: Red.
- 3) Neutral/Grounded: White.
- e. Equipment Ground, All Systems: Green.
- f. Isolated Ground, All Systems: Green with yellow stripe.
- g. Travelers for 3-Way and 4-Way Switching: Pink.
- h. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
- i. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com.
 - b. Encore Wire Corporation: www.encorewire.com.
 - c. Southwire Company: www.southwire.com.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 - 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Installed Underground: Type XHHW-2.
 - b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 MANUFACTURED WIRING SYSTEMS

- A. Manufacturers:
 - 1. AFC Cable Systems Inc: www.afcweb.com.
 - 2. RELOC Wiring Solutions, a brand of Acuity Brands, Inc: www.relocwiring.com.
 - 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us.
- B. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.
- C. Provide components necessary to transition between manufactured wiring system and other wiring methods.
- D. Branch Circuit Cables:
 - 1. Conductor Stranding (Size 10 AWG and Smaller): Solid.
 - 2. Insulation Voltage Rating: 600 V.
 - 3. Insulation: Type THHN.
 - 4. Provide dedicated neutral conductor for each phase conductor where indicated or required.
 - 5. Grounding: Full-size integral equipment grounding conductor.
 - 6. Armor: Steel, interlocked tape.
- E. Connectors: Keyed and color-coded to prevent interconnection of different voltages.
- F. Fixture Leads: Type TFN insulation.

2.05 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26-05-26.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 - 1. Manufacturers:
 - a. 3M: www.3m.com.
 - b. Ideal Industries, Inc: www.idealindustries.com.
 - c. NSI Industries LLC: www.nsiindustries.com.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
 - 1. Manufacturers:
 - a. Burndy: www.burndy.com.
 - b. IlSCO: www.ilSCO.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
 - 1. Manufacturers:
 - a. Burndy: www.burndy.com.
 - b. IlSCO: www.ilSCO.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 - 1. Manufacturers:
 - a. Burndy: www.burndy.com.
 - b. IlSCO: www.ilSCO.com.
 - c. Thomas & Betts Corporation: www.tnb.com.

2.06 WIRING ACCESSORIES

- A. Electrical Tape:
 - 1. Manufacturers:
 - a. 3M: www.3m.com.

- b. Plymouth Rubber Europa: www.plymouthrubber.com.
 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
 6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
 7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
1. Manufacturers:
 - a. 3M: www.3m.com.
 - b. Burndy: www.burndy.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
 - a. 3M: www.3m.com.
 - b. American Polywater Corporation: www.polywater.com.
 - c. Ideal Industries, Inc: www.idealindustries.com.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
 2. Arrange circuiting to minimize splices.
 3. Include circuit lengths required to install connected devices within 10 ft of location indicated.
 4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is permitted, under the following conditions:

- a. Increase size of conductors as required to account for ampacity derating.
- b. Size raceways, boxes, etc. to accommodate conductors.
7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
8. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Install conductors with a minimum of 12 inches of slack at each outlet.
- H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.
 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to un-spliced conductors.
 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

- a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
- a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.
- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- O. Identify conductors and cables in accordance with Section 26-05-53.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-84-00.
- Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26-05-19

SECTION 26-05-26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Chemically-enhanced ground electrodes.
- G. Ground plate electrodes.
- H. Ground enhancement material.
- I. Ground access wells.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26-05-53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- E. NFPA 70 - National Electrical Code.
- F. UL 467 - Grounding and Bonding Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- F. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 5. Ground Rod Electrode(s):
 - a. Provide two electrodes unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.

- c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
 - d. Provide ground enhancement material around electrode if required.
 - e. Provide ground access well for each electrode.
 6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
 7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 48 above finished floor unless otherwise indicated.
- G. Service-Supplied System Grounding:
 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
 1. Provide grounding electrode system for each separate building or structure.
 2. Provide equipment grounding conductor routed with supply conductors.
 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- I. Separately Derived System Grounding:
 1. Separately derived systems include, but are not limited to:
 - a. Transformers (except autotransformers such as buck-boost transformers).
 - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
 - c. Generators, when neutral is switched in the transfer switch.
 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
 5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- J. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
8. Provide bonding for metal building frame.
9. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26-05-26:
 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
 2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - a. Exceptions:
 - 1) Use exothermic welded connections for connections to metal building frame.
 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Burndy: www.burndy.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
- D. Ground Bars:
 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.
 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com.
- E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch diameter by 8 feet length, unless otherwise indicated.
 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Galvan Industries, Inc: www.galvanelectrical.com.
- F. Chemically-Enhanced Ground Electrodes:
1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.
 2. Length: 10 feet.
 3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.
 4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.
 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
- G. Ground Plate Electrodes:
1. Material: Copper.
 2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
 3. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
- H. Ground Enhancement Material:
1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
 2. Resistivity: Not more than 20 ohm-cm in final installed form.
 3. Manufacturers:
 - a. Erico International Corporation: www.erico.com.
 - b. Harger Lightning & Grounding: www.harger.com.
 - c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
- I. Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
 2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 8 inches in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
 2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- E. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- F. Identify grounding and bonding system components in accordance with Section 26-05-53.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 26-05-26

SECTION 26-05-29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 03-30-00 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- D. MFMA-4 - Metal Framing Standards Publication.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- F. NFPA 70 - National Electrical Code.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03-30-00.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - 1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel Material:
 - a. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 - 3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 - 4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 - 5. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:

- a. Equipment Supports: 1/2 inch diameter.
 - b. Busway Supports: 1/2 inch diameter.
 - c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
 - d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
 - f. Outlet Boxes: 1/4 inch diameter.
 - g. Luminaires: 1/4 inch diameter.
- F. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
 4. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. PHP Systems/Design: www.phpsd.com.
 - d. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
- G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps or machine bolts.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.
 9. Powder-actuated fasteners are permitted only as follows:
 - a. Where other methods of attachment will not produce satisfactory results and powder actuated fasteners can be safely driven without damaging the substrate material.
 10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 11. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.
 12. Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.
- K. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26-05-29

SECTION 26-05-33.13

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Reinforced thermosetting resin conduit (RTRC).
- I. Conduit fittings.
- J. Accessories.
- K. Conduit, fittings and conduit bodies.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-26 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- B. Section 26-05-29 - Hangers and Supports for Electrical Systems.
- C. Section 26-05-53 - Identification for Electrical Systems.
- D. Section 26-05-33.16 - Boxes for Electrical Systems.
- E. Section 26-05-53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC).
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC).
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
- K. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series.
- L. NFPA 70 - National Electrical Code.
- M. UL 1 - Flexible Metal Conduit.
- N. UL 6 - Electrical Rigid Metal Conduit-Steel.
- O. UL 360 - Liquid-Tight Flexible Steel Conduit.
- P. UL 514B - Conduit, Tubing, and Cable Fittings.

- Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
- R. UL 797 - Electrical Metallic Tubing-Steel.
- S. UL 1242 - Electrical Intermediate Metal Conduit-Steel.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- C. Products: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
- J. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- L. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit.
- M. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
- N. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet.
- O. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
 2. Damp, Wet, or Corrosive Locations: Use liquid-tight flexible metal conduit.
 3. Maximum Length: 6 feet unless otherwise indicated.
 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
 - c. HVAC Equipment and motorized Plumbing Equipment.
- P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Fittings for Grounding and Bonding: Also comply with Section 26-05-26.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 - 5. Underground, Interior: 3/4 inch (21 mm) trade size.
 - 6. Underground, Exterior: 1 inch (27 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com.
 - 2. Republic Conduit: www.republic-conduit.com.
 - 3. Wheatland Tube Company: www.wheatland.com.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com.
 - 2. Republic Conduit: www.republic-conduit.com.
 - 3. Wheatland Tube Company: www.wheatland.com.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 1. Allied Tube & Conduit.
 2. Thomas & Betts Corporation: www.tnb.com.
 3. Robroy Industries: www.robroy.com.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.
- D. Interior Coating: Urethane, minimum thickness of 2 mil.
- E. PVC-Coated Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel or malleable iron.
 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
- F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.
- G. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.06 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 1. AFC Cable Systems, Inc: www.afcweb.com.
 2. Electri-Flex Company: www.electriflex.com.
 3. International Metal Hose: www.metalhose.com.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.

- a. Do not use die cast zinc fittings.
- b. Do not use potted metal or indenter type fittings.

2.08 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 1. Allied Tube & Conduit: www.alliedeg.com.
 2. Republic Conduit: www.republic-conduit.com.
 3. Wheatland Tube Company: www.wheatland.com.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 4. Connectors and Couplings: Use compression (gland) type.
 - a. Do not use indenter type connectors and couplings.
 - b. Do not use potted metal or set-screw type connectors or couplings.
 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
- D.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 1. Cantex Inc: www.cantexinc.com.
 2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com.
 3. JM Eagle: www.jmeagle.com.
 4. AFC Cable Systems, Inc.
 5. Electri-Flex Company.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
- D. Fittings and Conduit Bodies: NEMA TC 3.

2.10 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- B. Supports: Per manufacturer's recommendations.
- C. Fittings: Same type and manufacturer as conduit to be connected.

2.11 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- E. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- G. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify routing and termination locations of conduit prior to rough-in.
- E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Install nonmetallic conduit in accordance with manufacturer's instructions.
- H. Arrange supports to prevent misalignment during wiring installation.
- I. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- J. Provide additional intermediate steel members and attach the steel to the building structure as required to provide structurally sound point of attachment for conduit supports. Install intermediate steel at approved panel points on bar joists. Do not attach to bar joists at any point or in any manner that is not approved by the bar joist manufacturer. Relocate all attachments that are found to be made in unapproved locations.
- K. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- L. Fasten conduit supports to building structure and surfaces under provisions of Section 26-05-29.
- M. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- N. Do not attach conduit to ceiling support wires.
- O. Arrange conduit to maintain headroom and present neat appearance.
- P. Route all above slab conduit parallel and perpendicular to walls.
- Q. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- R. Route conduit under slab from point-to-point where feasible.
- S. Maintain adequate clearance between conduit and piping.

- T. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- U. Bring conduit to shoulder of fittings; fasten securely.
- V. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- W. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- X. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- Y. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- Z. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.
- AA. Provide suitable pull string in each empty conduit except sleeves and nipples.
- AB. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- AC. Install expansion fittings every 200 linear feet and wherever structural expansion joints are crossed.
- AD. Ground and bond conduit under provisions of Section 26-05-26.
- AE. Identify conduit under provisions of Section 26-05-53.
- AF. Couplings and terminations for EMT conduit shall be made utilizing plated steel hexagonal compression connectors. No pot metal, setscrew or indented type fittings shall be used.
- AG. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 9. Arrange conduit to provide no more than 150 feet between pull points.
 - 10. Route conduits above water and drain piping where possible.
 - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
 - 13. Maintain minimum clearance of 2" from steel or wood roof decking.
 - 14. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:

- a. Heaters.
- b. Hot water piping.
- c. Flues.

AH. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 26-05-29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
9. Use of spring steel conduit clips for support of conduits is permitted only as follows:
10. Use of wire for support of conduits is permitted only as follows:
 - a. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or permitted).
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

AI. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquid-tight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

AJ. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.

7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
 10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-84-00.
- AK. Underground Installation:
1. Provide trenching and backfilling as required for installing underground conduits. Boring may be acceptable but only upon written approval by the owner or engineer.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 - b. Under Slab on Grade: 12 inches to bottom of slab.
 3. Provide underground warning tape in accordance with Section 26-05-53 along entire conduit length for all PVC conduits.
- AL. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03-30-00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- AM. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 4. Where conduits are subject to earth movement by settlement or frost.
- AN. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.
- AO. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- AP. Provide grounding and bonding in accordance with Section 26-05-26.
- AQ. Identify conduits in accordance with Section 26-05-53.

3.03 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

3.06 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in the UL firestopping method instructions.
- B. Provide all openings and sleeves for conduits penetrating exterior walls, interior walls and other partitions, floors and roofs. Waterproof penetrations through exterior walls. Seal all other penetrations smoke-tight.
- C. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Roofing Section of Division 7.
- D. Provide conduit fittings to penetrate cabinets of equipment. Do not route conduits through factory cut or field cut holes in cabinets.

END OF SECTION 26-05-33.13

SECTION 26-05-33.16

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches

1.02 RELATED REQUIREMENTS

- A. Section 08-31-00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 26-05-29 - Hangers and Supports for Electrical Systems.
- C. Section 26-05-33.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- D. Section 26-27-26 - Wiring Devices:
 - 1. Wall plates.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. NFPA 70 - National Electrical Code.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- I. UL 508A - Industrial Control Panels.
- J. UL 514A - Metallic Outlet Boxes.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
- B. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

202 BOXES

- A. General Requirements:
 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
 12. Wall Plates: Comply with Section 26-27-26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or

- UL 508A.
- 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
- 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- G. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels as required for access.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - 4. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26-05-33.13.
 - 5. Locate junction and pull boxes in the following areas, unless otherwise indicated:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- H. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26-05-29 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- I. Install boxes plumb and level.
- J. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished

- surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- K. Install boxes as required to preserve insulation integrity.
- L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-84-00.
- N. Close unused box openings.
- O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- P. Provide grounding and bonding in accordance with Section 26-05-26.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26-05-53

SECTION 26-05-53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Building wire color coding.
- E. Voltage markers.
- F. Underground warning tape.
- G. Warning signs and labels.
- H. Field-painted identification of conduit.

1.02 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.
- C. NFPA 70 - National Electrical Code.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace.
- E. UL 969 - Marking and Labeling Systems.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchgear:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.

- 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- b. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- c. Motor Control Centers:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- d. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- e. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
- f. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
- g. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
- h. Enclosed Contactors:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
 - 4) Identify coil voltage.
 - 5) Identify load(s) and associated circuits controlled. Include location.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting

- means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
- c. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.
3. Emergency System Equipment:
 - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
 - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
 - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
 4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
 5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 7. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
 8. Use identification label on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
 9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
 10. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
 11. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches.
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
 12. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
 13. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 14. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 15. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message

"DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26-05-19.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 - 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 - d. In cable tray, at maximum intervals of 20 feet.
 - 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
- D. Identification for Raceways:
 - 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 - 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Color Code:
 - (a) Emergency Power System: Red.
 - (b) Fire Alarm System: Red.
 - 2) Field-Painting: Comply with Section 09-91-23 and 09-91-13.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26-05-19.
 - 3. Use identification labels or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 - 4. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 - 5. Use underground warning tape to identify underground raceways.
 - 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.
- E. Identification for Boxes:
 - 1. Use voltage markers to identify highest voltage present.
 - 2. Use voltage markers or color-coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09-91-23 and 09-91-13 per the same color code used for raceways.
 - 3. Use identification labels to identify circuits enclosed.
- F. Identification for Devices:
 - 1. Wiring Device and Wall plate Finishes: Comply with Section 26-27-26.
 - 2. Factory Pre-Marked Wall plates: Comply with Section 26-27-26.
 - 3. Use identification label or engraved wall plate to identify serving branch circuit for all receptacles.
 - 4. Use identification label or engraved wall plate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

5. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- G. Identification for Luminaires:
 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - c. Seton Identification Products: www.seton.com.
 2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
 5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
 6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
 1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com.
 - b. Brother International Corporation: www.brother-usa.com.
 - c. Panduit Corp: www.panduit.com.
 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 1. Minimum Size: 1 inch by 2.5 inches.
 2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. System Designation: 1 inch.
 - b. Equipment Designation: 1/2 inch.
 - c. Other Information: 1/4 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
 5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
 - c. Fire Alarm System: White text on red background.

- D. Format for General Information and Operating Instructions:
 - 1. Minimum Size: 1 inch by 2.5 inches.
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/4 inch.
 - 5. Color: Black text on white background unless otherwise indicated.
 - a. Exceptions:
 - 1) Provide white text on red background for general information or operational instructions for emergency systems.
- E. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches by 4 inches.
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch.
 - 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Power source and circuit number or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Black text on clear background.
- G. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Black text on clear background.
- H. Format for Fire Alarm Device Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Designation indicated and device zone or address.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. HellermannTyton: www.hellermanntyton.com.
 - 3. Panduit Corp: www.panduit.com.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
 - 1. Do not use handwritten text.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
- E. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com.
 - 3. Seton Identification Products: www.seton.com.
- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.brimar.com.
 - 2. Clarion Safety Systems, LLC: www.clarionsafety.com.
 - 3. Seton Identification Products: www.seton.com.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: As follows.
 - a. Receptacles: Outside face of cover.
 - b. Switches: Inside face of cover - concealed from view.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.
- B. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION 26-05-53

SECTION 26-05-83

WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-19 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26-05-33.13 - Conduit for Electrical Systems.
- C. Section 26-05-33.16 - Boxes for Electrical Systems.
- D. Section 26-27-26 - Wiring Devices.
- E. Section 26-28-16.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices.
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications.
- C. NFPA 70 - National Electrical Code.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.
 - 3. Verify equipment voltage corresponds with the voltage and phase that will be supplied to the equipment. Do not connect if there is a discrepancy in voltage or phase.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Conform to NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26-28-16.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26-27-26.
- D. Flexible Conduit: As specified in Section 26-05-33.13.

- E. Wire and Cable: As specified in Section 26-05-19.
- F. Boxes: As specified in Section 26-05-33.16.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.
- C. Make conduit connections to equipment at the point of entry to the equipment cabinet using appropriate conduit fittings. Do not route conduits through cabinet openings.
- D. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- E. Provide receptacle outlet to accommodate connection with attachment plug.
- F. Provide cord and cap where field-supplied attachment plug is required.
- G. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- H. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- I. Install terminal block jumpers to complete equipment wiring requirements.
- J. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- K. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 26-05-83

SECTION 26-24-16

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-26 - Grounding and Bonding for Electrical Systems.
- B. Section 26-05-29 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NEMA PB 1 - Panelboards.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- H. NFPA 70 - National Electrical Code.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- K. UL 67 - Panelboards.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
- M. UL 869A - Reference Standard for Service Equipment.
- N. UL 943 - Ground-Fault Circuit-Interrupters.
- O. UL 1699 - Arc-Fault Circuit-Interrupters.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry

locations, conductor terminal information, and installed features and accessories.

- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

201 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

202 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 - 3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide removable end walls for NEMA Type 1 enclosures.
 - d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- L. Load centers are not acceptable.
- M. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Feed-through lugs.
 - 2. Sub-feed lugs.

203 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Copper.
 - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

204 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Copper, suitable for terminating copper conductors only.
 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
 5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - a. Provide the following field-adjustable trip response settings:
 - 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - 2) Long time delay.
 - 3) Short time pickup and delay.
 - 4) Instantaneous pickup.
 - 5) Ground fault pickup and delay where ground fault protection is indicated.
 - b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
 6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
 8. Provide listed switching duty rated circuit breakers with SWD marking for all branch

circuits serving fluorescent lighting. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

9. Do not use tandem circuit breakers.
10. Do not use handle ties in lieu of multi-pole circuit breakers.
11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
12. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

205 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

301 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

302 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required supports in accordance with Section 26-05-29.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 26-05-26.
- K. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- L. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- M. Install all field-installed branch devices, components, and accessories.
- N. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- O. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the

panelboard as required by NFPA 70.

- P. Set field-adjustable circuit breaker tripping function settings as indicated.
- Q. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- R. Provide filler plates to cover unused spaces in panelboards.
- S. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 - 1. Emergency and night lighting circuits.
 - 2. Fire detection and alarm circuits.
 - 3. Communications equipment circuits.
 - 4. Intrusion detection and access control system circuits.
 - 5. Video surveillance system circuits.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-40-00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section
- D. 7.6.1.1 for all main circuit breakers and circuit breakers larger than 800 amperes. Tests listed as optional are not required.
- E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- F. Test GFCI circuit breakers to verify proper operation.
- G. Test AFCI circuit breakers to verify proper operation.
- H. Test shunt trips to verify proper operation.
- I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 24 16

SECTION 26-27-26

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Receptacles.
- B. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.
- C. NEMA WD 1 - General Color Requirements for Wiring Devices.
- D. NEMA WD 6 - Wiring Devices - Dimensional Specifications.
- E. NFPA 70 - National Electrical Code.
- F. UL 498 - Attachment Plugs and Receptacles.
- G. UL 514D - Cover Plates for Flush-Mounted Wiring Devices.
- H. UL 943 - Ground-Fault Circuit-Interrupters.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc.. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 4. Notify Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Operation and Maintenance Data:
 - 1. GFCI Receptacles: Include information on status indicators.
- D. Project Record Documents: Record actual installed locations of wiring devices.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: Ivory with stainless steel wall plate.
- C. Wiring Devices Installed in Finished Spaces: Ivory with stainless steel wall plate.
- D. Wiring Devices Installed in Unfinished Spaces: Ivory with galvanized steel wall plate.
- E. Wiring Devices Installed in Wet or Damp Locations: Ivory with specified weatherproof cover.

2.03 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
 - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.04 WALL PLATES

- A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Oversized.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26-05-33.16 as required for installation of wiring devices provided under this section.
 1. Mounting Heights: Unless otherwise indicated, as follows:
 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Engineer to obtain direction prior to proceeding with work.
 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- I. Install wall switches with OFF position down.

- J. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-40-00 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Inspect each surge protection receptacle to verify surge protection is active.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26-27-26

SECTION 26-28-13

FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.

1.02 RELATED REQUIREMENTS

- A. Section 26-28-16.16 - Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses.
- B. NFPA 70 - National Electrical Code.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements.
- D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses.
- E. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses.
- F. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 26-28-16.16.
 - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
 - 3. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
- D. Products: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.
- B. Cutler-Hammer.
- C. GE Company.
- D. Littelfuse, Inc: www.littelfuse.com.

2.02 APPLICATIONS

- A. Service Entrance:
 - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- B. Feeders:
 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
 2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- C. General Purpose Branch Circuits: Class RK1, time-delay.
- D. Individual Motor Branch Circuits: Class RK1, time-delay.
- E. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.
- F. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class L Fuses: Comply with UL 248-10.
- I. Class CC Fuses: Comply with UL 248-4.
- J. Main Service Switches Larger than 600 amperes: Class L (time delay) current limiting with 200,000 amp interrupting rating..
- K. Main Service Switches 600A and less: Class RK1 or J (time delay), current limiting with 200,000 amp interrupting rating.
- L. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay), current limiting with 200,000 amp interrupting rating.
- M. Power Load Feeder Switches 600A and less: Class RK1 (time delay), current limiting with 200,000 amp interrupting rating.
- N. Motor Load Feeder, Motor Controller & Transformer Circuit Switches: Class RK5, current limiting with 200,000 amp interrupting rating.
- O. Individual Equipment Switches where fault current does not exceed 50,000A: Class K5 with 50kA interrupting rating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- C. Coordinate fuse sizes for equipment with the nameplate of the equipment being protected. The equipment supplied on the project may be different from the equipment originally specified.
- D. Replace all fuses that blow during construction after correcting the problem that caused the overload condition.

END OF SECTION 26-28-13

SECTION 26-28-16.16

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-26 - Grounding and Bonding for Electrical Systems.
- B. Section 26-05-29 - Hangers and Supports for Electrical Systems.
- C. Section 26-05-53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26-28-13 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- E. NFPA 70 - National Electrical Code.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- H. UL 98 - Enclosed and Dead-Front Switches.
- I. UL 869A - Reference Standard for Service Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- D. Project Record Documents: Record actual locations of enclosed switches.

- E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Number of Poles: Suitable for the load served.
 - 1. When a manufacturer does not offer a configuration compatible with the load served in Heavy Duty construction, furnish a 3-pole switch to meet the intent of the specification. Do not substitute General Duty switches under any circumstances.
- G. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
 - c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- H. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- I. Provide with switch blade contact position that is visible when the cover is open.
- J. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- K. Conductor Terminations: Suitable for use with the conductors to be installed.
- L. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- M. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- N. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- O. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- P. Heavy Duty Switches:
 1. Comply with NEMA KS 1.
 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- Q. Provide the following features and accessories where indicated or where required to complete installation:
 1. Hubs: As required for environment type; sized to accept conduits to be installed.
 2. Integral fuse pullers.
 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26-05-29.
- E. Install enclosed switches plumb.
- F. Mount controllers to walls or suitable structures. Do not mount to equipment. Where equipment is not located near a suitable wall or suitable structure, field fabricate a support structure and mount the controller to the structure. For exterior applications, fabricate structure from hot dipped galvanized strut materials and use hot dipped galvanized fasteners.
- G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- H. Provide grounding and bonding in accordance with Section 26-05-26.

- I. Provide fuses complying with Section 26-28-13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Identify enclosed switches in accordance with Section 26-05-53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-40-00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26-28-16.16

SECTION 26-51-00

INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Lamps.
- F. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26-05-33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.
- B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.
- C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society.
- D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems.
- G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems.
- H. NFPA 70 - National Electrical Code.
- I. NFPA 101 - Life Safety Code.
- J. UL 924 - Emergency Lighting and Power Equipment.
- K. UL 1598 - Luminaires.
- L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Conform to requirements of NFPA 70 and NFPA 101.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- E. Suitable for Use in Fire Rated Ceilings: For luminaires installed in fire rated ceiling assemblies, include label identifying the fixture is listed for use in a fire rated ceiling.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide three year manufacturer warranty for all LED luminaires, including drivers.
- B. Provide five year pro-rata warranty for batteries for emergency lighting units.
- C. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS - LUMINAIRES

- A. Acuity Brands, Inc: www.acuitybrands.com.
- B. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
- C. Hubbell Lighting, Inc: www.hubbellighting.com.
- D. Manufacturers of fixtures, lamps and ballasts must have a minimum of 5 years successful experience in the manufacture of the applicable product.

2.02 LUMINAIRES

- A. Manufacturers:
 1. Acuity Brands, Inc: www.acuitybrands.com.
 2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.

3. Hubbell Lighting, Inc: www.hubbellighting.com.
 4. Philips Lighting North America Corporation; www.lightingproducts.philips.com.
- B. Furnish products as indicated in Schedule included on the Drawings.
- C. NEC Article 417.73 Note: Provide disconnecting means to satisfy the NEC requirements for luminaire disconnecting means for ballasted fixtures with double ended lamps and luminaires with ballasts fed from multiwire circuits.
- D. Provide products that comply with requirements of NFPA 70.
- E. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- F. Provide products listed, classified, and labeled as suitable for the purpose intended.
- G. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- H. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- I. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- J. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
 2. Tested in accordance with IES LM-79 and IES LM-80.
 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

- A. Manufacturers:
1. Acuity Brands, Inc: www.acuitybrands.com.
 2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
 3. Hubbell Lighting, Inc: www.hubbellighting.com.
- B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Battery:
1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EMERGENCY EXIT LUMINAIRE

- A. Manufacturers:
1. Acuity Brands, Inc: www.acuitybrands.com.
 2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
 3. Hubbell Lighting, Inc: www.hubbellighting.com.
 4. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#lse.
- B. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single or double as indicated or as required for the installed location.

2. Directional Arrows: As indicated or as required for the installed location.
- C. Self-Powered Exit Signs:
1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
 2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
 3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
 4. Provide low-voltage disconnect to prevent battery damage from deep discharge.
 5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- D. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.
1. Provide fixtures complying with NFPA 101.
 2. Housing: Extruded aluminum.
 3. Style: Aluminum stencil face with red letters.
 4. Housing: Extruded aluminum.
 5. Lamps: Compact fluorescent.
 6. Directional Arrows: Universal type for field adjustment.
 7. Mounting: Universal, for field selection.
 8. Battery: Battery must be high temperature rated (0C-60C) maintenance free type, with 1.5 hour capacity.
 - a. Self contained maintenance free unit with a normal life expectancy of 10 years.
 - b. Battery must power the connected fixture lamps for a minimum of 90 minutes.
 - c. Resealable sintered pressure vent.
 - d. Positive and negative terminal.
 9. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
 - a. Fully automatic solid state type, full wave rectifying, with current limiting feature.
 - b. Charger shall restore the battery to full charge within 24 hours after a discharge of 90 minutes under full rated load.
 - c. The charger shall be activated when the battery voltage drops below 80%.
 - d. A low voltage disconnect switch shall be included if a lead battery is used to disconnect the battery from the load and prevent damage from a deep discharge during an extended power outage
 10. Lamps: LED. Maximum LED failure rate shall be 25% within a seven year period. If this failure rate is exceeded, the manufacturer shall replace the complete unit at no charge.
 11. Additional Features:
 - a. Pilot light to indicate the unit is connected to AC power.
 - b. The battery shall have a high rate charge pilot light unless it is the self diagnostic type.
 - c. Test switch to simulate operation of the unit upon loss of AC power by energizing the lamps from the battery and exercising the transfer relay.
 12. Special Warranty Requirements:
 - a. The entire unit shall be warranted for three years. The battery must have an additional two years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty paperwork shall be included in the contract close-out documents.

2.05 EMERGENCY EGRESS LUMINAIRE

- A. Emergency Lighting Units: Luminaire suitable for use as emergency lighting unit.
1. Housing: Plastic.
 2. Mounting: Universal, for field selection.

3. Battery: Battery must be 12 volt high temperature rated (0C-60C) maintenance free type, with 1.5 hour capacity.
 - a. Self contained maintenance free unit with a normal life expectancy of 10 years.
 - b. Battery must power the connected fixture lamps for a minimum of 90 minutes.
 - c. Resealable sintered pressure vent.
 - d. Positive and negative terminal.
4. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
 - a. Fully automatic solid state type, full wave rectifying, with current limiting feature.
 - b. Charger shall restore the battery to full charge within 24 hours after a discharge of 90 minutes under full rated load.
 - c. The charger shall be activated when the battery voltage drops below 80%.
 - d. A low voltage disconnect switch shall be included if a lead battery is used to disconnect the battery from the load and prevent damage from a deep discharge during an extended power outage
5. Lamps: Halogen incandescent lamps shall be supplied with the unit.
6. Additional Features:
 - a. Pilot light to indicate the unit is connected to AC power.
 - b. The battery shall have a high rate charge pilot light unless it is the self diagnostic type.
 - c. Test switch to simulate operation of the unit upon loss of AC power by energizing the lamps from the battery and exercising the transfer relay.
7. Special Warranty Requirements:
 - a. The entire unit shall be warranted for three years. The battery must have an additional two years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty paperwork shall be included in the contract close-out documents.

2.06 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Stepped dimming LED drivers for connection to existing wall switches: Provide separate conductor for lighting circuit voltage input from hardwired switchlegs to operate fixtures at 50% output with one switchleg energized and 100% power with both switchlegs energized.

2.07 LAMPS

- A. Lamps - General Requirements:
 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Engineer to be inconsistent in perceived color temperature.
- B. Lamp Types: As specified for each fixture.
- C. Fluorescent Lamps:
 1. Lamps shall comply with the EPA Guidelines regarding the Toxicity Characteristic Leaching Procedure (TCLP).
- D. Reflector Lamps: Beam patterns in accordance with ANSI C78.379.

2.08 ACCESSORIES

- A. Accessories: As specified or as otherwise required for each luminaire.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26-05-33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 4. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
 - 5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- G. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).
- H. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- I. Support luminaires from the building steel independent of ceiling framing.
- J. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- K. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- L. Exposed Grid Ceilings: Support surface mounted and lay-in luminaires in grid ceiling directly from building structure. Support each fixture with four dedicated support wires securely attached to each corner of the fixture. The support wires shall be installed a maximum of 15 degrees from vertical. Provide additional intermediate steel secured to the building structure where the building structural elements do not accommodate the fixture support requirements

listed above. Secure lay-in fixtures to the grid main runners at the four corners using sheet metal screws.

- M. Install recessed luminaires flush with ceiling surface. For lay-in ceilings, support the fixture from building steel with a dedicated support wire at each corner of the fixture. Furnish intermediate building steel when the steel framing of the building is not located near the fixture.
- N. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- O. Install clips to secure recessed grid-supported luminaires in place.
- P. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.
- Q. Install accessories furnished with each luminaire.
- R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.
- S. Connect luminaires and exit signs to branch circuit outlets provided under Section 26-05-37 using flexible conduit.
- T. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- U. Bond products and metal accessories to branch circuit equipment grounding conductor.
- V. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
- W. Provide all attachments and intermediate steel as required to provide support members for luminaires. Do not support fixtures from steel joist bridging - bridging is not considered to be a load carrying portion of the building steel.
- X. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- Y. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- Z. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-40-00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.
- F. Test exit and emergency lighting units for proper operation after they have charged for at least 24 hours by disconnecting power from the unit and observing operation for the full 90 minute minimum test cycle. Repair or replace any unit that fails the test until all units have passed the test. Perform this test at least 10 days prior to final inspection. Record the results of the test for each unit and include the report in the close-out documentation. The test shall demonstrate that the batteries conform to the requirements of NEC 700.12(F).

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Engineer or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer or authority having jurisdiction.
- D. Aim and adjust fixtures as directed.
- E. Position exit sign directional arrows as indicated.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.
- B. Replace defective ballasts and drivers as indicated by failure to fire lamps, or excessive noise, heat, or odors.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

3.09 SCHEDULE - SEE DRAWINGS

END OF SECTION 26-51-00