

**BID DOCUMENTS
and
CONSTRUCTION DOCUMENTS**

**ITB 18-024
GOVERNMENT CENTER HVAC UPGRADE
PROJECT NO. 15068**

For

**Highlands County
Board of County Commissioners**



Sweet Sparkman Architects, Inc.
2168 Main Street
Sarasota, FL 34237

January 2018

PROJECT MANUAL

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**HIGHLANDS COUNTY BOARD
OF COUNTY COMMISSIONERS**

Purchasing Division

**SECTION 00010
INVITATION TO BID (“ITB”)
ITB 18-024**

The Board of County Commissioners (Board) of Highlands County, Florida (County) will receive sealed Bids in the Highlands County Purchasing Division (Purchasing Division) for:

**ITB NO. 18-024 GOVERNMENT CENTER HVAC UPGRADE
PROJECT NUMBER: 15068**

Construction Documents may be obtained by downloading from our website: www.hbcc.net, or by contacting: Jamee Soto, Buyer; 600 S. Commerce Ave., Sebring, Florida 33870; Phone: 863-402-6526; Fax: 863-402-6735; or Email: jasoto@hbcc.org.

A MANDATORY PRE-BID meeting will be held at 10:00 A.M. on Wednesday; January 31, 2018, in the Government Center Board Room, 600 S. Commerce Ave., Sebring, FL. 33870. The purpose of this meeting is to provide a forum where the Bidders can familiarize themselves with the Specifications of the Project with County staff and the Engineer. The County will only accept Bid submittals from Bidders that are represented during the entire pre-Bid meeting and are signed in on the sign-in sheet as primary Bidders. The public is invited to attend this meeting. Arrival after 10:00 A.M. will be noted on the sign-in sheet, and Bids will not be accepted from Bidders that were late.

Each submittal shall include one (1) original, one (1) exact paper copy and one (1) exact electronic copy (CD or thumb drive) of the Bid submission packet. **BIDS MUST BE DELIVERED to the Purchasing Division, 600 S. Commerce Ave., Sebring, FL 33870 so as to reach that office no later than 2:00 P.M., THURSDAY; February 15, 2018,** at which time they will be opened. The public is invited to attend this meeting. Bid envelopes must be sealed and marked with the ITB number and name so as to identify the enclosed Bid. Bids received later than the date and time as specified will be rejected. The County will not be responsible for the late deliveries of Bids that are incorrectly addressed, delivered in person, by mail or any other type of delivery service.

One or more County Commissioners may be in attendance at the Pre-Bid meeting.

The Board’s Local Preference Policy (“Local Preference Policy”) and Women/Minority Business Enterprise Policy (“W/MBE Policy”) will apply to the award of this ITB.

The County reserves the right to accept or reject any or all Bids or any parts thereof, and the determination of this Award, if an Award is made, will be made to the most responsive and

responsible Bidder whose Bid and qualifications indicate that the Award will be in the best interest of the County. The County reserves the right to waive irregularities in the Bid.

A Bidder must submit a Bid on all Work to receive consideration. A Bid Bond or Cashier's Check in an amount of five percent (5%) of the Bid must be included on Bids over one hundred thousand dollars (\$100,000.00). If the successful Bid is greater than two hundred thousand dollars (\$200,000.00), a Public Construction Bond will be required. The Bidder must be a Licensed General Contractor in the State of Florida. The Bid must be accompanied by evidence of Bidder's qualifications to do business in the State of Florida, in accordance with Chapter 489, Florida Statutes.

The principal features of the Project are:

Providing all labor, materials and equipment to accomplish the removal and replacement of the existing chiller and pumps, add variable frequency drives to all air handling units and remove inlet guide vanes, replace the air handling unit that serves the Board Meeting Room and add conditioning to the equipment area, add demand control ventilation to all air handling units, change out actuators and controls in all variable air volume units, replace Direct Digital Control system, and other items as noted on the construction drawings or in the specifications.

The Board, does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of the Board's functions, including one's access to, participation, employment or treatment in its programs or activities. Anyone requiring reasonable accommodation as provided for in the Americans with Disabilities Act or Section 286.26, Florida Statutes, should contact Pamela Rogers, ADA Coordinator at: 863-402-6509 (Voice), or via Florida Relay Service 711, or by e-mail: progers@hcbcc.org. Requests for CART or interpreter services should be made at least 24 hours in advance to permit coordination of the service.

**Board of County Commissioners,
Highlands County, FL
Website: www.hcbcc.net**

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**SECTION 00100
INSTRUCTIONS TO BIDDERS
ITB 18-024**

Article 1 - Defined Terms

- 1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the Sections 00250 General Terms and Conditions for Construction Projects, 00700 Standard General Conditions of the Construction Contract, and 00800 Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below and in Section 00700 of this ITB which are applicable to both the singular and plural thereof:
- A. Alternative – Amount proposed by Bidder and stated on the Bid Form that will be added to or deducted from the base Bid amount if Engineer decides to accept a corresponding change in either Scope of Work or in products, materials, equipment, systems or installation methods described in Construction Documents.
 - B. Award – The selection by the County of the lowest responsible and responsive Bidder to perform the Work.
 - C. Bid – The Bid Form and other documents submitted by a Bidder in response to this ITB.
 - D. Bidder - The individual or entity who submits a Bid directly to the County.
 - E. Bid Form – Section 00300 of this ITB, which shall be used to submit a Bid.
 - F. Bidding Documents – This ITB, all Addenda to this ITB, and the Construction Documents.
 - G. Board – County’s Board of County Commissioners.
 - H. County Attorney – The County’s County Attorney.
 - I. Construction Documents – The drawings bearing the general title “GOVERNMENT CENTER - HVAC RENOVATION” dated 11/20/17 and 11/13/17 prepared by Sweet Sparkman Architects, Inc. and Pyramid Engineering, Inc.
 - J. County Engineer – The County’s County Engineer.
 - K. County or Owner –Highlands County, a political subdivision of the State of Florida.
 - L. Engineer – The Engineer or Architect of Record.
 - M. Purchasing Division - The County’s Purchasing Division, which issues Bidding Documents and administers the bidding procedures.

- N. Site – The Site is the Highlands County Government Center, 600 South Commerce Avenue, Sebring, Florida 33870.
- O. Work – The Work described and depicted in the Construction Documents.

Article 2 - Copies of Bidding Documents

- 2.01 Complete sets of the Bidding Documents in electronic format may be obtained from the County website.
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

Article 3 - Qualifications of Bidders

- 3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit detailed written evidence with the Bid Form as follows:
 - A. A list of a minimum of five (5) jobs that the Bidder has performed within the past three (3) years which are of equal magnitude and complexity as the type of work to be done for the Owner. The list should include the name of the entity, complete address, name, phone number, and email of a responsible individual qualified to respond to questions concerning the Bidder's abilities, costs, schedules, etc. Prior successful, on-time accomplishment of such equal work will be a consideration in determining whether the Bidder is qualified to perform the Work.
 - B. Supervisory and staffing capabilities with resumes of supervisory personnel planned for the Work and the number and classification of personnel required per shift.
 - C. A minimum of five (5) references of clients for whom similar work has been performed.
- 3.02 Each Bid must contain evidence of Bidder's qualification to do business as a General Contractor in the State, in accordance with Chapter 489, Florida Statutes.
- 3.03 In addition, to demonstrate Bidder's qualifications to perform the Work, within ten (10) days and prior to Notice of Award, Bidder shall submit detailed written evidence such as financial data (note if financial data is considered confidential it must be marked as such) and other such data as may be called for below:
 - A. A listing of all Subcontractors where the subcontract value exceeds ten percent (10%) of the total contract amount. Provide experience statements for these Subcontractors.

- B. List of present commitments (workload), including name of project, location, and value of contract.

3.04 Each Bid must contain proof of enrollment in E-Verify.

Article 4 - Examination of Bidding Documents, Other Related Data, and Site

4.01 Subsurface and Physical Conditions known to Owner are shown in the Construction Documents. No other Site specific subsurface studies have been done.

4.02 Underground Facilities known to Owner are shown on the Construction Documents. No other Site specific utility locates have been done.

4.03 No Hazardous Environmental Condition has been identified at the Site.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Paragraphs 5.03, 5.04, and 5.05 of Section 00700 Standard General Conditions of the Construction Contract as modified in Section 00800 Supplementary Conditions of the Contract Documents. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to Hazardous Environmental Conditions at the Site, if any, and possible changes in the Contract Documents due to Hazardous Environmental Conditions uncovered or revealed at the Site which were not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 5.06 of Section 00700 Standard General Conditions of the Construction Contract as modified in Section 00800 Supplementary Conditions of the Contract Documents.

4.05 On request, Project Manager will provide Bidder access to Site to conduct such examinations, investigations, explorations, tests, and studies, as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former conditions upon completion of such explorations, investigations, tests, and studies.

4.06 It is the responsibility of each Bidder before submitting a Bid to:

- A. Examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;
- B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;

- D. Carefully study all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site:
- E. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, test, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
- F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Document;
- G. Become aware of the general nature of the Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Document;
- H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
- I. Promptly give Engineer and the Purchasing Division written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer and the Purchasing Division is acceptable to Bidder; and
- J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.07 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer and the Purchasing Division written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer and the Purchasing Division are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

Article 5 - Pre-Bid Meeting

- 5.01 There will be a **MANDATORY** Pre-Bid Meeting as specified in Section 00010, Invitation To Bid. Bid responses will only be accepted from Proposers listed on the Mandatory Pre-Bid Meeting sign-in sheet.

Article 6 - Site and Other Areas

- 6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work is to be obtained and paid for by the Contractor. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents.

Article 7 - Interpretation and Addenda

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be directed to the Purchasing Division. Interpretations or clarifications considered necessary by the Purchasing Division and Engineer in response to such questions will be issued by Addenda and will be mailed, emailed, or delivered to all parties recorded by the Purchasing Division as having received the Bidding Documents and attended the Mandatory Pre-Bid Meeting. A Request for Information (“RFI”) received after a set date may not be answered. Only a RFI answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner, Engineer or the Purchasing Division.
- 7.03 Addenda will be posted to the County’s website; www.hcbcc.net. It is the sole responsibility of the Bidder to frequently check the County’s website for Addenda.

Article 8 - Bid Security

- 8.01 A “Bid Bond” or Cashier’s Check, in the amount of five percent (5%) of the Bid, must be included on each Bid over one hundred thousand dollars (\$100,000.00). If the successful Bid is greater than two hundred thousand dollars (\$200,000.00) a “Public Construction Bond” of not less than one hundred percent (100%) of the Awarded Bid amount will be required. All Bonds must be in a form acceptable to Owner and County Attorney.
- 8.02 Within thirty (30) days after the Award, Owner will return the bid securities to all Bidders whose Bids are not to be further considered in awarding the Contract. Retained bid securities will be held until the Agreement has been finally executed, after which all bid securities, other than Bidder’s bond and any guarantees which have been forfeited, will be returned to the respective Bidders whose Bids they accompanied.

Article 9 - Contract Times

9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and, (b) also completed and ready for final payment are set forth in the Bid Form.

Article 10 - Liquidated Damages

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

Article 11 - Substitute or "Or-Equal" Items

11.01 The Contract, if awarded, will be on the basis of materials and equipment described in the Bidding Documents with consideration of possible substitute or "or-equal" items if allowed within the Bidding Documents. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will be considered by Engineer during the allotted time frame for a RFI.

Article 12 - Subcontractors, Suppliers and Others

12.01 The apparent successful Bidder, and any other Bidder so requested, shall within five (5) days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identifications are required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner, Engineer, or the Purchasing Division after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent successful Bidder to submit a substitute, without an increase in the Bid.

12.02 If the apparent successful Bidder declines to make any such substitution, Owner may Award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner, Engineer or the Purchasing Division makes no written objection prior to giving of the Notice of Award will be deemed acceptable to all indicated parties subject to revocation of such acceptance after the Effective Date of the Contract as provided in Paragraph 7.06 of Section 00700 Standard General Conditions of the Construction Contract as modified in Section 00800 Supplementary Conditions of the Contract Documents.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

12.04 It is the responsibility of the Contractor to insure that all Subcontractors comply with all insurance requirements.

Article 13 - Bid Form

- 13.01 Bidder shall use and/or make necessary copies of Section 00300 "Bid Form" of this ITB for their Submittal Document(s).
- 13.02 All blanks on the Bid Form shall be completed legibly by non-erasable marking and the Bid Form shall be signed. A Bid Price shall be indicated for the Base Bid and for each Bid Alternate, if any, listed therein, if applicable, or the words "No Bid", "No Change", or "Not Applicable" entered. All names shall be typed or printed below the signature line with all signatures in ink or other non-erasable marking.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership and state of organization and type of partnership shall be shown below the signature.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.
- 13.06 A Bid by an individual shall show the Bidder's name and official address, telephone number, and email address.
- 13.07 A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid Form. The official address of the joint venture must be shown below the signature.
- 13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.09 All Bid Forms shall have the name, official address, telephone number, and email address for communications regarding the Bid.
- 13.10 Attachments to the Bid Form shall include the following:
- A. Documentation as required in Article 3 of this Section including a copy of Contractors License.
 - B. All insurances from both Contractor and Subcontractor (if applicable) required to fulfill the obligations of this Project.

Article 14 - Basis of Bid; Evaluation of Bids

- 14.01 Bidders shall submit a Bid on a Lump Sum basis as noted on the Bid Form for the Work listed in these Bid Documents.
- 14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances.

Article 15 - Submittal of Bid

- 15.01 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or ITB and shall be enclosed in an opaque sealed envelope plainly marked with the Bid/Project Title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation **BID ENCLOSED** -- "ITB 18-024 – GOVERNMENT CENTER HVAC UPGRADE; PROJECT NO. 15068". A mailed Bid shall be addressed to the Highlands County BCC; Attn: Purchasing Division, 600 S. Commerce Ave., Sebring, FL 33870.

Article 16 - Modification and Withdrawal of Bids

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

Article 17 - Opening of Bids

- 17.01 Bids will be opened at the time and place indicated in the advertisement or ITB Section 00010 and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids, by means of a copy of the "Bid Opening Sheet."

Article 18 - Bids to Remain Subject to Acceptance

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, and as allowed by Section 119.071, Florida Statutes, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

Article 19 - Award of Contract

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, non-conforming, non-responsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder that it finds, after reasonable inquiry and evaluation, to be non-responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an Award to that Bidder. Owner also reserves the right to waive

all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause of disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternatives, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

C. In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or the entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as required by Article 12 of this Section 00100.

19.04 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.05 If the Contract is to be awarded, Owner will Award the Contract to the Bidder whose Bid is determined to be the most advantageous to Owner, taking into consideration those Bids in compliance with the requirements as set forth in this ITB.

19.06 Within thirty-five (35) days after the opening of Bids, unless otherwise stated in this ITB, Owner will accept one of the Bids or will act in accordance with these Instructions to Bidders or the Section 00250 General Terms and Conditions for Construction Projects. The acceptance of the Bid will be by written Notice of Intent of Award with an attached copy of the signed Bid tabulation, emailed, mailed or delivered to the office designated in the Bid, with a copy to all other Bidders. In the event of failure of the lowest responsible qualified Bidder to sign and return the Agreement, as prescribed herein, Owner may Award to the next lowest responsible and responsive qualified Bidder. Such Award, if made will be made within ninety (90) days after opening Bids.

Article 20 - Contract Security and Insurance

20.01 When the successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required Certificate of Insurance.

Article 21 - Signing of Agreement

21.01 When Owner gives a Notice of Award to the successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents, which are identified in the Agreement attached thereto. Within fifteen (15) days thereafter, successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached Contract Documents to Owner. Within thirty (30) days thereafter, Owner shall deliver one fully signed counterpart to successful Bidder.

Article 22 – Retainage

22.01 Provisions concerning retainage are set forth in the Contract Documents.

Article 23 – Designated Contacts and RFI Deadline

23.01 All questions regarding this ITB must be submitted in writing to:

Jamee Soto
Highlands County Purchasing Division
600 S. Commerce Ave., Sebring, Florida 33870
Phone: (863) 402-6526; Email: jasoto@hcbcc.org

The deadline to submit questions is 5 P.M. on Wednesday; February 7, 2018. The County will release responses in the form of an Addendum to all Mandatory Pre-Bid attendees via email. This Addendum will be posted to the County's website: www.hcbcc.net.

Article 24 – Direct Material Purchase Procedure

24.01 The Owner may require the Contractor to utilize the Direct Material Purchase Procedure of Paragraph 7.09 of Section 00700 Standard General Conditions of the Construction Contract as modified in Section 00800 Supplementary Conditions of the Contract Documents.

END OF SECTION

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**DIVISION 0 - SECTION 00160
CERTIFICATION PURSUANT TO SECTION 287.135, FLORIDA STATUTES
ITB 18-024**

**THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR
OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.**

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION

Bidder hereby certifies that at the time of its Bid the Bidder is not on the Scrutinized Companies that Boycott Israel list created pursuant to Section 215.4725, Florida Statutes, is not participating in a boycott of Israel, is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List and that it does not have business operations in Cuba or Syria.

THIS CERTIFICATION IS MADE PURSUANT TO SECTION 287.135(5), FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD.

Print Name: _____

STATE OF _____
COUNTY OF _____

The foregoing Certification was sworn to before me this ___ day of _____, 20____, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [] or has produced _____ as identification [].

(AFFIX NOTARY SEAL)

Print Name: _____
Notary Public, State of Florida
Commission No. _____
My Commission Expires: _____

**CERTIFICATION PURSUANT TO SECTION 287.087, FLORIDA STATUTES
PREFERENCE TO DO BUSINESS WITH DRUG FREE WORKPLACE PROGRAMS
ITB 18-024**

**THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER
OFFICIAL AUTHORIZED TO ADMINISTER OATHS.**

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____

[Print individual's name and title]

for _____

[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION

Bidder hereby certifies that at the time of its Bid the Bidder has a drug free workplace program in place. The program meets the requirements of Section 287.087, Florida Statutes.

THIS CERTIFICATION IS MADE PURSUANT TO SECTION 287.087, FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD.

Print Name: _____ Date: ___/___/___

STATE OF FLORIDA
COUNTY OF _____

The foregoing Certification was sworn to before me this ___ day of _____, 20___, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [] or has produced _____ as identification [].

(AFFIX NOTARY SEAL)

Signature: _____

Print Name: _____

Notary Public, State of _____

Commission No. _____

My Commission Expires: _____

**SWORN STATEMENT UNDER SECTION 287.133(3)(A), FLORIDA STATUTES,
ON PUBLIC ENTITY CRIMES
ITB 18-024**

**THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER
OFFICIAL AUTHORIZED TO ADMINISTER OATHS.**

DESCRIPTION OF CONTRACT: _____

STATE OF FLORIDA }ss
COUNTY OF _____ }

Before me, the undersigned authority, personally appeared _____ who, being by me first duly sworn, made the following statement:

1. The business address of _____ (name of bidder or contractor), is

2. I understand that a public entity crime as defined in Section 287.133 of the Florida Statutes includes a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity in Florida or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid or contract for goods or services to be provided to any public entity or such an agency or political subdivision and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy or material misrepresentation.

3. I understand that "convicted" or "conviction" is defined by the statute to mean a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilt or nolo contendere.

4. I understand that "affiliate" is defined by the statute to mean (1) a predecessor or successor of a person or a corporation convicted of a public entity crime, or (2) an entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime, or (3) those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate, or (4) a person or corporation who knowingly entered into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months.

5. Neither the bidder or contractor nor any officer, director, executive, partner, shareholder, employee, member or agent who is active in the management of the bidder or contractor nor any affiliate of the bidder or contractor has been convicted of a public entity crime subsequent to July 1, 1989.

(Draw a line through paragraph 5 if paragraph 6 below applies.)

6. There has been a conviction of a public entity crime by the bidder or contractor, or an officer, director, executive, partner, shareholder, employee, member or agent of the bidder or contractor who is active in the management of the bidder or contractor or an affiliate of the bidder or contractor. A determination has been made pursuant to 287.133(3) by order of the Division of Administrative Hearings that it is not in the public interest for the name of the convicted person or affiliate to appear on the convicted vendor list. The name of the convicted person or affiliate is _____.

A copy of the order of the Division of Administrative Hearings is attached to this statement.

(Draw a line through paragraph 6 if paragraph 5 above applies.)

THIS SWORN STATEMENT IS MADE PURSUANT TO SECTION 287.133(3)A, FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD

Signature: _____

Print Name: _____

Print Title: _____

On ____ day of _____, 20____.

Sworn and subscribed before me in the State and County first mentioned above on the _____ day of _____, 20____.

(AFFIX NOTARY SEAL)

Signature: _____

Print Name: _____

Notary Public, State of _____

Commission No. _____

My Commission Expires: _____

**CERTIFICATION PURSUANT TO SECTION 287.134, FLORIDA STATUTES
DISCRIMINATION; DENIAL OR REVOCATION OF THE RIGHT TO TRANSACT BUSINESS WITH
PUBLIC ENTITIES
ITB 18-024**

**THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER
OFFICIAL AUTHORIZED TO ADMINISTER OATHS.**

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION

Bidder hereby certifies that at the time of its Bid the Bidder has not been placed on the discriminatory vendor list by the Department of Management Services.

THIS CERTIFICATION IS MADE PURSUANT TO SECTION 287.134, FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD.

Print Name: _____ Date: ____/____/____

STATE OF FLORIDA
COUNTY OF _____

The foregoing Certification was sworn to before me this ____ day of _____, 20____, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [] or has produced _____ as identification [].

(AFFIX NOTARY SEAL)

Signature: _____

Print Name: _____

Notary Public, State of _____

Commission No. _____

My Commission Expires: _____

**CERTIFICATION OF PARTICIPATION IN THE UNITED STATES CITIZENSHIP AND IMMIGRATION
SERVICE BUREAU'S E-VERIFY PROGRAM
ITB 18-024
THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER
OFFICIAL AUTHORIZED TO ADMINISTER OATHS.**

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION

Bidder hereby certifies that at the time of its Bid the Bidder participates in the United States Citizenship and Immigration Services Bureau's E-Verify Program, and does not knowingly employ, hire for employment, or continue to employ an unauthorized alien.

Bidder's E-verify Company ID #: _____

THIS CERTIFICATION IS, UPON DELIVERY, A PUBLIC RECORD.

Print Name: _____ Date: ____/____/____

STATE OF FLORIDA
COUNTY OF _____

The foregoing Certification was sworn to before me this ____ day of _____, 20____, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [] or has produced _____ as identification [].

(AFFIX NOTARY SEAL)

Signature: _____
Print Name: _____
Notary Public, State of _____
Commission No. _____
My Commission Expires: _____

**LOCAL PREFERENCE AFFIDAVIT OF ELIGIBILITY
ITB 18-024**

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to
HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name of Company/Individual submitting sworn statement]

Whose business address is _____

(If applicable) its Federal Employer Identification Number (FEIN) is _____

(If the entity has no FEIN, include the Social Security Number of the individual signing this
Sworn statement): _____.

2. LOCAL PREFERENCE ELIGIBILITY

A. Vendor/Individual has had a fixed office or distribution point located in and having a street address within
Highlands County for at least twelve (12) months immediately prior to the issuance of the request for
quotation, competitive bids or request for proposals by the County.

YES _____ NO _____

B. Vendor/Individual holds business license required by the County, and/or if applicable, the Municipalities:

YES _____ NO _____

C. Vendor/Individual employs at least one full-time employee, or two part-time employees whose primary
residence is in Highlands County, or, if the business has no employees, the business shall be at least fifty
(50) percent owned by one or more persons whose primary residence is in Highlands County.

YES _____ NO _____

**I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE PUBLIC ENTITY IDENTIFIED IN PARAGRAPH
1 (ONE) ABOVE IS FOR THAT PUBLIC ENTITY ONLY AND, THAT THIS FORM SHALL BE CONSIDERED
PUBLIC RECORD.**

[Signature and Date]

STATE OF _____
COUNTY OF _____

Subscribed and sworn before me, the undersigned notary public on this ____ day of _____, 20____.

NOTARY PUBLIC

SEAL

Commission Expiration Date

**SECTION 00250
GENERAL TERMS AND CONDITIONS FOR CONSTRUCTION PROJECTS
ITB 18-024**

- A. All Bidding Documents shall become the property of the County.

- B. Compliance with Florida Statutes Section 287.087, on Drug Free Workplace, Section 287.133(2)(a), on Public Entity Crimes, Section 287.134, on Discrimination, and Section 287.135, Prohibiting contracting with scrutinized companies is required.

FLORIDA STATUTES

Section 287.087, Florida Statutes. Preference to businesses with drug free workplace programs:

In order to have a drug free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893, Florida Statutes, or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community by, any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug free workplace through implementation of this section.

Section 287.133, Florida Statutes. Public entity crime; denial or revocation of the right to transact business with public entities:

(2)(a) A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO for a period of 36 months following the date of being placed on the convicted vendor list.

Section 287.134, Florida Statutes. Discrimination; denial or revocation of the right to transact business with public entities:

(2)(a) An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity.

Section 287.135, Florida Statutes. Prohibition against contracting with scrutinized companies:

(2) A company is ineligible to, and may not, bid on, submit a proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services of \$1 million or more if at the time of bidding or submitting a proposal for a new contract or renewal of an existing contract, the company:

(a) Is on the Scrutinized Companies that Boycott Israel List, created pursuant to Section 215.4725, Florida Statutes, or is engaged in a boycott of Israel;

(b) Is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to Section [215.473](#), Florida Statutes.

(c) Is engaged in business operations in Cuba or Syria.

(5) At the time a company submits a bid or proposal for a contract or before the company enters into or renews a contract with an agency or governmental entity for goods or services of \$1 million or more, the company must certify that the company is not participating in a boycott of Israel, on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or that it does not have business operations in Cuba or Syria.

CERTIFICATIONS OF COMPLIANCE WITH THE ABOVE REFERENCED STATUTES ARE LOCATED IN SECTION 00160, AND MUST BE INCLUDED WITH THE BID, SIGNED AND NOTARIZED.

- C. Bids are due and must be received in accordance with the instructions given in Section 00010 of this ITB.
- D. Owner will not reimburse Bidder(s) for any costs associated with the preparation and submittal of any Bid.
- E. Bidders, their agents and associates shall NOT solicit any County official. Bidders, their agents and associates shall NOT contact any County official other than the individual(s) listed in Article 23 of Section 00100 of this ITB for additional information and clarification.
- F. Due care and diligence has been exercised in the preparation of this ITB and all information contained herein is believed to be substantially correct; however, the responsibility for determining the full extent of the service required rests solely with those making response. Neither Owner nor its representatives shall be responsible for any error or omission in the Bids submitted, nor for the failure on the part of the Bidders to determine the full extent of the exposures.
- G. All timely responses meeting the specifications set forth in this ITB will be considered. However, Bidders are cautioned to clearly indicate any deviations from these specifications. The terms and conditions contained herein are those desired by Owner and preference will be given to those Bids in full or substantially full compliance with them.
- H. Each Bidder is responsible for full and complete compliance with all laws, rules and regulations including those of the Federal Government, the State of Florida and the County of Highlands. Failure or inability on the part of the Bidder to have complete knowledge and intent to comply with such laws, rules and regulations shall not relieve the Bidder from its obligation to honor its Bid and to perform completely in accordance with its Bid.

- I. County, at its discretion, reserves the right to waive minor informalities or irregularities in any Bids, to reject any and all Bids in whole or in part, with or without cause, and to accept that Bid, if any, which in its judgment will be in its best interest.
- J. Award will be made to the Bidder whose Bid is determined to be the most advantageous to Owner, taking into consideration those Bids in compliance with the requirements as set forth in this ITB. The Board reserves the right to reject any and all Bids for any reason or make no Award whatsoever or request clarification of information from the Bidders.
- K. Any interpretation, clarification, correction or change to this ITB will be made by written addendum issued by the Purchasing Division. Any oral or other type of communication concerning this ITB shall not be binding.
- L. Bids must be signed by an individual of the Bidder's organization legally authorized to commit the Bidder to the performance of the product(s) and/or service(s) contemplated by this ITB.
- M. The insurance requirements of Paragraphs 6.02, 6.03, and 6.06 of the Standard General Conditions, as amended by the Supplementary Conditions, found in Sections 00700 and 00800 of this ITB must be satisfied before delivery of goods and performance of services.
- N. If submitting a Bid for more than one ITB, each Bid must be in a separate envelope and correctly marked. Only one (1) Bid per project shall be accepted from any person, corporation or firm. Modifications will not be accepted or acknowledged.
- O. If the successful Bid is greater than two hundred thousand dollars (\$200,000.00), a Public Construction Bond will be required. **Awarded Bidder must record Public Construction Bond at the Clerk's Recording Department and comply with Section 255.05, Florida Statutes.** All Bonds must be in a form acceptable to Owner and County Attorney.
- P. Each Bid must contain proof of enrollment in E-Verify.
- Q. Board policy prohibits any County employee or members of their family from receiving any gift, benefit, and/or profit resulting from any contract or purchase. Board policy also prohibits acceptance of gifts of any kind other than advertising novelties valued less than ten dollars (\$10.00).
- R. Construction Projects that are awarded for less than two hundred thousand dollars (\$200,000.00) and without a Public Construction Bond require the following:
 - 1. At any time prior to final completion of the Contract, Owner will not authorize or make payment to the Contractor in excess of ninety percent (90%) of the amount due on the Contract on the basis of the Work suitably completed.

2. In case of the default by the Contractor, the laborers, materialmen, and Subcontractors, as defined in Section 713.01, Florida Statutes, making claims for unpaid bills, may be paid from the ten percent (10%) retainage.
3. The final payment of retainage shall not be made until: (1) the Project has been inspected by the Engineer or other person designated by the County for the purpose; (2) Engineer or other designated person has issued a written certificate that the Project has been constructed in accordance with the approved Construction Documents and approved Change Orders; (3) the County has accepted the Project; and (4) the Contractor has supplied the County with signed and dated statements from all laborers, materialmen, and subcontractors as defined in Section 713.01, Florida Statutes, and identified under subparagraph (d) of this paragraph 2, that they have no claims against the Contractor for the Work under the Contract. Said statements shall identify the Project by name and Project number.
4. The Contractor, before beginning Work or within two (2) workdays thereafter, shall post in a conspicuous place on the Site the following notice.

“Notice is hereby made to all those concerned and affected that _____ (Contractor’s Name) is performing the “GOVERNMENT CENTER HVAC UPGRADE; PROJECT NO. 15068” All parties furnishing labor and/or materials to said project must, within twenty (20) days of first providing such labor and/or materials, deliver notice of such in writing, by certified mail, returned receipt requested, to:

**SUZANNE HUNNICUTT, CAPITAL PROJECTS MANAGER
HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
600 S. COMMERCE AVE.
SEBRING, FLORIDA 33870**

5. The Contractor shall provide a certified list of all Subcontractors, laborers, and material suppliers to the Owner or Designee within thirty (30) days of receiving the Notice to Proceed with the Work. This list shall be updated thereafter each month with a certified statement that the list and its updates include the names and address of all of those Subcontractors, laborers, and material suppliers furnishing labor and/or material for the Project.
6. The Contractor shall provide a written statement with each pay request to the Engineer which indicates how each payment will be distributed. This pay request breakdown shall define the disbursement intended for all the funds requested. When the Contractor receives any payment it shall pay such moneys received to each Subcontractor and material supplier as set forth in that written statement.
7. The Contractor shall provide a written statement with all but the first payment request from each of the Subcontractors, laborers, and material suppliers indicated in paragraph 5 of this Section R that they have in fact received payment as indicated in paragraph 6 of this Section R. In the event a payment is not made as indicated on a prior written statement provided pursuant to paragraph 5 of this Section R, the Contractor shall furnish an explanation as to the reasons for such deviation and shall request approval from the Engineer.

- S. Late Bids will not be accepted under any circumstances. If Bids received after the scheduled time of the Bid Opening Meeting, the Bidder will be contacted for disposition. The Purchasing Department, at the Bidder's expense, can return the unopened envelope, or, at the Bidder's request, in writing, can destroy it.
- T. Electronically submitted Bids and faxed Bids will not be accepted. Any blank spaces on the required Bid Form or the absence of required submittals or signatures may cause the Bid to be declared non-responsive.
- U. The County is not responsible for correcting any errors or typos made on the Bid response. Incorrect calculations may cause the Bid to be declared non-responsive.
- V. Minority Owned and Women owned businesses must submit a copy of the certificate to receive credit.
- W. The Bidder shall comply with the Florida Sales and Use Tax Law as it may apply to this Contract. The quoted amount(s) shall include any and all Florida Sales and Use Tax payment obligations required by Florida Law of the successful Bidder and/or its Subcontractors or material suppliers.
- X. Public Records: Any material submitted in response to this ITB will become Public Record pursuant to Section 119(1)(b) and (c), Florida Statutes.

ADDITIONAL TERMS AND CONDITIONS

All pages included in or attached by reference to this ITB shall be called and constitute the Invitation to Bid.

Bidders who will not be bidding on this ITB are requested to notify the County and indicate why they are not bidding. Bidders who fail to respond to two (2) or more consecutive ITB's may be removed from the County's Bid notification mailing list.

END OF SECTION

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**SECTION 00300
BID FORM
ITB 18-024**

PROJECT IDENTIFICATION: GOVERNMENT CENTER HVAC UPGRADE
PROJECT NO. 15068
ITB 18-024

THIS BID IS SUBMITTED TO: Highlands County Board of County Commissioners
Attn: Purchasing Division
600 S. Commerce Ave.
Sebring, FL 33870

BID SUBMITTED BY:

[Bidder's Name]

[Bidder's Authorized Representative's Name]

[Bidder's Address 1]

[Bidder's Address 2]

[Print Contact Person's Name for this Bid]

[Contact Person's Email Address]

[Contact Person's Phone Number]

1. The Bidder proposes and agrees, if this Bid is accepted, to furnish all labor, materials, and equipment to construct and complete the Work according to and as specified or indicated in ITB 18-024 and the Bidding Documents for the Bid Price and within the time periods stated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for thirty (30) days after the day of Bid opening. Bidder will sign and deliver the required number of the other documents required by this ITB within fifteen (15) days after the date of County's Notice of Award.

3. In submitting this Bid, Bidder represents that:

a. Bidder has examined and carefully studied the Bidding Documents, including the following Addenda, receipt of all of which is hereby acknowledged:

Date	Number	Date	Number
_____	_____	_____	_____
_____	_____	_____	_____

b. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, performance, and furnishing of the Work;

c. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.

d. Bidder acknowledges that County and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the Site. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site or otherwise which may affect cost progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto. Bidder does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price, and other terms and conditions of the Contract Documents.

e. Bidder is aware of the general nature of the Work to be performed by County and others at the Site that relates to the Work.

f. Bidder has correlated information known to Bidder, information and observations obtained from visits to the Site and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

g. Bidder has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Bidding Documents and the written resolution thereof by Engineer is acceptable to Bidder, and the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

- h. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid. Bidder has not solicited or induced any person, firm or corporation to refrain from Bidding, and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over County.

4. Documentation included with Bid packet

	YES	NO
One (1) original (signed in blue ink), one (1) exact paper copy, and one (1) exact electronic copy (CD or thumb drive) of the submitted Bid.		
Acknowledgment of the Addenda (if applicable)		
Statement of compliance with Section 287.087, Florida Statutes, as a “Drug Free Workplace”		
Statement of compliance with Section 287.133, Florida Statutes, as a “Public Entity Crime”		
Statement of compliance with Section 287.134, Florida Statutes, as a “Discrimination”		
Section 00160 – Certification pursuant 287.135, Florida Statutes,		
Certification of participation in E-Verify		
Woman or Minority Owned Business (Include a copy of your certificate if applicable)		
Required Bidder's Qualification Statement with supporting data included		
A list of a minimum of (5) five jobs similar in scope and size included		
A minimum of five (5) references of clients for whom similar work has been performed included		
A tabulation of Subcontractors Included		
Acord Insurance Certificate Included		
Bid Security in the form of _____		
Local Preference Affidavit (Include a copy of your Affidavit if applicable)		
Copy of any applicable Licenses		
Other _____		

5. Pricing

This is a Lump Sum Bid. Bidder will complete the Work in accordance with the Contract Documents for the following Lump Sum Bid Price. Award will be based on the total Lump Sum Bid Price and requirements of Bidder. All work for this ITB will be awarded to one (1) Bidder.

BASE BID TOTAL:

_____ (Numbers)

_____ (Words)

ALTERNATE ONE ADD/DEDUCT: (\$ _____)
(Numbers)

_____ (Words)

6. Bidder agrees that the Work will be substantially complete within one hundred and eighty (180) days and completed and ready for final payment within two hundred and ten (210) days after the date when the Contract Times commence to run. The Contract Times will commence to run on the thirteenth (13th) day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the Effective Date of the Agreement.
7. Communications concerning this Bid have been addressed only to the contacts listed in Article 23 of Section 00100.

SUBMITTED on _____, 2018

State Contractor License No. _____

If Bidder is:

An Individual

By: _____ (SEAL)
(Individual's Name)

doing business as _____

Business Address: _____

Phone No.: _____ Fax No.: _____

A Partnership

_____(SEAL)
(Partnership Name)

(State in Which Organized and Type of Partnership)

By: _____
(Name of General Partner)

Business Address: _____

Phone No.: _____ Fax No.: _____

A Corporation

By: _____(SEAL)
(Corporation Name)

(State of Incorporation)

By: _____
(Name of Person Authorized to Sign)

(Title)

Attest: _____
(Secretary)

Business Address: _____

Phone No.: _____ Fax No.: _____

Date of Qualification to do business is _____

A Joint Venture

By: _____(SEAL)
(Name)

(Address)

By: _____ (SEAL)
(Name)

(Address)

Phone Number and Address for receipt of official communications:

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above for an individual or the appropriate form of entity.)

-END OF SECTION-

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**SECTION 00410
BID BOND
ITB 18-024**

STATE OF FLORIDA
COUNTY OF HIGHLANDS

KNOW ALL MEN BY THESE PRESENTS, that we _____
_____ (hereinafter called "Principal"), and _____
_____ as Surety, (hereinafter called "Surety"), are held and firmly bound unto
the Highlands County, a political subdivision of the State of Florida (hereinafter called
"Owner"), in the sum of _____ Dollars (\$_____),
lawful money of the United States of America, for the payment of which sum well and truly
to be made, we bind ourselves, our heirs, executors, administrators and successors,
jointly and severally, firmly by these presents:

WHEREAS, the "Principal" contemplates submitting or has submitted a bid to the
said "Owner" for Bid No. ITB 18-024.

**GOVERNMENT CENTER HVAC UPGRADE
HIGHLANDS COUNTY PROJECT NUMBER: 15068**

WHEREAS, it was a condition precedent to the submission of said bid that a
certified check or bid bond in the amount of not less than five percent (5%) of the amount
of bid be submitted with said bid as a guarantee that the Bidder would, if awarded the
contract, enter into a written contract with the "Owner" within fifteen (15) consecutive
calendar days after having been given notice of the award of the contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that
if the bid of the "Principal" herein be accepted and said "Principal", within fifteen (15)

consecutive calendar days after notice being given of such acceptance, enter into a written contract with the "Owner", then this obligation shall be void; otherwise, the sum herein stated shall be due and payable to the "Owner", and the "Surety" herein agrees to pay said sum immediately upon demand of said "Owner", in good and lawful money of the United States of America; as liquidated damages for failure thereof said "Principal".

IN WITNESS WHEREOF, the said _____, as "Principal" herein, has caused these presents to be signed in its name by its _____ and attested by its _____ under its corporate seal, and the said _____ as "Surety" herein, has caused these presents to be signed in its name by _____ and attested by its _____ under its corporate seal, this _____ day of _____, A.D. 20__ .

ATTEST:

Title: _____

ATTEST:

Title: _____

CONTRACTOR, AS PRINCIPAL:

By: _____(Seal)

Title: _____

AS SURETY:

By: _____(Seal)

Title: _____

END OF SECTION

**SECTION 00500
AGREEMENT
ITB 18-024**

THIS AGREEMENT made this ____ day of _____ 2018, by and between Highlands County, a political subdivision of the State of Florida, 600 South Commerce Avenue, Sebring, Florida 33870 (hereinafter called "Owner") and _____ (hereinafter called "Contractor").

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. WORK

Contractor shall provide all labor, materials, and equipment to replace the specified heating, ventilating and air conditioning equipment of the Highlands County Government Center at 600 South Commerce Avenue, Sebring, Florida 33870. Contractor shall complete the Work as specified or indicated in the Contract Documents.

The principal features, as defined above, are not intended to cover every aspect of the Project details. Contractor shall be responsible for reviewing the Contract Documents to determine the full scope of the Work and specific requirements of the Project, which include familiarity and compliance with all Laws and Regulations.

Article 2. ARCHITECT AND ENGINEER

The Architect of Record (hereinafter called "Architect") is Todd Sweet, AIA, Sweet Sparkman Architects, Inc. a Florida Corporation registered to transact business in the State of Florida. The Engineer of Record (hereinafter called "Engineer") is Michael J. Curkan, P.E., Pyramid Engineering, Inc., a Florida corporation registered to transact business in the State of Florida.

Article 3. CONTRACT TIMES

3.1 Contractor agrees that the Work will be substantially complete within one hundred and eighty (180) days and completed and ready for final payment within two hundred and ten (210) days after the date when the Contract Times commence to run. The Contract Times will commence to run on the thirtieth (30th) day after the Effective Date of this Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the Effective Date of this Agreement.

3.2 Liquidated Damages:

3.2.1 Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 of this Article. In agreeing upon the daily liquidated damages amount stated in this paragraph, Owner and Contractor have considered the original Contract Price stated in Article 4 of this Agreement, the average construction, engineering, and inspection costs experienced by Owner, and anticipated costs of project-related delays and inconveniences to Owner and the public. Owner and Contractor also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed

on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (and not as a penalty) Contractor shall pay Owner Five Hundred Dollars (\$500.00) for each day that expires after the time specified in paragraph 3.1 of this Article until the Work is completed and ready for final payment. Liquidated damages shall be deducted by Owner from any balance due Contractor or, if the balance due Contractor is less than the amount of liquidated damages, Contractor shall pay to Owner the remaining unpaid liquidated damages within thirty (30) days after Owner's invoice is sent to Contractor.

3.2.2 Owner does not waive its right to liquidated damages due under this Agreement by allowing Contractor to continue and to finish the Work, or any part of it, after the expiration of the Contract Time including granted time extensions.

3.2.3 In the case of a default of this Agreement and the completion of the Work by Owner, Contractor and Contractor's surety are liable for the liquidated damages under this Agreement, but Owner will not charge liquidated damages for any delay in the final completion of Owner's performance of the Work due to any unreasonable action or delay on the part of Owner.

Article 4. CONTRACT PRICE

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the amount determined pursuant to paragraph 4.1 below:

4.1 For all Work as listed on the Bid Form and described in the Drawings and Specifications attached hereto as Exhibit "A" and included herein by this reference, a Lump Sum of:

(USE WORDS)

(USE FIGURES)

Contractor has included all costs in the Contract Price and shall cause the Work to be completed for the Contract Price. The Contract Price shall be reduced in the manner described in SC-7.09 of Section 00800 of the Supplementary Conditions of this Agreement.

Article 5. PAYMENT PROCEDURES

5.1 Deliverables must be received and accepted in writing by the Architect/Engineer prior to reimbursements. Supporting documentation with the invoices must establish that the deliverables were received and accepted in writing by the Architect/Engineer. Contractor may receive progress payments for deliverables based on the Contractor's Schedule of Values and on a percentage of services that have been completed, approved, and accepted to the satisfaction of Owner when properly supported by detailed invoices and acceptable evidence of payment. All costs charged to the Project by Contractor shall be supported by detailed invoices, proof of payments, contracts or vouchers evidencing in proper detail the nature and propriety of the charges.

5.2 Progress Payments; Retainage: Contractor shall deliver Contractor's Applications for Payment

to Architect/Engineer on or before the third (3rd) day of each month. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Architect/Engineer, on or about the fifteenth (15th) day of each month during construction as provided in paragraphs 5.2.1 and 5.2.2 below.

5.2.1 Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but in each case, less the aggregate of payments previously made and less such amounts as Architect/Engineer shall determine, or Owner may withhold, in accordance with paragraph 14.02 of The Standard General Conditions of the Construction Contract, EJCDC C-700.

90 % of the Work completed up until fifty percent (50%) of the Work and ninety-five percent (95%) of the Work completed subsequently.

0 % of materials and equipment not incorporated in the Work (but delivered, suitably stored, and accompanied by documentation satisfactory to the Owner as provided in paragraph 15.01B of The Standard General Conditions of the Construction Contract, EJCDC C-700, as modified by Section 00800 Supplementary Conditions to EJCDC C-700).

5.2.2 Upon Substantial Completion, in an amount sufficient to increase total payments to Contractor to ninety-five percent (95%) of the Contract Price (with the balance being retainage), less such amounts as Architect/Engineer shall determine, or Owner may withhold, in accordance with paragraph 15.01 of The Standard General Conditions of the Construction Contract, EJCDC C-700, as modified by Section 00800 Supplementary Conditions to EJCDC C-700.

5.3 *Final Payment:* Upon completion of the Work, Contractor shall notify Owner in writing of the completion. The certification shall state that the Work has been completed in compliance with the Drawings and Specifications. If any deviations are noted from the approved Drawings and Specifications, the certification shall include a list of all deviations along with an explanation that justifies the reason to accept each deviation. After Contractor has, in the opinion of Architect/Engineer, satisfactorily completed all corrections identified during the final inspection and deviations not accepted by Owner and has delivered to Owner, in accordance with the Contract Documents, schedules, guarantees, Bonds, certificates or other evidence of insurance, certificates of inspection, permits, marked-up record documents, paper final as-built Drawings and Specifications, signed, sealed, and certified by a Professional Surveyor, registered in the State of Florida, and all applicable permits, final releases from Contractor and all Subcontractors and Suppliers at every level, all warranties, and all other documents reasonably required by Owner pertaining to the Work, Contractor may make application for final payment.

Article 6. CONTRACTOR'S REPRESENTATIONS

In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- 6.1 Contractor has examined and carefully studied the Contract Documents (including any Addenda) and the other related data identified in the ITB 18-024 Documents, including "technical data."
- 6.2 Contractor has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, performance or furnishing of the Work.

- 6.3 Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.
- 6.4 Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- 6.5 Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports, Drawings and Specifications identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.
- 6.6 Contractor has not given Architect/Engineer written notice of any conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Contract Documents, and Contractor agrees that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- 6.7 Contractor certifies by signing this Agreement that no Commissioner or employee of the Highlands County Board of County Commissioners has solicited or accepted gratuities, favors, or anything of monetary value from Contractor or parties to subcontracts. Contractor and Subcontractors shall not pay any gratuities, favors, or anything of monetary value to any Commissioner or employee of the Highlands County Board of County Commissioners.

Article 7. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire Contract between Owner and Contractor concerning the Work consist of the following:

- 7.1 This Agreement (pages 00500-1 to 00500-10, inclusive).
- 7.2 The Standard General Conditions of the Construction Contract, EJCDC C-700 (2013 Edition).
- 7.3 ITB 18-024 Section 00800 Supplementary Conditions to EJCDC C-700 (2013 Edition).
- 7.4 EXHIBIT "A"- Drawings dated _____, consisting of sheets numbered ____ to _____, inclusive with each sheet bearing the general title: "Government Center - HVAC Renovations".
- 7.5 Except as expressly otherwise noted in this paragraph and paragraph 7.7 of this Article, there are no Contract Documents other than those listed in paragraphs 7.1 through 7.5 of this Article. In the event of a conflict the provisions of the order of precedence shall be this Agreement, followed by the Supplementary Conditions, followed by EJCDC C-700 (2013 Edition). The Contract Documents may only be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:
 - (a) Written Amendment signed by both parties
 - (b) Change Order signed by both parties
 - (c) Work Change Directive signed by both parties
- 7.6 The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 - (a) A Field Order issued by the Architect/Engineer

- (b) Architect/Engineer's approval of a Shop Drawing
- (c) Architect/Engineer's written interpretation or clarification.

Article 8. MISCELLANEOUS

- 8.1 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by Laws and Regulations), and unless specifically stated to the contrary in any written consent of an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 8.2 Owner and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.
- 8.3 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- 8.4 Upon the occurrence of any event of default, all obligations on the part of Owner to make any further payments of funds pursuant to this Agreement shall, if Owner so elects, terminate but Owner may make any payments or parts of payments after the happening of any event of default without thereby waiving the right to exercise any remedy which it may have and without becoming liable to make any further payment.
- 8.5 Contractor certifies by signing this Agreement that no Commissioner or employee of the Highlands County Board of County Commissioners has solicited or accepted gratuities, favors or anything of monetary value from Contractor or parties to subcontracts. Contractor, Subcontractors, and Suppliers shall not pay any gratuities, favors, or anything of monetary value to any Commissioner or employee of the Highlands County Board of County Commissioners.
- 8.6 No funds received pursuant to this Agreement may be expended for lobbying the Legislature, the judicial branch, any state agency, Owner or Owner's elected officials, employees or agents.
- 8.7 By entering into this Agreement, Contractor agrees and promises that, during and after a public emergency, disaster, hurricane, flood, or acts of God, Owner shall be given "first priority" for all goods and services under this Agreement. Contractor agrees to provide all goods and services to Owner during and after the emergency at the terms, conditions, and prices as provided in this Agreement on a "first priority" basis. Contractor shall furnish a twenty-four (24) hour phone number to Owner in the event of such an emergency. Failure to provide the stated priority during and after an emergency shall constitute a breach of Contract and make Contractor subject to sanctions from doing further business with Owner. For purposes of this paragraph, the term "first priority" means priority over all other contracts and agreements between Contractor and any person or entity other than Owner and requires Contractor to deliver the goods and services described in this Agreement to Owner prior to providing those goods and services to any other person or entity during and after the emergency.

- 8.8 Owner shall not be obligated or liable hereunder to any person, organization or entity other than Contractor. No provision in this Agreement is intended to, or shall be construed to, create any third party beneficiary or to provide any rights to any person, organization or entity not a party to this Agreement, including, but not limited to, any citizen or employees of the Owner and/or Contractor.
- 8.9 In no event shall the making by Owner of any payment to Contractor constitute or be construed as a waiver by Owner of any breach of covenant or any default which may then exist, on the part of Contractor, and the making of such payment by Owner while any such breach or default exists shall in no way impair or prejudice any right or remedy available to Owner with respect to such breach or default.
- 8.10 No waiver by either Contractor or Owner with respect to any breach or default of or with respect to any provisions or conditions of this Agreement shall be deemed to constitute a continuing waiver of any other breach or default of or with respect to the same or any other provision or condition of this Agreement. No claim or right arising out of a breach of this Agreement can be discharged in whole or in part by a waiver or renunciation of the claim or right unless the waiver or renunciation is supported by consideration and is in writing signed by the aggrieved party.
- 8.11 This Agreement, including exhibits and amendments, and all matters relating to the validity, interpretation, and performance of this Agreement (whether in contract, statute, tort, or otherwise) shall be governed and construed in accordance with the laws of the State of Florida, without giving effect to principles of conflict of laws. Venue for any legal action shall lie in Highlands County, Florida, and any proceedings to enforce or interpret any provision of the Contract Documents shall be brought exclusively in a court of competent jurisdiction in Highlands County, Florida.
- 8.12 Owner is an Equal Employment Opportunity (“EEO”) employer and as such encourages Contractor to voluntarily comply with EEO regulations with regards to gender, age, race, veteran status, country of origin, and creed. In addition, Contractor or anyone under its employ shall comply with all applicable Laws and Regulations thereby pertaining to the avoidance or appearance of sexual harassment or on the job discrimination. Contractor shall maintain a work environment free of discrimination or unwelcome action of a personal nature. Any subcontracts entered into shall make deference to this clause with the same degree of application being encouraged. When applicable, Contractor shall comply with all new Laws and Regulations.
- 8.13 Contractor may only subcontract a portion of the Work to a Subcontractor or Subcontractors approved in advance, in writing by Architect/Engineer.
- 8.14 This Agreement shall be effective upon execution by both parties and shall continue in effect and be binding on the parties until the Project is completed and accepted and payment made by Owner or terminated in accordance with Article 16 of Section 00700 Standard General Conditions of the Construction Contract as modified in Section 00800 Supplementary Conditions of the Contract Documents.
- 8.15 Contractor shall be responsible for all quality control testing requirements.
- 8.16 In the event there is a discrepancy between the language of another section of this Agreement and the Contract Documents, the requirements this Agreement shall govern.

Article 9. EMPLOYMENT ELIGIBILITY VERIFICATION

9.1 Definitions. As used in this Article:

- 9.1.1 Employee assigned to this Agreement means an employee who was hired after November 6, 1986, who is directly performing work, in the United States, under this Agreement. An employee is not considered to be directly performing work under this Agreement if the employee.
- (a) Normally performs support work, such as indirect or overhead functions; and
 - (b) Does not perform any substantial duties applicable to the Agreement.
- 9.1.2 Subcontract means any contract entered into by a Subcontractor to furnish supplies or services for performance of this Agreement or a subcontract under this Agreement. It includes but is not limited to purchase orders, and changes and modifications to purchase orders.
- 9.1.3 Subcontractor means any supplier, distributor, vendor, or firm that furnishes supplies or services to or for Contractor or another subcontractor.
- 9.1.4 United States, as defined in 8 U.S.C. 1101(a)(38), means the 50 States, the District of Columbia, Puerto Rico, Guam, and the U.S. Virgin Islands.

9.2 Enrollment and verification requirements.

- 9.2.1 Contractor must be enrolled in E-Verify at time of Contract award, and Contractor shall use E-Verify to initiate verification of employment eligibility of
- (a) All new employees.
 - (1) Enrolled thirty (30) calendar days or more. Contractor shall initiate verification of employment eligibility of all new hires of Contractor, who are working in the State of Florida, whether or not assigned to this Agreement, within three (3) business days after the date of hire; or
 - (2) Enrolled less than thirty (30) calendar days. Within thirty (30) calendar days after enrollment in E-Verify, Contractor shall initiate verification of employment eligibility of all new hires of Contractor who are working in the State of Florida, whether or not assigned to this Agreement, within three (3) business days after the date of hire; or
 - (b) Employees assigned to this Agreement. For each employee assigned to this Agreement, Contractor shall initiate verification of employment eligibility, to the extent allowed by the E-Verify program, within thirty (30) calendar days after date of Contract award or within thirty (30) calendar days after assignment to this Agreement, whichever date is later.
- 9.2.2 Contractor shall comply, for the period of performance of this Agreement, with the requirements of the E-Verify program MOU. Termination of Contractor's MOU and denial access to the E-Verify system by the Department of Homeland Security or the Social Security Administration or the U.S. Citizenship and Immigration Service is an event of default under this Agreement.

- 9.3 Website. Information on registration for and use of the E-Verify program can be obtained via the Internet at the U.S. Citizenship and Immigration Service's Web site: <http://www.uscis.gov>.
- 9.4 Individuals previously verified. Contractor is not required by this Article to perform additional employment verification using E-Verify for any employee whose employment eligibility was previously verified by Contractor through the E-Verify program.
- 9.5 Subcontracts. Contractor shall include, and shall require the inclusion of, the requirements of this Article, including this paragraph (9.5) (appropriately modified for identification of the parties), in each subcontract that includes work performed in the United States under this Agreement.

Article 10. COMPLIANCE WITH SECTION 287.135(3)(b), FLORIDA STATUTES

Pursuant to Section 287.135(3)(b), Florida Statutes, Owner may terminate this Contract, at the option of its Board of County Commissioners, if the Contractor is found to have submitted a certification required by Section 287.135(5), Florida Statutes, that is false or if Contractor is or has been placed on the Scrutinized Companies that Boycott Israel List, or is engaged in a boycott of Israel or if Contractor is or has been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or if Contractor is or has been engaged in business operations in Cuba or Syria.

Article 11. PUBLIC RECORDS COMPLIANCE

If by providing services to Owner pursuant to this Contract Contractor is a contractor, as defined by Section 119.0701, Florida Statutes, Contractor shall:

- 11.1 Keep and maintain public records required by the County to perform the services.
- 11.2 Upon request from the County's custodian of public records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law.
- 11.3 Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the term of this Contract and following competition of this Contract if Contractor does not transfer the records to the County.
- 11.4 Upon competition of this Contract, transfer to the County, at no cost, all public records in possession of Contractor or keep and maintain public records required by the County to perform the services. If Contractor transfers all public records to the County upon competition of this Contract, Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If Contractor keeps and maintains public records upon completion of this Contract, Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the County upon request from the County's custodian of public records, in a format that is compatible with the information technology systems of the County.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

Gloria Rybinski
County Public Information Officer
Telephone Number: 863-402-6836
E-mail Address: grybinski@hcbcc.org
Mailing Address: 600 South Commerce Avenue
Sebring, FL 33870

IN WITNESS WHEREOF, the parties of these presents have executed this Agreement in three (3) counterparts, each of which shall be deemed an original, but all of which constitute the same Agreement, in the year and day first shown and mentioned.

OWNER: HIGHLANDS COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA, BY ITS BOARD OF COUNTY COMMISSIONERS

R. Greg Harris, Chairman

Address for giving notices:
600 S. Commerce Avenue
Sebring, Florida 33870

ATTEST:

Robert W. Germaine, Clerk

[SEAL]

CONTRACTOR:

Address for giving notices:

Print Name: _____
Print Title: _____

ATTEST:

[CORPORATE SEAL]

By: _____
Print Name: _____
Print Title: _____

-END OF SECTION-

SECTION 00600
PUBLIC CONSTRUCTION BOND
(Section 255.05(3), Florida Statutes)

Bond No. _____

BY THIS BOND, we, _____, whose principal business address and phone number are _____ (_____), as Principal and _____, whose principal business address and phone number are _____, as Surety, are bound to Highlands County, a political subdivision of the State of Florida, herein called Owner, whose principal business address and telephone number are 600 South Commerce Avenue, Sebring, Florida 33870 (863-402-6500), in the sum of _____ (\$_____), for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the Contract dated _____, _____, between Principal and Owner for construction of the GOVERNMENT CENTER HVAC UPGRADE; HIGHLANDS COUNTY PROJECT NO. 15068, located at 600 South Commerce Avenue, Sebring, FL 33870, that Contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and
2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, services, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in that Contract; and
3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under that Contract; and
4. Performs the Principal's guarantee of all work and materials furnished under that Contract for the time specified in that Contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2) and (10), Florida Statutes.

Any changes in or under the Contract Documents and compliance or noncompliance with any formalities connected with that Contract or the changes does not affect Surety's obligation under this bond.

Dated _____, 2018.

AS SURETY:

CONTRACTOR, AS PRINCIPAL:

By: _____
(As Attorney in Fact)

By: _____

Title: _____

END OF SECTION

INSTRUCTIONS FOR PUBLIC CONSTRUCTION BOND

1. A good and sufficient Public Construction Bond, in the penal sum of not less than one hundred (100%) percent of the contract amount, with a surety company satisfactory to OWNER, will be required of CONTRACTOR guaranteeing that the contract, including the various guarantee periods thereunder will be faithfully performed; and that CONTRACTOR will promptly make payment to all persons supplying CONTRACTOR labor, materials, supplies and services used directly or indirectly by CONTRACTOR in the prosecution of the work provided for in the Contract.

2. The Surety Company furnishing this bond shall be authorized to do business in the State of Florida, shall be in compliance with the provisions of the Florida insurance code, shall have twice the minimum surplus and capital required by the Florida Insurance code, and shall hold a currently valid certificate of authority issued by the United States Department of Treasury pursuant to Title 31, Sections 9304-9308, of the United States Code. Surety company must have a rating of not less than "A-X" by the latest edition of the KEY RATING GUIDE as published by A.M. Best company, A.M. Best Road, Oldwick, NJ 08858.

3. The Attorney-in-Fact (Resident Agent) who executes the Public Construction Bond on behalf of the Surety Company must attach a notarized copy of his or her power-of-attorney as evidence of his or her authority to bind the surety on the date of execution of the bonds. All signatures must be original. No copied or facsimile signatures will be accepted. All Contracts, Public Construction Bond, and respective powers-of-attorney will have the same date.

4. In the event the Surety Company becomes unsatisfactory to OWNER, OWNER may at its discretion, require from CONTRACTOR an additional or new bond in the same or lessor penal sum, satisfactory to OWNER, and to be conditioned as above required. Upon CONTRACTOR's failure to furnish such additional or new bond within ten (10) days from the date of written notice to do so, all payments under the Contract will be withheld until such additional bond is furnished.

Y:\PROJECTS\2015\15068 Government Center HVAC Upgrade\Bidding\Bid docs\Draft\SECTION 00600 PUBLIC CONSTRUCTION BOND.docx

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
 1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
 1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against 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. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
 - 1. include at least the specific coverages provided in this Article.
 - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 Supervision and Superintendence

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 Services, Materials, and Equipment

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

- O. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

**SECTION 00800
SUPPLEMENTARY CONDITIONS
ITB 18-024**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2013 Edition) and other provisions of the Contract Documents as indicated below. All references in these Supplementary Conditions to the Standard General Conditions are to the Standard General Conditions of the Construction Contract, EJCDC C-700 (2013 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings stated in those Standard General Conditions. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the Standard General Conditions of the Construction Contract EJCDC C-700 (2013 Edition), with the prefix "SC" added thereto.

SC-1.01 *Defined Terms*

Delete the definition of the term Liens in Paragraph 1.01.A.24. and insert in its place the following:

24. *Liens* – Charges, security, interests, or encumbrances upon Contract – related funds, real property, or personal property and claims delivered to Owner by laborers, Subcontractors, and Suppliers who have not been paid by Contractor.

SC-2.01 *Delivery of Bonds and Evidence of Insurance*

Delete Paragraph 2.01.A. in its entirety and insert the following in its place:

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner unexecuted copies of the bonds and related powers of attorney that Contractor will be required to furnish. Within 10 days after execution of the Agreement by Owner, Contractor shall deliver to Owner fully executed bonds, accompanied by a certified copy of the signing individual's authority to bind the surety establishing that it is effective on the date the agent or attorney-in-fact signed the accompanying bond, as provided in Paragraph 5.06.B. of the Standard General Conditions.

SC-2.02 *Copies of Documents*

Delete Paragraph 2.02.A. in its entirety and insert the following in its place:

- A. Owner shall furnish Contractor with 1 printed copy of the fully executed Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

SC-2.04 *Preconstruction Conference; Designation of Authorized Representatives*

Add the following to the end of Paragraph 2.04.A.:

Contractor shall be ready, willing, and able to attend this conference within 10 calendar days after the date of the notice to proceed. The date, time, and place of this conference will be set by Engineer.

SC-4.01 *Commencement of Contract Times; Notice to Proceed*

Delete Paragraph 4.01.A. in its entirety and insert the following in its place:

- A. The Contract Times will commence to run on the day indicated in a Notice to Proceed.

SC-4.02 *Starting the Work*

Add the following new Paragraph to Paragraph 4.02:

- B. Contractor, before beginning the Work or within 2 workdays thereafter, shall post in a conspicuous place on the Site the following notice.

Notice is hereby made to all those concerned and affected that _____ is performing the "GOVERNMENT CENTER HVAC UPGRADE; PROJECT NO. 15068". All parties furnishing labor and/or materials to that project must, within twenty (20) days of first providing such labor and/or materials, deliver notice of such in writing, by certified mail, return receipt requested, to:

HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
ATTN: SUZANNE HUNNICUTT, CAPITAL PROJECTS MANAGER
600 S. COMMERCE AVE.
SEBRING, FLORIDA 33870

SC-5.01 *Availability of Lands*

Delete the following from Paragraph 5.01.B.:

as necessary for giving notice of or filing a mechanic's or construction Lien against such lands in accordance with applicable Laws and Regulations

SC-5.02 *Use of Site and Other Areas*

Add the following new paragraph to Paragraph 5.02:

- E. Contractor shall at all times control dust and keep the Site free from accumulation of waste materials or rubbish caused by Contractor's employees or subcontractors, and at the completion of the Work, Contractor shall remove all Contractor's rubbish from and about the Site and all Contractor's tools and surplus materials and shall leave Contractor's Site and any other Work area clean. Owner may remove the rubbish and charge the cost to Contractor as the Engineer may determine to be just. In the event that Contractor does not keep the Site and any other Work area free of rubbish or accumulations of waste materials and control dust, Owner will withhold an additional 5% from any pay request, above and beyond the standard 10% retainage.

SC-5.03 *Subsurface and Physical Conditions*

Add the following new paragraphs immediately after Paragraph 5.03.B:

- C. *Subsurface Conditions Known to Owner.* The subsurface conditions at or contiguous to the Site known to Owner are shown in the Contract Documents. Contractor is not entitled to rely upon any other information and data known to or identified by Owner or Engineer.
- D. *Unforeseen Physical Conditions:* Contractor shall notify Engineer in writing of any subsurface or latent physical condition at the Site differing materially from those indicated in the Contract Documents. Engineer shall promptly investigate those conditions and advise Owner in writing if additional information shall be required. Owner shall then obtain such information, and if deemed necessary, shall issue written orders to perform necessary revisions.

SC 5.05 *Underground Facilities*

Add the following new Paragraph to Paragraph 5.05:

- F. *Protection of Underground Facilities:*
 - 1. Existing utilities and other facilities such as drainage structures have been indicated on the Drawings and Specifications only to the extent that such information was made available to Owner. There is no guarantee as to the accuracy or completeness of this information, and Owner will not be responsible for such accuracy or completeness.
 - 2. Contractor shall be responsible for protecting all such utilities indicated in the manner determined necessary by the owner of such utilities. Any utilities not indicated on the Drawings and Specifications, which do not require relocation, shall be protected by Contractor. The Work shall be performed at the original Contract Price. All visible surface facilities or underground utilities shown on the Drawings and Specifications, whether or not shown to be relocated, shall be protected or relocated by Contractor at its expense.
 - 3. Utility relocations are not anticipated for this Project. However, existing utilities which are found during construction and determined necessary to be relocated will be considered an unknown condition. Contractor will cooperate with the appropriate authority in identifying and protecting the utility during relocation.
 - 4. Abandoned utilities, when encountered, shall be severed and plugged at Contractor's expense.
 - 5. Contractor shall be responsible for discovery of existing underground installations, in advance of excavating or trenching, by contacting all local utilities and by prospecting and pot holing. Any damage to facilities not shown shall be solely the responsibility of Contractor.

SC-5.06 *Hazardous Environmental Conditions at Site*

Delete Paragraphs 5.06.A. and 5.06B. in their entirety and insert the following:

- A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.
- B. Not used.

Delete Paragraph 5.06.I. in its entirety.

SC-6.01 *Performance, Payment, and Other Bonds*

Delete Paragraph 6.01.A. in its entirety and insert the following in its place:

- A. Contractor shall furnish a payment and performance bond in an amount at least equal to the Contract Price, in complete satisfaction of the provisions of Section 255.05, Florida Statutes, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. The form of the payment and performance bond shall be in the form of the Public Construction Bond provided by Owner in Section 00600 of the ITB issued by Owner for construction of the Work. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws and Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract. Contractor shall record that bond in the Public Records of Highlands County, Florida, as required by Section 255.05(1), Florida Statutes.

SC-6.03 *Contractor's Insurance*

Delete Paragraph 6.03.I.3. in its entirety and insert the following in its place:

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 10 days, or such longer time period as is required by Laws and Regulations, prior written notice has been given to Contractor.

Add the following new Paragraphs to Paragraph 6.03:

- K. Contractor shall have and maintain in full force and effect the following insurance during the Term of this Contract and shall furnish to County Certificates of Insurance documenting that insurance coverage has been obtained which meets the following requirements:
 1. Workers' Compensation. Contractor shall have and maintain workers' compensation insurance for all employees for statutory limits in compliance with Laws and Regulations. This insurance policy must include Employer's Liability with a limit of \$100,000 each accident, \$500,000 disease (policy Limit), and \$100,000 disease (each employee).
 2. Commercial General Liability. Occurrence Form Required: Contractor shall have and maintain commercial general liability (CGL) insurance with a limit of not less than \$3,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to this project in the amount of \$3,000,000. Products and completed operations aggregate shall be \$3,000,000. CGL insurance shall be written on an occurrence form and shall include bodily injury and property damage liability for premises, operations, independent contractors, products and completed operations, contractual liability, broad form property damage and property damage resulting from explosion, collapse or underground (x, c, u) exposures, personal injury, and advertising injury. Fire damage liability shall be included at \$100,000.

3. Commercial Auto Liability Insurance. Contractor shall have and maintain commercial automobile liability insurance with a limit of not less than \$3,000,000 combined single limit per occurrence for bodily injury and property damage liability. That insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos). The policy shall be endorsed to provide contractual liability coverage.
 4. Umbrella Excess Liability. Contractor may satisfy the required minimum liability limits with an Umbrella or Excess Liability policy. Contractor agrees to endorse Owner and its elected officials, agents, employees, and volunteers, in the manner required by Paragraph 6.03.K.7, as Additional Insureds unless the Umbrella provides "follow form" provisions of the underlying policies. This must be confirmed in writing on the Certificate of Insurance.
 5. Deductibles/Retentions. Contractor is responsible for any expenses or costs below deductibles applicable to any policies.
 6. Formal Certificates of Insurance shall be delivered by Contractor to Owner upon execution of the Agreement. Certificates of Insurance shall be signed by a person authorized by that insurer to bind coverage on its behalf. All Certificates of Insurance must be on file with and approved by Owner before commencement of any Work activities.
 7. The formal insurance certificates shall name "Highlands County, a political subdivision of the State of Florida and its elected officials, agents, employees and volunteers" as "Additional Insureds" on all policies except Workers' Compensation. Additional Insureds status for Completed Operations must be provided without time limitation or for a minimum of 5 years following completion of the Project.
 8. These are minimum requirements which are subject to modification in response to high hazard operations. Owner reserves the right to require Contractor to provide and pay for any other insurance coverage Owner deems necessary, depending upon the possible exposure to liability.
 9. The policies of insurance shall be written on forms acceptable to Owner and placed with insurance carriers authorized by the Insurance Department in the State of Florida and meet a minimum financial AM Best company rating of no less than "A-Excellent: FSC VII.
 10. All policies must include Waiver of Subrogation and any liability aggregate limits shall apply "Per Jobsite"/Per Job Aggregate. All liability insurance shall be Primary and Non-Contributory. Each Certificate of Insurance shall confirm in writing that these provisions apply.
- L. Contractor shall require each Subcontractor to have and maintain the insurance required by Paragraph 6.03.K. This requirement may be modified by Owner by written instrument on a case by case basis, in its sole discretion. It is the responsibility of the Contractor to ensure that all Subcontractors comply with all insurance requirements.

- M. Contractor shall provide notification to Owner and Engineer by overnight delivery return receipt requested, hand delivery or confirmed facsimile 30 days prior to giving and within 3 days after receiving notice of cancellation, modification, non-renewal, or any other lapse in coverage of any required insurance policies.

SC-6.05 *Property Insurance*

Delete Paragraph 6.05.B. in its entirety and insert the following Paragraph in its place:

- B *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days, or such longer time period as is required by Laws and Regulations, prior written notice has been given to the purchasing policyholder. Contractor shall provide notification to Owner and Engineer by overnight delivery return receipt requested, hand delivery or confirmed facsimile 30 days prior to giving and within 3 days after receiving notice of cancellation, modification, non-renewal, or any other lapse in coverage of any required insurance policies.

SC-6.06 *Waiver of Rights*

Delete Paragraphs 6.06.B. and C. in their entirety.

SC-7.01 *Supervision and Superintendence*

Add the following to the end of Paragraph 7.01.B.:

The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

SC-7.02 *Labor; Working Hours*

Add the following new Paragraphs immediately after Paragraph 7.02.B.:

- C. In all cases, local labor shall be given preference when available.
- D. Whenever Owner shall notify Contractor that any man on the Work is, in his opinion, incompetent, unfaithful, or disorderly, or who uses threatening or abusive language to any person representing Owner when on the Work, such man shall be immediately discharged from the Work and shall not be re-employed thereon except with the consent of Owner.

SC-7.03 *Services, Materials, and Equipment*

Add the following new Paragraph immediately after Paragraph 7.03.C.:

- D. The responsibility for the protection and safekeeping of equipment and materials on or near the Site will be entirely that of Contractor and that no Claim shall be made against Owner by reason of any act of an employee or trespasser. Should an occasion arise necessitating access to the sites occupied by the stored materials and equipment,

Contractor shall immediately move same. No materials or equipment may be placed upon the property of Owner until Owner has approved the location contemplated by Contractor to be used for storage.

SC-7.04 *“Or Equals”*

Delete the word “considered” from Paragraph 7.04.E. and insert the word “consider” in its place.

SC-7.06 *Concerning Subcontractors, Suppliers, and Others*

Delete Paragraph 7.06.H. in its entirety and insert the following in its place:

- H. Prior to submitting the first Application for Payment and within 3 workdays after any change, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

SC-7.07 *Patent Fees and Royalties*

Delete Paragraph 7.07.B. in its entirety.

SC-7.08 *Permits*

Delete Paragraph 7.08.A. in its entirety and insert the following in its place:

- A. Unless otherwise provided in the Contract Documents or Section 218.80, Florida Statutes, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor’s Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

SC-7.09 *Taxes and Direct Material Purchase Procedure*

Add the following new Paragraphs immediately after Paragraph 7.09.A.:

- B. Owner is exempt from payment of sales and compensating use taxes of the State of Florida and of cities and counties thereof on all materials to be incorporated into the Work.
- C. Contractor shall provide assistance to Owner for Direct Purchases to enable Owner to purchase tangible personal property needed for this Project which Owner intends to purchase in order to realize savings of sales tax on all tangible personal property needed for this Project. Contractor will recommend direct purchases for items where those direct purchases will result in significant tax savings to Owner. Owner will either accept or reject Contractor’s recommendations, and purchases will be made according to Owner’s decision. Owner retains the absolute right, with or without Contractor’s recommendation, to purchase any or all tangible personal property needed for this Project.

- D. Contractor will provide detailed scoping and pricing for purchase orders with a minimum value of \$5,000, in harmony with the Subcontractors to Owner for the incorporation in Owner's purchase orders.
- E. Owner will issue purchase orders within 3 workdays from the date of receipt of requisition, directly to the vendors and provide a copy of each purchase order to Contractor.
- F. Contractor will be responsible for the materials until they are incorporated into the Project and will purchase and/or have ample Builder's Risk insurance for the direct purchased materials.
- G. Contractor will issue a deductive subcontract adjustment to the Subcontractor which will account for the value of the material and the sales tax as it pertains to that Subcontractor's contract. All subcontracts shall include a clause incorporating, by reference, the provisions of this Paragraph 7.09.
- H. As the material is delivered to the Site, the Subcontractor will sign off on the delivery receipt/invoice for the material delivered, store and secure the material adequately at the Site, and forward the invoice to Contractor who will review, approve and forward the invoice to Owner's Representative for approval and processing.
- I. Owner will draft a check for the approved invoice amount and mail that check directly to the vendor. A list of the check numbers with related dates of issue, names of vendors, amounts paid, and paid invoice numbers will be forwarded to Contractor in order that Contractor can accurately track payment.
- J. Contractor and Owner are encouraged to take advantage of all discounts available.
- K. Owner will issue to Contractor a deductive Change Order in the amount of the direct purchased materials. The amount equal to the sales tax which would have been paid if those materials had been purchased by Contractor will be credited to Owner through a Contingency line item on the pay application's schedule of values, and the Contract Price specified in Article 4 of the Agreement shall be reduced by an amount equal to the amounts paid directly by Owner for direct purchases made pursuant to this Article, plus an amount equal to the sales tax that would have been paid if those materials had been purchased by Contractor.

SC-7.10 *Laws and Regulations*

Delete Paragraph 7.10.B. in its entirety and insert the following in its place:

- B. It shall be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations. Contractor shall bear all costs and losses, and shall indemnify and hold harmless Owner and Owner's officers and employees from and against all liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees arising out of or relating to Work or other action that is contrary to Laws or Regulations.

SC-7.11 *Record Documents*

Delete the word "Engineer" at the end of Paragraph 7.11.A. and insert the word "Owner" in its place.

SC-7.12 *Safety and Protection*

Add the following new Paragraph to Paragraph 7.12:

- H. Contractor shall pay for all damages to private property, public property, and any public utilities.

SC-7.16 *Shop Drawings, Samples, and Other Submittals*

Add the following new Paragraph to paragraph 7.16.A:

- 4. Submit Shop Drawings, Product Data and Samples for all manufactured products and equipment, structural materials, finish materials, systems designed by a specialty engineer and as otherwise required by Contract Documents.

SC-7.17 *Contractor's General Warranty and Guarantee*

Add the following new Paragraph to paragraph 7.17:

- E. All materials incorporated in the Work shall comply with the requirements of the Construction Documents. Any Defective Work which develop within 1 year after the date of final acceptance shall be promptly repaired by or replaced to "as new" condition by Contractor without any additional expense to Owner.

SC-7.18 *Indemnification*

Delete Paragraph 7.18 in its entirety and insert the following in its place.

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Owner's officers and employees from and against all liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Contractor and persons employed or utilized by Contractor in the performance of any of the Work.
- B. In any and all claims against Owner or any of its officers or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly utilized by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall be limited to \$3,000,000 per occurrence.

SC-7.19 *Delegation of Professional Design Services*

Add the following new Paragraph immediately after Paragraph 7.19.E.:

- F. If Contractor provides professional design services as a design professional, as that term is defined in Section 725.08(4), Florida Statutes, Contractor shall indemnify and hold harmless Owner and Owner's officers and employees, from liabilities, damages, losses, and costs, including, but not limited to reasonable attorneys' fees, to the extent caused by the negligence, recklessness, or intentionally wrongful conduct of Contractor providing professional design services as a design professional and other persons employed or utilized by Contractor in the performance of the professional design services.

SC-7.20-7.29

Add the following new Paragraphs immediately after new Paragraph 7.19.F.:

SC-7.20 *Storage of Materials*

- A. The responsibility for the protection and safekeeping of equipment and materials on or near the Site will be entirely that of Contractor, and no claim shall be made against Owner by reason of any act of an employee or trespasser. Should an occasion arise necessitating access to the sites occupied by these stored materials and equipment, Contractor shall immediately move same. No materials or equipment may be placed upon the property of Owner until Owner has approved the location contemplated by Contractor to be used for storage.

SC-7.21 *Erosion and Drainage Control*

- A. Contractor shall implement Best Management Practices (BMP's) to provide for drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site and adjacent property.
- B. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris or other substances resulting from this work. Contractor shall clean up and isolate such materials on a continuing basis to prevent risk of washing into such drainage ways.
- C. Contractor shall determine if a Stormwater Discharge Permit or a Construction Dewatering Discharge Permit applies to the Work. Contractor shall obtain required permit(s) if necessary for completion of the Work.

SC-7.22 *Protection of Trees and Natural Conditions*

- A. No trees or shrubs shall be damaged or removed beyond delineated limits of disturbance except those flagged by Owner. No areas shall be disturbed beyond the designated limits indicated by Owner. Contractor shall install orange safety fence to delineate limits of disturbance, and Contractor shall be responsible for damage mitigation beyond these limits.

SC-7.23 *Dewatering*

- A. If dewatering is required at the Site, Contractor shall comply with all dewatering

requirements of governmental agencies.

SC-7.24 *Protection of Public and Private Property*

- A. Contractor shall protect, shore, brace, support and maintain all underground pipes, conduits, drains, and other underground or above ground structures uncovered or otherwise affected by the construction of the Work performed by Contractor. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, guard posts, and other surface structures affected by construction operations, together with all trees, sod and shrubs in yards and parking lots removed or damaged, shall be restored to their original condition or replaced as determined and approved by Owner, whether within or outside Owner's property. All replacements shall be made with new materials.
- B. Contractor shall be responsible for all damages to streets, roads, highways, shoulders, ditches, embankments, culverts, facilities and utilities, bridges, property corners and monuments and other public or private property, regardless of location or character, which may be caused by construction of the Work or by transporting equipment, materials or men to or from the Work or any part or site thereof, whether by Contractor or Contractor's Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.
- C. All fire hydrants and water control valves shall be kept free from obstruction and for use at all times.
- D. Contractor shall be responsible for any damage to existing structures during the course of the Work.

SC-7.25 *Maintenance of Traffic*

- A. Contractor shall provide traffic control plans as required by the controlling highway, street or road authority. Contractor shall perform the Work so as to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever necessary to cross, use, obstruct or close roads, driveways and walks, whether public or private, Contractor shall, at its own expense, provide and maintain suitable and safe bridges, detours or other temporary expedients, for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over the public property involved, to obstruct traffic at the designated point. Obstructions, such as material piles and equipment, shall be provided with appropriate warning signs and lights.
- B. After completion, the roadway shall be restored to original condition, and disturbed areas shall be restored to original condition.

SC-7.26 *Unfavorable Construction Conditions*

- A. During unfavorable weather, wet ground or other unsuitable construction conditions,

Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

SC-7.27 *Notices to Owners and Authorities*

- A. Contractor shall notify owners of adjacent property and utilities when prosecution of Work may affect them.
- B. Utilities and other concerned agencies shall be contracted at least 48 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or pole lines.

SC-7.28 *Storage of Fuel or Hazardous Materials*

- A. No fuel or other hazardous materials shall be stored on the Site. Extreme care and compliance with all regulations shall be required when handling all such materials.

SC-11.01 *Amending and Supplementing Contract Documents*

Delete the first sentence of Paragraph 11.01.A. and insert the following in its place:

The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order if approved, in writing, by Owner.

SC-15 **ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD.**

Add the following to the end of 15.01.B.1.:

If the payment and performance of the Work is not secured by a payment and performance bond, all applications for payment shall include a written statement that indicates how the payment will be distributed. Contractor shall disburse the payment as provided in that written statement.

Add the following new Paragraphs to Paragraph 15.01.B.:

- 4. *If Requested by Owner:*
 - a. Contractor shall deliver a certified list of all Subcontractors, laborers, and material suppliers to Owner within 30 days of receiving the request. This list shall be updated by Contractor thereafter each month with a certified statement by Contractor that the list and its updates include the names and address of all of Subcontractors, laborers, and Suppliers furnishing labor and/or material for the Project.
 - b. Contractor shall provide a written statement with each pay request to the Owner which indicates how each payment will be distributed. This pay request breakdown shall define the disbursement of all the funds requested.

- c. When Contractor receives any payment pursuant to this Contract, Contractor shall pay laborers and each Subcontractor and Supplier the amounts stated in Contractor's written statement delivered to Owner for that pay request.
- d. Contractor shall provide a written statement with all but the first payment request from each of the Subcontractors, laborers, and Suppliers identified in Paragraph 15.01.B.4.b., that they have in fact received payment as provided in Paragraph 15.01.B.4.c. In the event a payment will not be made as stated on a prior written statement delivered pursuant to Paragraph 15.01B.4.b., Contractor shall furnish an explanation as to the reasons for such deviation and shall request approval from the Engineer.

5. Contractor shall submit any Application for Payment in the form of AIA Document G702.

Delete Paragraph 15.06.C. in its entirety and insert the following in its place.

- B. The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment, but in no event shall Work be considered complete unless and until Contractor provides Owner with:
 - a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements;
 - b. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure;
 - c. Field changes of dimension and detail;
 - d. Changes made by Field Order or by Change Order; and
 - e. Details not on original contract Drawings.

Add the following new Paragraphs immediately after Paragraph 15.08.E.:

SC-15.09 *Local Government Prompt Payment Act*

- A. If the total cost of the construction services purchased by Owner pursuant to this Contract exceeds \$200,000, the provisions of this Article are subject to the provisions of the Local Government Prompt Payment Act, Sections 218.70 through 218.79, inclusive, Florida Statutes, except to the extent provided therein and in that event provisions of this Article are modified and amended to the extent required to be consistent with the Local Government Prompt Payment Act.

SC-15.10 *Interest*

- A. All moneys not paid when due as provided in Paragraph 15 shall bear interest at the maximum rate of 6 percent per annum, simple.

SC-16.02 *Owner May Terminate for Cause*

Delete Paragraph 16.02 in its entirety and insert the following in its place:

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 4. Contractor's repeated disregard of the authority of Owner or Engineer; or
 5. Contractor becomes involved as a debtor in a bankruptcy proceeding, or becomes involved in a reorganization, dissolution, or liquidation proceeding, or if a trustee or receiver is appointed over all or a substantial portion of the property of Contractor under federal bankruptcy law or any state insolvency law.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
1. declare Contractor to be in default, give Contractor (and any surety) notice that the Contract is terminated, and enforce the rights available to Owner under any applicable payment and performance bond; or
 2. notify Contractor of the deficiency with a requirement that the deficiency be corrected within a specified time, otherwise the Contract will be terminated at the end of such time; or
 3. take whatever action is deemed appropriate by Owner.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraph 16.02.B.

END OF SECTION

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**SECTION 00836
WAIVER OF RIGHT TO CLAIM
AGAINST THE PUBLIC CONSTRUCTION BOND
(FINAL PAYMENT)**

The undersigned, in consideration of the final payment in the amount of \$ _____, hereby waives its right to claim against the Public Construction Bond for labor, services, or materials furnished to _____ on the job of Highlands County, a political subdivision of the State of Florida, for improvements to the following described project: GOVERNMENT CENTER HVAC UPGRADE; PROJECT NO. 15068.

DATED ON _____, 2018.

By: _____

IN WITNESS WHEREOF _____ have (has) hereunto set hand and seal this _____ day of _____, 2018.

WITNESS:

_____ (Seal)
Print Name: _____

SWORN AND SUBSCRIBED TO BEFORE ME THIS _____ day of _____, 2018.

Notary Public
State of Florida-at-Large
My Commission Expires: _____

**WAIVER OF RIGHT TO CLAIM
AGAINST THE PAYMENT BOND
(PROGRESS PAYMENT)**

The undersigned, in consideration of the sum of \$ _____, hereby waives its right to claim against the Public Construction Bond for labor, services, or materials furnished through (insert date) to (insert the name of your customer) on the job of (Highlands County, a political subdivision of the State of Florida), for improvements to the following described project: GOVERNMENT CENTER HVAC UPGRADE; PROJECT NO. 15068.

This waiver does not cover any retention or any labor, services, or materials furnished after the date specified.

DATED ON _____, 2018.

By: _____

IN WITNESS WHEREOF _____ have (has) hereunto set hand and seal this _____ day of _____, 2018.

WITNESS:

_____ (Seal)
Print Name: _____

SWORN AND SUBSCRIBED TO BEFORE ME THIS _____ day of _____, 2018.

Notary Public
State of Florida-at-Large

My Commission Expires: _____

END SECTION

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

B. Related Requirements:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Highlands County Government Center - HVAC Renovation.

1. Project Location: 600 S. Commerce Avenue, Sebring, Florida.
2. Client's Project No.: 15068

B. Owner: Highlands County Board of County Commissioners.

1. Owner's Representative: Ms. Suzanne Hunnicutt.

C. Architect: Sweet Sparkman Architects.

1. Project Architect: Mr. Todd Sweet.
2. Architect's Project No.: 17471

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

- (2) Phase existing chiller and water pump replacement. Interior temperatures to be maintained at 75F during the duration of the renovation.
- Add VFD's to all AHU's and remove inlet guide vanes.
- Replace the AHU that serves the Board Meeting room.
- Add conditioning to the mechanical space where the Board Meeting Room equipment is located.
- Add demand control ventilation feature to all AHU's.
- Change out actuators and controls in all VAV's
- Replace Direct Digital Control (DDC) system with new.

- Improvements to the Chiller Yard include concrete slab design, removal of an existing tree and fencing revisions for new chiller placement.

B. Type of Contract.

1. Project will be constructed under a single prime contract.

1.4 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to roof and Owner approved staging area. Coordinate Contractor parking area with Owner.
2. Driveways, Walkways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 - c. Schedule deliveries to eliminate over burden of weight on roof.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.5 COORDINATION WITH OCCUPANTS

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

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

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated.

- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than three days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than three days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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SECTION 012500

SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for handling requests for substitutions.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 2. Division 01 Section "Submittal Procedures" specifies requirements for submitting the Contractor's Submittals Schedule and the Submittals.

1.03 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. **Products, materials, and equipment listed in the Contract Documents must be provided by the Contractor without qualification to their bid and for the duration and scope of the work. Substitutions may only be requested in the event a product or system is no longer available on a date after the bid due date through no control of the Contractor.**
 - 1. No substitutions will be considered during the bidding period.
- C. Not considered substitutions:
 - 1. Revisions to the Contract Documents requested by the Owner or Architect.
 - 2. Specified options of products and construction methods included in the Contract Documents.
 - 3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

- A. Substitution Request Submittal: During bidding and when applicable per 1.03B noted above, the Architect will consider requests for substitution:
 - 1. Submit each request for substitution for consideration separately. Submit requests in the form and according to procedures required for change-order requests. Also use form provided at end of this section.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.

3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 7 days of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be formalized in the form of a change order.

PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

- A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.
- B. Substitution Requests Must Include and Demonstrate:
 1. Substitution Request Form: Use form provided at end of this Section.
 2. Statement indicating why specified material or product cannot be provided.
 3. Extensive revisions to the Contract Documents are not required.
 4. Proposed changes are in keeping with the general intent of the Contract Documents.
 5. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Architect or Owner and separate contractors that will be necessary to accommodate proposed substitution.
 6. The request is timely, fully documented, and properly submitted.
 7. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 8. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 9. Samples, where applicable or requested.
 10. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

11. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 12. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 13. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 14. Cost information, including a proposal of change, if any, in the Contract Sum.
 15. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 16. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 17. Where a proposed substitution involves more than one prime contractor, each contractor shall cooperate with the other contractors involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of products.
- B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.
- C. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.

PART 3 - EXECUTION (Not Applicable)

SUBSTITUTION REQUEST FORM

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

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No. _____

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

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

The Undersigned certifies:

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

Submitted By: _____
Signed By: _____
Firm: _____
Address: _____
Telephone: _____ Fax: _____

A/E's REVIEW AND ACTION

- Submission approved - Make submittals in accordance with contractual obligations.
 Submission approved as noted - Make submittals in accordance with contractual obligations.
 Submission rejected - Use specified materials.
 Submission request received too late - Use specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports
 Other _____

HIGHLANDS COUNTY
GOVERNMENT CENTER - HVAC RENOVATION
SEBRING, FLORIDA

11.20.17

END OF SECTION 012500

SUBSTITUTIONS
012500-5

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SECTION 013100

PROJECT MANAGEMENT

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. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Administrative and supervisory personnel.
 - 2. Project meetings.
 - 3. Requests for Interpretation (RFIs).
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
 - 9. Project closeout activities.
 - 10. Commissioning Requirements.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.
- E. Coordination Meetings:
 - 1. Meeting to coordinate conduits, boxes, power, relays, etc. Include Owner's "IT" Representative, Architect, CM, Engineer, radio tech, telecom consultant, electrician, etc.

1.5 SUBMITTALS

- A. Key Personnel Names: At the Preconstruction Conference, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

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

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
 3. Minutes: Record and distribute meeting minutes.
- C. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings.

All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor includes dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: Form approved by Architect.
- D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal on Owner / Architect approved form.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:
1. Project name.

2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013113

PROJECT COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Cleaning and protection.

- B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Project Meetings" for progress meetings, coordination meetings, and preinstallation conferences.
2. Division 01 Section "Submittal Procedures" for preparing and submitting the Contractor's Construction Schedule.
3. Division 01 Section "Closeout Procedures" for coordinating contract closeout.

1.03 COORDINATION

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

1. Schedule construction operations in the 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 assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.04 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittal Procedures."

B. Staff Names: At the Preconstruction Conference, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.02 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. 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. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 013113

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SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule: Contractor posts to Primavera Contract Manager interface.
2. Contractor's Construction Schedule: Contractor posts to Primavera Contract Manager interface.
3. Submittals Schedule.
4. Daily construction reports: Contractor posts to Primavera Contract Manager interface.
5. Material location reports.
6. Field condition reports.
7. Special reports.

- B. Related Sections include the following:

1. Division 01 Section "Quality Control" for submitting a schedule of tests and inspections.

1.03 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

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

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

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

- E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.04 SUBMITTALS

- A. Preliminary Submittals Schedule: Submit for Owner and Architect of record at pre-Construction Conference. Arrange the following information in a tabular format:
1. Scheduled date for first submittal.
 2. Specification Section number and title.
 3. Submittal category (action or informational).
 4. Name of subcontractor.
 5. Description of the Work covered.
 6. Scheduled date for Architect's final release or approval.
- B. Construction Schedule: Contractor posts to Primavera Contract Manager interface. Submit for Owner and Architect record at pre-Construction Conference, large enough to show entire schedule for entire construction period.
- C. Preliminary Network Diagram: Submit for Owner and Architect record at pre-Construction Conference, large enough to show entire network for entire construction period.
- D. Daily Construction Reports: Contractor posts to Primavera Contract Manager interface. Keep on record at Contractor office and at job site at all times during construction.
- E. Material Location Reports: Keep on record at Contractor office and at job site at all times during construction.
- F. Daily Field Condition Reports: Keep on record at Contractor office and at job site at all times during construction.
- G. Special Reports: Submit copies to Owner and Architect at time of unusual event.

1.05 QUALITY ASSURANCE

- A. Pre-Construction Conference: Conduct conference to comply with requirements in Division 01 Sections. Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

- a. Notice to Proceed, Notice of Commencement.
- b. Distribution of the Contract Documents.
- c. Designation of responsible personnel.
- d. Construction schedule. CPM or in-house CPM consultant qualifications.
- e. Phasing.
- f. Critical work sequencing.
- g. Responsibility for temporary facilities and controls.
- h. Parking availability.
- i. Office, work, and storage areas.
- j. Equipment deliveries and priorities.
- k. First aid.
- l. Security.
- m. Use of premises, office and storage areas, security, housekeeping, and Owner's needs.
- n. Working hours.
- o. Procedures for processing Applications for Payment.
- p. Transmittal, review, and distribution of Contractor's submittals.
- q. Requests for additional information (RFI's).
- r. Procedures for processing field decisions and Change Orders.
- s. Maintaining and Preparation of Record Documents.
- t. Progress cleaning.

1.06 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Auxiliary Services: Cooperate with photographer including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit concurrently with construction schedule at pre-construction conference. Include submittals required during the first 90 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Updated Submittals: Submit concurrently coordinated with requests for payment under Section 012900 "Payment Procedures".

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than (7) days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.

8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.

- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

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

- B. Preliminary Network Diagram: Submit diagram within 30 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports for progress site meetings showing the following:
1. Identification of activities that have changed.

2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.05 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.06 SPECIAL REPORTS

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

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

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

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

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

END OF SECTION 013200

SECTION 01 32 33 - PHOTOGRAPHIC 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. This Section includes administrative and procedural requirements for the following:
 1. Preconstruction photographs.
 2. Periodic construction photographs.
 3. Final Completion construction photographs.

1.3 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation. Include same label information as corresponding set of photographs.
- B. Construction Photographs: Submit two record copies of each photograph with each application for payment.
 1. Digital Images: Submit a complete set of digital image electronic files with each submittal of photographs on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the original camera sensor, uncropped.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly involved with the photography of construction projects.

1.5 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

1.6 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: An individual who has been regularly involved with the photography of construction projects.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- D. Preconstruction Photographs: Before commencement of excavation, take, digital photographs of Project site and surrounding areas of the building and property, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Take a minimum of eight photographs to show existing conditions adjacent to the project site before starting the Work.
- E. Periodic Construction Photographs: Maintain a digital photographic daily diary of the on-going construction activity. With each application for payment, select and print a minimum of 12 of the collected images that in the Contractor's opinion best describes the job progress during the previous monthly period.
- F. Architect-Directed Construction Photographs: From time to time, Architect may request additional digital photographs with different direction or vantage point than those already collected.
- G. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.
 - 1. Do not include date stamp.

END OF SECTION 01 32 33

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Coordination" for submitting Coordination Drawings.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 3. Division 01 Section "Quality Control" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.
 - 5. Division 01 Section "Substitutions" for product substitutions.

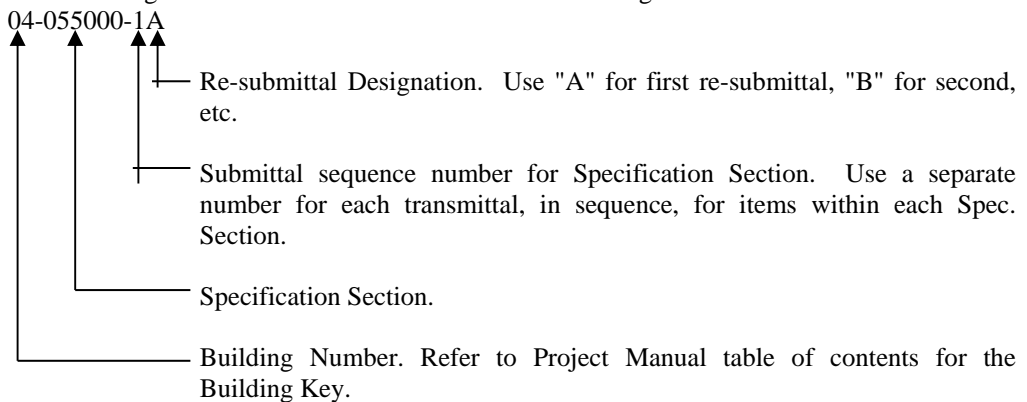
1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

- A. General: Copies of Architectural Floor Plan drawings in digital format will be provided to the Contractor once by the architect prior to construction in accordance with the "Authorization Statement for Electronic Transfer" form. (Example attached herein). Information provided in digital format is for the sole information and use of the authorizing entity. Further copying or transfer of this information is prohibited by copyright. Costs for such files as required by Architect and its consultants shall be paid for by the Owner.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Allow 14 days for processing each re-submittal.
 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 8 inches (100 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Submittal tracking number: Mark each submittal with a tracking number as follows:



04-055000-1A

Re-submittal Designation. Use "A" for first re-submittal, "B" for second, etc.

Submittal sequence number for Specification Section. Use a separate number for each transmittal, in sequence, for items within each Spec. Section.

Specification Section.

Building Number. Refer to Project Manual table of contents for the Building Key.
 4. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal tracking number.
 - i. Drawing number and detail references, as appropriate.
- F. Other necessary identification. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
 1. For submittals not requiring raised seal: Post one *.pdf copy of submittal to Architect via County Primavera Contract Manager interface (provide notification of posting date by Contractor to Architect).

2. For submittals requiring raised seal: Submit seven copies of submittal to Architect. Upon approval, Contractor shall post one scanned *.pdf, *.tiff, or *.jpg copy of submittal to Architect via County Primavera Contract Manager interface (provide notification of posting date by Contractor to Architect).
 3. For product samples: Submit three submittals to Architect.
 4. Copies of approved submittals for maintenance manuals and Project Closeout will be made by Contractor.
 5. All submittals shall have (1) copy returned to Owner for Project record by Contractor after each review by Architect has been completed. Owner shall sign off on each submittal at this time. For *.pdf submittals (all except those requiring sign and seal), Contractor shall post the Architect approved and Owner sign-off submittal to the Primavera Contract Manager interface.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.
- 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: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.01 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 1. Number of Copies: Submit the number of copies of each submittal required, unless otherwise indicated. Architect will retain at least one copy marked up as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operating and maintenance manuals.
 - k. Compliance with recognized trade association standards.
 - l. Compliance with recognized testing agency standards.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop work manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
- D. Coordination Drawings: Provide to show attachment to adjacent work.
- E. Samples: Prepare physical units of materials or products, including the following:
1. Comply and coordinate with Sections that call for mockups.
 2. Samples for Selection:
 - a. When indicated, submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - b. When indicated, submit full-size units or samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:

- a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 4. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
 5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 6. Number of Samples for Selection: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned marked up as required.
 - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
- F. Disposition: Maintain sets of approved Submittals and Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- G. Delegated-Design Submittal: Comply with requirements in Division 01 Section "Quality Control."
- H. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.
- I. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- J. Application for Payment: Comply with requirements in Division 01 Section "Payment Procedures."
- K. Schedule of Values: Comply with requirements in Division 01 Section "Payment Procedures."
- L. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.02 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit copies as required of each submittal, unless otherwise indicated for review by Architect.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Control."
- B. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Closeout Procedures."
- P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. Material Safety Data Sheets: Retain copies on site at all times, and submit information as part of Project close out submittals.
- U. Listed Products: include in each submittal, a copy of the Approved Products as listed in the contract documents. If substitutions to these products are approved by Architect prior to submittal in accordance with Division 01 "Substitutions", Contractor shall be responsible for updating and informing jurisdictional authority.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Stamp or statement shall include the following: "The Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents."

3.02 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will attached to each submittal, a Submittal Review Memo appropriately to indicate action taken, required next steps as applicable.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

AUTHORIZATION STATEMENT For Electronic Transfer

Architect's Project No.: 17471

Project Name: HIGHLANDS COUNTY
GOVERNMENT CENTER
HVAC RENOVATION
Client's Project No. 15068

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

DESCRIPTION OF SERVICE: Providing electronic base drawing information.

FEE BASIS:

\$250 (Minimum \$250 per request)

Fee Waived for initial one-time transfer of Architectural files

TERMS AND CONDITIONS:

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

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

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

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

AUTHORIZATION:

I/We hereby grant permission or have obtained permission for Sweet Sparkman Architects, Inc. to perform the above services.

APPROVED/ACCEPTED BY:

(Type Company name)

SIGN HERE: _____

Print or type signer's name here: _____

Sweet Sparkman Architects, Inc.

Project Manager

Date: _____

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SECTION 014219

REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
- D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations by the indicated entity. In the event the indicated entity is not indicated, unloading, unpacking, assembly, installation, and similar operations shall be performed by the Contractor.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons

of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
 - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

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

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the 2004 CSI/CSC's "MasterFormat" numbering system.

B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Section Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.
- F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association 900 19th St., NW, Suite 300 Washington, DC 20006 www.aluminum.org	(202) 862-5100
AAF	Aluminum Association of Florida 3165 McCrory Place, suite 185 Orlando, FL	
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol St., NW, Suite 249 Washington, DC 20001 www.aashto.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Dr. Research Triangle Park, NC 27709-2215 www.aatcc.org	(919) 549-8141

ABMA	American Bearing Manufacturers Association 1200 19th St., NW, Suite 300 Washington, DC 20036-2401 www.abma-dc.org	(202) 429-5155
ABMA	American Boiler Manufacturers Association 950 North Glebe Rd., Suite 160 Arlington, VA 22203-1824 www.abma.com	(703) 522-7350
ACCA	Air Conditioning Contractors of America 2800 Shirlington Road, Suite 300 Arlington, VA 22206	
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48333-9094 www.aci-int.org	(248) 848-3700
ACIL	ACIL: The Association of Independent Scientific, Engineering, and Testing Firms 1629 K St., NW, Suite 400 Washington, DC 20006 www.acil.org	(202) 887-5872
ACPA	American Concrete Pipe Association 222 West Las Colinas Blvd., Suite 641 Irving, TX 75039-5423 www.concrete-pipe.org	(972) 506-7216
ADC	Air Diffusion Council (312) 201-0101 11 South LaSalle St., Suite 1400 Chicago, IL 60603	
AEIC	Association of Edison Illuminating Companies 600 N. 18th St. P.O. Box 2641 Birmingham, AL 35291-0992	(205) 250-2530
AFBMA	Anti-Friction Bearing Manufacturers Association (See ABMA)	
AF&PA	American Forest and Paper Association (202) 463-2700 1111 19th St., NW, Suite 800 Washington, DC 20036	(800) 878-8878
AGA	American Gas Association 1515 Wilson Blvd. Arlington, VA 22209 www.aga.com	(703) 841-8400

AHA	American Hardboard Association 1210 W. Northwest Hwy Palatine, IL 60067-1897	(847) 934-8800
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Dr., Suite 1500 Chicago, IL 60606 www.aham.org	(312) 984-5800
AHRI	Air-conditioning, Heating and Refrigeration Institute 4100 North Fairfax Drive, Suite 200 Arlington, VA	
AI	Asphalt Institute Research Park Dr. P.O. Box 14052 Lexington, KY 40512-4052 www.asphaltinstitute.org	(606) 288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	(202) 626-7300
AIA	American Insurance Association 1130 Connecticut Ave., NW, Suite 1000 Washington, DC 20036	(202) 828-7100
AIHA	American Industrial Hygiene Association 2700 Prosperity Ave., Suite 250 Fairfax, VA 22031	(703) 849-888
AISC	American Institute of Steel Construction One East Wacker Dr., Suite 3100 Chicago, IL 60601-2001	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute 1101 17th St., NW Washington, DC 20036-4700 www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction 7012 S. Revere Pkwy, Suite 140 Englewood, CO 80112 www.aitc-glulam.org	(303) 792-9559
ALA	American Laminators Association (See LMA)	
ALCA	Associated Landscape Contractors of	(703) 620-6363

	America 12200 Sunrise Valley Dr., Suite 150 Reston, VA 20191 www.alca.org	
ALI	Associated Laboratories, Inc. P.O. Box 152837 1323 Wall St. Dallas, TX 75315	(214) 565-0593
ALI	Automotive Lift Institute PO Box 85 Cortland, NY 13045	
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Dr. Arlington Heights, IL 60004-1893 www.amca.org	(847) 394-0150
ANLA	American Nursery and Landscape Association 1250 Eye St., NW, Suite 500 Washington, DC 20005	(202) 789-2900
ANSI	American National Standards Institute 11 West 42nd St., 13th Floor New York, NY 10036-8002 www.ansi.org	(212) 642-4900
AOAC	AOAC International 481 N. Frederick Ave., Suite 500 Gaithersburg, MD 20877	(301) 924-7077
AOSA	Association of Official Seed Analysts 201 N. 8th St., Suite 400 P.O. Box 81152 Lincoln, NE 68501-1152	(402) 476-3852
APA	APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700 www.apawood.org	(206) 565-6600
APA	Architectural Precast Association P.O. Box 08669 Fort Myers, FL 33908-0669	(941) 454-6989
API	American Petroleum Institute 1220 L St., NW, Suite 900 Washington, DC 20005-8029	(202) 682-8000

ARI	Air-Conditioning and Refrigeration Institute 4301 Fairfax Dr., Suite 425 Arlington, VA 22203 www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association Center Park 4041 Powder Mill Rd., Suite 404 Calverton, MD 20705	(301) 231-9050
APSP	The Association of Pool and Spa Professionals 2111 Eisenhower Avenue Alexandria, VA 22314	
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	(516) 576-2360
ASC	Adhesive and Sealant Council 1627 K St., NW, Suite 1000 Washington, DC 20006-1707	(202) 452-1500
ASABE	American Society of Agricultural and Biological Engineers 2950 Niles Road St. Joseph, MI 49085	
ASCA	Architectural Spray Coaters Association 230 W. Wells St., Suite 311 Milwaukee, WI 53203	(414) 273-3430
ASCE	American Society of Civil Engineers-World Headquarters 1801 Alexander Bell Dr. Reston, VA 20191-4400 www.asce.org	(800) 548-2723 (703) 295-6000
ASHES	American Society for Healthcare Environmental Services - Division of the American Hospital Assoc. One North Franklin, Suite 2700 Chicago, IL 60606	(800) 424-2626 (312) 422-3860
ASHRAE	American Society of Heating, Refrigerating and Air- Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	(800) 527-4723 (404) 636-8400
ASLA	American Society of Landscape	(202) 686-2752

	Architects 4401 Connecticut Ave., NW, 5th Floor Washington, DC 20008-2369 www.asla.org	
ASME	American Society of Mechanical Engineers 345 East 47th St. New York, NY 10017-2392 www.asme.org	(800) 434-2763 (212) 705-7722
ASPA	American Sod Producers Association (See TPI)	
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake Village, CA 91362-3649	(805) 495-7120
ASQC	American Society for Quality Control 611 East Wisconsin, Ave. Milwaukee, WI 53201-3005 www.asqc.org	(800) 248-1946 (414) 272-8575
ASSE	American Society of Sanitary Engineering 28901 Clemens Rd. Westlake, OH 44145 www.asse-plumbing.org	(216) 835-3040
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr. West Conshohocken, PA 19428-2959 www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions (Formerly: Exchange Carriers Standards Association) 1200 G St., NW, Suite 500 Washington, DC 20005	(202) 628-6380
AWCI	Association of the Wall and Ceiling Industries--International 307 E. Annandale Rd., Suite 200 Falls Church, VA 22042-2433 www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCMA)	
AWI	Architectural Woodwork Institute	(703) 733-0600

	1952 Isaac Newton Sq. Reston, VA 20190 www.awinet.org	
AWPA	American Wood Preservers' Association 3246 Fall Creek Hwy, Suite 1900 Granbury, TX 76049-7979	(817) 326-6300
AWS	American Welding Society 550 NW LeJeune Rd. Miami, FL 33126 www.amweld.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association 6666 W. Quincy Ave. Denver, CO 80235 www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017-6603	(212) 661-4261
BIA	Brick Institute of America 11490 Commerce Park Dr. Reston, VA 22091-1525 www.bia.org	(703) 620-0010
BIFMA	The Business and Institutional Furniture Manufacturer's Association 2680 Horizon Dr., SE, Suite A1 Grand Rapids, MI 49546-7500 www.bifma.com	(616) 285-3963
CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/cagi	(216) 241-7333
CAUS	Color Association of the United States 409 W. 44th St. New York, NY 10036-4402	(212) 582-6884
CBM	Certified Ballast Manufacturers Association 1422 Euclid Ave., Suite 402 Cleveland, OH 44115-2094	(216) 241-0711
CCC	Carpet Cushion Council P.O. Box 546 Riverside, CT 06878-0546	(203) 637-1312
CDA	Copper Development Association	(800) 232-3282

	Bethesda, MD 20814-4408	
CRI	Carpet and Rug Institute 310 S. Holiday, Ave. Dalton, GA 30722-2048 www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Rd. Schaumburg, IL 60173-4758 www.crsi.org	(847) 517-1200
CSSB	Cedar Shake and Shingle Bureau 515 116th Ave., NE, Suite 275 Bellevue, WA 98004-5294	(206) 453-1323
CTI	Ceramic Tile Institute of America 12061 West Jefferson Blvd. Culver City, CA 90230-6219	(310) 574-7800
CTI	Cooling Tower Institute P.O. Box 73383 Houston, TX 77273	(281) 583-4087
DASMA	Door and Access Systems Manufacturers Association, International c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/dasma	(216) 241-7333
DECO	Document Engineering Co. inc. 5210 Stagg Street Van Nuys, CA 91401	
DHI	Door and Hardware Institute 14170 Newbrook Dr. Chantilly, VA 20151-2223 www.dhi.org	(703) 222-2010
DIPRA	Ductile Iron Pipe Research Association 245 Riverchase Pkwy East, Suite O Birmingham, AL 35244	(205) 988-9870
DOC/NIST	U.S. Department of Commerce National Institute of Standards and Technology 100 Bureau Drive Stop 3460 Gaithersburg, MD 20899	
DOL/OSHA	Department of Labor Occupational Safety and Health Administration Frances Perkins building 200 Constitution Avenue, NW	

	Washington, DC 20210	
ECSA	Exchange Carriers Standards Association	
EIA	Electronic Industries Association 2500 Wilson Blvd. Arlington, VA 22201	(703) 907-7500
EIMA	EIFS Industry Members Association 402 N. Fourth St., Suite 102 Yakima, WA 98901-2470 www.eifsfacts.com	(800) 294-3462 (509) 457-3500
EJMA	Expansion Joint Manufacturers Association 25 N. Broadway Tarrytown, NY 10591-3201	(914) 332-0040
EN	European Committee for Standardization Central Secretariat Rue de Stassart 36 B-10 50 Brussels	
ETL	ETL Testing Laboratories, Inc. (Now part of ITS)	
FCI	Fluid Controls Institute c/o Thomas Associates, Inc 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/fci	(216) 241-7333
FCICA	Floor Covering Installation Contractors Association P.O. Box 948 Dalton, GA 30722-0948	(706) 226-5488
FGI	Facility Guidelines Institute 191 McKinney Avenue Dallas, TX 75201	
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System 1151 Boston-Providence Tnpk. P.O. Box 9102 Norwood, MA 02062-9102 www.factorymutual.com	(781) 762-4300
FRSA	Florida Roofing, Sheet Metal and Air Conditioning Contractors Association 4111 Metric Drive Winter Park, FL 32792	

FTI	Facing Tile Institute c/o Stark Ceramics P.O. Box 8880 Canton, OH 44711	(330) 488-1211
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002 www.usg.com	(202) 289-5440
GBI	Green Building Initiative 2104 SE Morrison, Portland, Oregon 97214 Email: info@thegbi.org	(877) GBI-GBI1
GANA	Glass Association of North America 3310 SW Harrison St. Topeka, KS 66611-2279 www.glasswebsite.com/gana	(913) 266-7013
GRI	Geosynthetic Research Institute 33rd and Lancaster Walk Rush Building, West Wing Philadelphia, PA 19104 www.gri-server.coe.drexel.edu	(215) 895-2343
HEI	Heat Exchange Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/hei	(216) 241-7333
HI	Hydraulic Institute 9 Sylvan Way Parsippany, NJ 07054-3802	(201) 267-9700
HI	Hydronics Institute Division of Gas Appliance Manufacturers Association P.O. Box 218 35 Russo Pl. Berkeley Heights, NJ 07922 www.gamanet.org	(908) 464-8200
HMA	Hardwood Manufacturers Association 400 Penn Center Blvd., Suite 530 Pittsburgh, PA 15235-5605 www.hardwood.org	(412) 829-0770
HPVA	Hardwood Plywood and Veneer Association 1825 Michael Farraday Dr. P.O. Box 2789 Reston, VA 22195-0789 www.hpva.org	(703) 435-2900

IAS	International Approval Services 8504 East Pleasant Valley Rd. Cleveland, OH 44131 www.iasapprovals.org	(216) 524-4990
IBD	Institute of Business Designers	
ICC	International Code Council 500 New Jersey Avenue NW 6 th Floor Washington, DC 20001	
ICEA	Insulated Cable Engineers Association, Inc. P.O. Box 440 South Yarmouth, MA 02664	(508) 394-4424
IEC	International Electrotechnical Commission (Available from ANSI) 11 West 42nd St., 13th Floor New York, NY 10036-8002	(212) 642-4900
IEEE	Institute of Electrical and Electronics Engineers 345 E. 47th St. New York, NY 10017-2394 www.ieee.org	(800) 678-4333 (212) 705-7900
IESNA	Illuminating Engineering Society of North America 120 Wall St., 17th Floor New York, NY 10005-4001 www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council	
IIAR	International Institute of Ammonia Refrigeration 1110 North Glebe Road Arlington, VA 22201	
IIDA	International Interior Design Association 341 Merchandise Mart Chicago, IL 60654-1104	(312) 467-1950
ILI	Indiana Limestone Institute of America Stone City Bank Building, Suite 400 Bedford, IN 47421	(812) 275-4426
IMSA	International Municipal Signal Association P.O. Box 539	(800) 723-4672 (315) 331-2182

	165 E. Union St. Newark, NY 14513	
INCE	Institute of Noise Control Engineering P.O. Box 3206, Arlington Branch Poughkeepsie, NY 12603	(914) 462-4006
IRI	Industrial Risk Insurers P.O. Box 5010 85 Woodland St. Hartford, CT 06102-5010	(860) 520-7300
ISA	ISA - International Society for Measurement and Control P.O. Box 12277 67 Alexander Dr. Research Triangle Park, NC 27709 www.isa.org	(919) 549-8411
ISO	International Organization for Standardization ISO Central Secretariat 1 ch. De la Voie-Creuse, Case Postale 56 CG-1211 Geneva 20, Switzerland	
ISEA	International Safety Equipment Association 1901 N. Moore Street, Suite 808 Arlington, VA 22209	
ISS	Iron and Steel Society 410 Commonwealth Dr. Warrendale, PA 15086-7512 www.issource.org	(412) 776-1535
ISWA	Insect Screening Weavers Association P.O. Box 1018 Ossining, NY 10562	(914) 962-9052
ITS	Intertek Testing Services P.O. Box 2040 3933 US Route 11 Cortland, NY 13045-7902 www.itsglobal.com	(800) 345-3851
KCMA	Kitchen Cabinet Manufacturers Association 1899 Preston White Dr. Reston, VA 22091-4326 www.kema.org	(703) 264-1690
LGSI	Light Gage Structural Institute c/o Loseke Technologies, Inc. P.O. Box 560746 The Colony, TX 75056	(972) 625-4560

LIA	Lead Industries Association, Inc. 295 Madison Ave. New York, NY 10017 www.leadinfo.com	(800) 422-5323 (212) 578-4750
LMA	Laminating Materials Association 116 Lawrence St. Hillsdale, NJ 07642-2730 www.lma.org	(201) 664-2700
LPI	Lightning Protection Institute 3335 N. Arlington Heights Rd., Suite E Arlington Heights, IL 60004-7700	(800) 488-6864 (847) 577-7200
MBMA	Metal Building Manufacturer's Association c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/mbma	(216) 241-7333
MCAA	Mechanical Contractors Association of America 1385 Piccard Dr. Rockville, MD 20850-4329	(301) 869-5800
MFMA	Maple Flooring Manufacturers Association 60 Revere Dr., Suite 500 Northbrook, IL 60062 www.maplefloor.com	(847) 480-9138
MFMA	Metal Framing Manufacturers Association 401 N. Michigan Ave. Chicago, IL 60611	(312) 644-6610
MHI	Material Handling Institute (A Division of the Material Handling Industry) 8720 Red Oak Blvd., Suite 201 Charlotte, NC 28217-3992 www.mhi.org	(800) 345-1815 (704) 522-8644
MIA	Marble Institute of America 30 Eden Alley, Suite 301 Columbus, OH 43215 www.marble-institute.com	(614) 228-6194
MIA	Masonry Institute of America 2550 Beverly Blvd. Los Angeles, CA 90057 www.masonryinstitute.org	(213) 388-0472

ML/SFA	Metal Lath/Steel Framing Association (A Division of the NAAMM) 8 South Michigan Ave., Suite 1000 Chicago, IL 60603	(312) 456-5590
MRCA	Midwest Roofing Contractors Association 4840 W. 15th St., Suite 1000 Lawrence, KS 66049	(800) 879-4448 (913) 843-4888
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St., NE Vienna, VA 22180-4602	(703) 281-6613
NAA	National Arborist Association P.O. Box 1094 Amherst, NH 03031-1094 www.natlarb.com	(800) 733-2622 (603) 673-3311
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Ave., Suite 1000 Chicago, IL 60603 www.gss.net/naamm	(312) 456-5590
NAGDM	National Association of Garage Door Manufacturers (See DASMA)	
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	(703) 684-0084
NAMI	National Accreditation & Management Institute, Inc. P.O. Box 366 207 S. Washington St. Berkeley Springs, WV 25411	(304) 258-5100
NAPA	National Asphalt Pavement Association NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	(301) 731-4748
NAPM	National Association of Photographic Manufacturers 550 Mamaroneck Ave. Harrison, NY 10528	(914) 698-7603
NBHA	National Builders Hardware Association (See DHI)	
NCAC	National Council of Acoustical	(201) 564-5859

	Consultants P.O. Box 359 66 Morris Ave., Suite 1A Springfield, NJ 07081	
NCCA	National Coil Coaters Association 401 N. Michigan Ave. Chicago, IL 60611	(312) 321-6894
NCMA	National Concrete Masonry Association 2302 Horse Pen Rd. Herndon, VA 20171-3499 www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute P.O. Box 759 253-80 Center St. Lake Geneva, WI 53147	(414) 248-9094
NCRPM	National Council on Radiation Protection and Measurements 7910 Woodmont Ave., Suite 800 Bethesda, MD 20814-3095 www.ncrp.com	(800) 229-2652 (301) 657-2652
NCSPA	National Corrugated Steel Pipe Association 1255 23rd St., NW, Suite 850 Washington, DC 20037 www.ncspa.org	(202) 452-1700
NEBB	Natural Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877-4121	(301) 977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-5372	(301) 657-3110
NEI	National Elevator Industry 185 Bridge Plaza North, Suite 310 Fort Lee, NJ 07024	(201) 944-3211
NELMA	Northeastern Lumber Manufacturers Association 272 Tuttle Rd. P.O. Box 87A Cumberland Center, ME 04021	(207) 829-6901
NEMA	National Electrical Manufacturers Association 1300 N 17th St., Suite 1847 Rosslyn, VA 22209	(703) 841-3200

	www.nema.org	
NETA	InterNational Electrical Testing Association P.O. Box 687 106 Stone St. Morrison, CO 80465-1526 www.electricnet.com/neta	(303) 697-8441
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org	(800) 344-3555 (617) 770-3000
NFPA	National Forest Products Association (See AFPA)	
NFRC	National Fenestration Rating Council Incorporated 1300 Spring St., Suite 120 Silver Spring, MD 20910 www.nfrc.org	(301) 589-NFRC
NHLA	National Hardwood Lumber Association P.O. Box 34518 Memphis, TN 38184-0518 www.natlhardwood.org	(901) 377-1818
NIA	National Insulation Association 99 Canal Center Plaza, Suite 222 Alexandria, VA 22314 www.insulation.org	(703) 683-6422
NIAC	National Insulation and Abatement Contractors Association (See NIA)	
NKCA	National Kitchen Cabinet Association (See KCMA)	
NLGA	National Lumber Grades Authority #406-First Capital Pl., 960 Quayside Dr. New Westminster, BC V3M 6G2	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association P.O. Box 3009 Memphis, TN 38173-0009	(901) 526-5016
NPA	National Particleboard Association 18928 Premiere Ct. Gaithersburg, MD 20879-1569 www.pbmdf.com	(301) 670-0604

NPCA	National Paint and Coatings Association 1500 Rhode Island Ave., NW Washington, DC 20005-5597 www.paint.org	(202) 462-6272
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018-5607 www.roofonline.org	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association 900 Spring St. Silver Spring, MD 20910 www.nrmca.org	(301) 587-1400
NSA	National Stone Association 1415 Elliot Pl., NW Washington, DC 20007 www.aggregates.org	(202) 342-1100
NSF	NSF International P.O. Box 130140 Ann Arbor, MI 48113-0140 www.nsf.org	(313) 769-8010
NSSEA	National School Supply and Equipment Association 8300 Colesville Rd., Suite 250 Silver Spring, MD 20910	(800) 395-5550 (301) 495-0240
NTMA	National Terrazzo and Mosaic Association 3166 Des Plaines Ave., Suite 121 Des Plaines, IL 60018 www.ntma.com	(800) 323-9736 (847) 635-7744
NUSIG	National Uniform Seismic Installation Guidelines 12 Lahoma Ct. Alamo, CA 94526	(510) 946-0135
NWMA	National Woodwork Manufacturers Association (See NWWDA)	
NWWDA	National Wood Window and Door Association 1400 E. Touhy Ave., G-54 Des Plaines, IL 60018 www.nwwda.org	(800) 223-2301 (847) 299-5200

PATMI	Power Actuated Tool Manufacturers' Institute, Inc. 1603 Boonslick Rd. St. Charles, MO 63301-2244	(314) 947-6610
PCA	Portland Cement Association 5420 Old Orchard Rd. Skokie, IL 60077-1083 www.portcement.org	(847) 966-6200
PCI	Precast/Prestressed Concrete Institute 175 W. Jackson Blvd. Chicago, IL 60604 www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America 3913 Old Lee Hwy, Suite 33-B Fairfax, VA 22030 www.pdca.com	(800) 332-7322 (703) 359-0826
PDI	Plumbing and Drainage Institute 45 Bristol Dr., Suite 101 South Easton, MA 02375	(800) 589-8956 (508) 230-3516
PEI	Porcelain Enamel Institute 4004 Hillsboro Pike, Suite 224-B Nashville, TN 37215 www.porcelainenamel.com	(615) 385-5357
PGI	PVC Geomembrane Institute P.O. Box 4226 Traverse City, MI 49685 users.aol.com/forPVC1	(616) 933-6373
PPFA	Plastic Pipe and Fittings Association 800 Roosevelt Rd., Building C, Suite 20 Glen Ellyn, IL 60137-5833	(630) 858-6540
PPI	Plastic Pipe Institute (The Society of the Plastics Industry, Inc.) 1801 K St., NW, Suite 600L Washington, DC 20006 www.plasticpipe.org	(202) 974-5306
PTI	Post Tensioning Institute 8601 North Black Canyon Highway, Suite 103 Phoenix, AZ 85021	
RCMA	Roof Coatings Manufacturers Association Center Park 4041 Powder Mill Rd., Suite 404	(301) 230-2501

	Calverton, MD 20705	
RCSC	Research Council on Structural Connections Sargent & Lundy 55 E. Monroe St. Chicago, IL 60603	(312) 269-2424
RFCI	Resilient Floor Covering Institute 966 Hungerford Dr., Suite 12-B Rockville, MD 20850-1714	(301) 340-8580
RMA	Rubber Manufacturers Association 1400 K St., NW, Suite 900 Washington, DC 20005 www.rma.org	(800) 220-7620 (202) 682-4800
RMI	Rack Manufacturers institute 8720 Red Oak Boulevard, Suite 201 Charlotte, NC 28217	
SAE	SAE International 400 Commonwealth Dr. Warrendale, PA 15096-0001 For publications: Call (412) 776-4970	(412) 776-4841
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	(847) 462-1930
SDI	Steel Door Institute 30200 Detroit Rd. Cleveland, OH 44145-1967	(216) 889-0010
SEFA	Scientific Equipment and Furniture Association 1028 Duchess Dr. McLean, VA 22102-2010 www.sefalabfurn.com	(703) 790-8661
SEGD	Society for Environmental Graphic Design 401 F St., NW, Suite 333 Washington, DC 20001-2728	(202) 638-5555
SFPA	Southern Forrest Products Association PO Box 641700 Kenner, LA 70064-1700	
SFPE	Society of Fire Protection Engineers 7315 Wisconsin Avenue, Suite 620E Bethesda, MD 20814	

SGCC	Safety Glazing Certification Council (Now part of ITS)	
SHLMA	Southern Hardwood Lumber Manufacturers Association (See HMA)	
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave. Chicago, IL 60611-4267	(312) 644-6610
SJI	Steel Joist Institute 3127 10th Ave., North Ext. Myrtle Beach, SC 29577-6760	(803) 626-1995
SMA	Screen Manufacturers Association 2850 S. Ocean Blvd., Suite 114 Palm Beach, FL 33480-5535	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association, Inc. 4201 Lafayette Center Dr. P.O. Box 221230 Chantilly, VA 20151-1209 www.smacna.org	(703) 803-2980
SPI	Society of the Plastics Industry, Inc. Spray Polyurethane Division 1801 K St., NW, Suite 600K Washington, DC 20006 www.socplas.org	(800) 951-2001 (202) 974-5200
SPIB	Southern Pine Inspection Bureau 4709 Scenic Hwy Pensacola, FL 32504-9094	(904) 434-2611
SPRI	SPRI 175 Highland Ave. Needham Heights, MA 02194-3034	(617) 444-0242
SSINA	Specialty Steel Industry of North America c/o Collier, Shannon Rill & Scott 3050 K St., NW, Suite 400 Washington, DC 20007 www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	Steel Structures Painting Council 40 24th St., 6th Floor Pittsburgh, PA 15222-4643	(412) 281-2331
SSPMA	Sump and Sewage Pump Manufacturers Association	(847) 559-9233

	P.O. Box 647 Northbrook, IL 60065-0647	
STI	Steel Tank Institute 570 Oakwood Rd. Lake Zurich, IL 60047-1559	(847) 438-8265
SWI	Steel Window Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 www.taol.com/swi	(216) 241-7333
SWPA	Submersible Wastewater Pump Association 1806 Johns Dr. Glenview, IL 60025-1657	(847) 729-7972
SWRI	Sealant, Waterproofing and Restoration Institute 2841 Main Kansas City, MO 64108	(816) 472-7974
TCA	Tile Council of America 100 Clemson Research Blvd. Anderson, SC 29625	(864) 646-8453
TECO	Timber Company Inc. 2402 Daniels Street Madison, WI 53704	
TIA	Telecommunications Industry Association 2500 Wilson Boulevard Arlington, VA 22201-3834	
TIMA	Thermal Insulation Manufacturers Association (See NAIMA)	
TMS	The Masonry Society 3970 Broadway, Unit 201-D Boulder, CO 80304-1135	
TPI	Truss Plate Institute 583 D'Onofrio Dr., Suite 200 Madison, WI 53719	(608) 833-5900
TPI	Turfgrass Producers International (Formerly: American Sod Producers Association) 1855-A Hicks Rd. Rolling Meadows, IL 60008	(800) 405-8873 (847) 705-9898
UL	Underwriters Laboratories Inc.	(800) 704-4050

	333 Pflingsten Rd. Northbrook, IL 60062 www.ul.com	(847) 272-8800
ULC	Underwriters laboratories Canada 7 Underwriters Road Toronto, ON, Canada M1R 3B4	
UNI	Uni-Bell PVC Pipe Association 2655 Villa Creek Dr., Suite 155 Dallas, TX 75234 www.members.aol.com/unibell1	(972) 243-3902
USC	United States Code U.S. Government Printing Office Washtong, DC, 20402-9325	
USITT	USITT: The American Association of Design and Production Professionals in the Performing Arts 6443 Ridings Rd. Syracuse, NY 13206-1111	(800) 938-7488 (315) 463-6463
USP	U.S. Pharmacopeia (Formerly: U.S. Pharmacopoeial Convention) 12601 Twinbrook Pkwy Rockville, MD 20852-1790	(800) 227-8772 (301) 881-0666
WA	Wallcoverings Association 401 N. Michigan Ave. Chicago, IL 60611-4267	(312) 644-6610
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281-3145	(503) 639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017-6603	(212) 661-4261
WDMA	Window and door Manufacturers Assocation 1400 East Touhy Avenue #470 Des Plaines, IL 60018	
WEF	Water Environment Federation 601 Wythe St. Alexandria, VA 22314-1994	(703) 684-2400
WIC	Woodwork Institute of California P.O. Box 980247 West Sacramento, CA 95798-0247	(916) 372-9943

WMMPA	Wood Moulding & Millwork Producers Association 507 First St. Woodland, CA 95695 www.wmmpa.com	(800) 550-7889 (916) 661-9591
WPCF	Water Pollution Control Federation (See WEF)	
WRI	Wire Reinforcement Institute 203 Loudoun St., SW Leesburg, VA 20175-2718	(703) 779-2339
WSC	Water Systems Council Building C, Suite 20 800 Roosevelt Rd. Glen Ellyn, IL 60137	(630) 545-1762
WSFI	Wood and Synthetic Flooring Institute (See MFMA)	
WWPA	Western Wood Products Association Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122	(503) 224-3930

- G. Federal Government Agencies: Names and titles of Federal Government standards- or specification-producing agencies are often abbreviated. The following abbreviations and acronyms referenced in the Contract Documents indicate names of standards- or specification-producing agencies of the Federal Government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CSA	Canadian Standards Association 5060 Spectrum Way Mississauga, ON, Canada L4W 5N6	
CE	Corps of Engineers (U.S. Department of the Army) 20 Massachusetts Ave., NW Washington, DC 20314	(202) 761-0660
	CRD standards are available from: U.S. Army Corps of Engineers Waterways Experiment Station Technical Report Distribution Section Services Branch, TIC 3909 Halls Ferry Rd. Vicksburg, MS 39180-6199	(601) 634-2696
CFR	Code of Federal Regulations (Available from the Government Printing Office) Washington, DC 20401 (Material is usually published first in the "Federal Register.")	(202) 512-0000

Washington, DC 20250

USPS U.S. Postal Service (202) 268-2000
475 L'Enfant Plaza, SW
Washington, DC 20260-0010

1.05 GOVERNING REGULATIONS AND AUTHORITIES

- A. Copies of Regulations: Obtain copies of the following regulations and retain at the Project site to be available for reference by parties who have a reasonable need:

1.06 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the 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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 014219

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SECTION 014500

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for quality-control services and mockups.
- B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Prime Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified inspections, tests, and related actions do not limit Prime Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Prime Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- E. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
 - 2. Division 01 Section "Submittal Procedures" specifies requirements for development of a schedule of required tests and inspections.

1.03 RESPONSIBILITIES

- A. Prime Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Prime Contractors shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
 - 1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Prime Contractor's responsibility, the Prime Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these

- services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
 - a. Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.
- B. Retesting: The Prime Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
1. The cost of retesting construction, revised or replaced by the Prime Contractor, is the Prime Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
- C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
1. Provide access to the Work.
 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 4. Provide facilities for storage and curing of test samples.
 5. Deliver samples to testing laboratories.
 6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 7. Provide security and protection of samples and test equipment at the Project Site.
- D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Prime Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect and the Prime Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 3. The agency shall not perform any duties of the Prime Contractor.
- E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Owner is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
 2. Mockups: provide as required in individual Sections coordinated into the overall project schedule.
- 1.04 SUBMITTALS
- A. Unless the Prime Contractor is responsible for this service, the independent testing agency shall submit a

certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Prime Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.05 QUALITY ASSURANCE

- A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
 1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014500

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Division 01 Section "Summary of Work" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
 - 1. If existing system connections are inadequate, provide temporary power or generator service.

1.3 INFORMATIONAL SUBMITTALS

- A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following.
 - 1. Building code requirements.
 - 2. Health and Safety regulations.
 - 3. Police, fire department, and rescue squad rules.
 - 4. Environmental protection regulations.
 - 5. State and Federal laws.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Project Signs: Unauthorized signs are not permitted.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. 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.
- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable or removable access to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Secure access at end of each work day.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Egress: Maintain egress from existing occupied facilities as required by authorities having jurisdiction.
- G. 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.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
 - 1. Prohibit smoking in construction areas.
 - 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.

3.5 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 airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

3.6 OPERATION, TERMINATION, AND REMOVAL

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

- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures".

END OF SECTION 01 50 00

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Reference Standards" for applicable industry standards for products specified.
 - 2. Division 01 Section "Closeout Procedures" and Contract for Construction related to project closeout for submitting warranties for contract closeout.
 - 3. Sections listed elsewhere in the specifications for specific requirements for warranties on products and installations specified to be warranted.
 - 4. Division 01 Section "Substitutions".

1.03 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Basis of Design: Product(s) listed and noted in the contract documents, and as approved through the submittal process.
 - 4. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor, and where allowed as a product substitution per Section 012500 "Substitutions", 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.
 - 5. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

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

1.04 QUALITY ASSURANCE

- A. Compatibility: Products shall be compatible.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.06 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.

3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements for project closeout noted in the Contract for Construction and as noted in Section 017700 "Closeout Procedures".

PART 2 - PRODUCTS

2.01 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Basis of Design: Where listed as an Approved or Listed Product on the drawings, provide the product named.
 - a. Substitutions may only be considered as provisions in Section 012500 "Substitutions" apply.
 2. Products: Where Specification paragraphs or subparagraphs titled "Products" or "Manufacturers" introduce a list of names of both products and/or manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions are not applicable unless provisions in Section 012500 "Substitutions" apply.
 - b. Products shall be of the same manufacturer as listed per Section.
 3. Substitutions not permitted: Where identified, provide the product named.
 - a. Substitutions may only be considered as provisions in Section 012500 "Substitutions" apply.

PART 3 - EXECUTION (Not Used)

HIGHLANDS COUNTY
GOVERNMENT CENTER - HVAC RENOVATION
SEBRING, FLORIDA

11.20.17

END OF SECTION 016000

SECTION 017300

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Contract for Construction regarding progress coordination procedures for coordinating field engineering with other construction activities.
 - 2. Division 01 Section "Closeout Procedures".
 - 3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

1.03 SUBMITTALS

- A. Qualification Data: For land surveyor and professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Certificates: Submit certificate signed by land surveyor and professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility as required by Owner, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit copies of final property survey signed by land surveyor and professional engineer in quantity as required by the Owner.

- E. Submit to SWFWMD a written statement of completion and certification by a registered professional engineer utilizing the required Statement of Completion and Request for Transfer to Operation Entity form identified in Chapter 40D-1.659, F.A.C., and signed, dated and sealed as-built drawings.

1.04 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
- C. 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.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 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 and Construction Manager promptly.
- B. General: Engage a land surveyor and professional engineer to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 6. 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 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 Architect and Construction Manager.

3.04 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. 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 and Construction Manager before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. 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.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. 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.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 8 feet (2.4 m) in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's 'Facilities', vendors, and construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Pre-installation Conferences: Include Owner's construction forces at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.07 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. 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: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. 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.
- J. 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.
- K. 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.

3.08 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, ensure compliance with minimum manufacturer qualification requirements for personnel supporting this role.

3.09 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.010 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

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SECTION 017320

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of portions of buildings and structures.
 - 2. Removing below-grade construction.
 - 3. Disconnecting, capping or sealing, and removing site utilities.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, structures, antiques, and other items of interest or value to Owner that may be encountered during building demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
 - 1. Coordinate with Owner's historical adviser (as applicable), who will establish special procedures for removal and salvage.

1.5 SUBMITTALS

- A. Qualification Data: For professional engineer refrigerant recovery technician.
- B. Proposed Environmental-Protection Dust-Control and Noise-Control Measures: Comply with Division 01 "Construction Waste Management and Disposal" requirements that indicate the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services.

3. Coordination for shutoff, capping, and continuation of utility services.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

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

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

A. Portions of buildings and areas adjacent to elements to be demolished will be vacated and their use discontinued or turned off before start of Work.

B. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. 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 materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are the same as those indicated in Project Record Documents.

C. Take digital existing conditions photographs of area of work and adjacent areas – provide to the Owner prior to the start of work.

D. Inventory and record the condition of items to be removed and salvaged.

E. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Architect.

3.2 PREPARATION

- A. Refrigerant: Before interrupting mechanical service, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If utility services are required to be removed, relocated, or abandoned, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 4. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.
- D. Removed and Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area off-site.
 - 5. Protect items from damage during transport and storage.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during demolition and cleaned and reinstalled in their original locations after demolition operations are complete.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and structures completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain adequate ventilation when using cutting torches.
 - 3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.5 MECHANICAL DEMOLITION

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact or dust generation.
- C. Concrete: Cut concrete full depth at junctures with construction indicated to remain, using power-driven saw, then remove concrete between saw cuts.
- D. Masonry: Cut masonry at junctures with construction indicated to remain, using power-driven saw, then remove masonry between saw cuts.
- E. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished at junctures with construction indicated to remain, then break up and remove.
- F. Below-Grade Construction: Abandon foundation walls and other below-grade construction. Cut below-grade construction flush with grade.
- G. Existing Utilities: Cap existing unused utilities and below-grade utility structures that are within 5 feet outside of footprint indicated for new construction or area of Work. Ensure remaining utilities outside this area remain in working order.
 - 1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements and structural requirements.

3.6 EXPLOSIVE DEMOLITION

- A. Explosives: Use of explosives is not permitted.

3.7 SITE RESTORATION

- A. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by building demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Refer to Division 01 Section "Construction Waste Management and Disposal".
- B. Burning: Do not burn demolished materials.
- C. Disposal: Refer to Division 01 Section "Construction Waste Management and Disposal".

3.10 CLEANING

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

END OF SECTION 017320

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SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 00 and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or results in increased maintenance or decreased operational life or safety.
 - 1. Primary operational systems and equipment.
 - 2. Air or smoke barriers.
 - 3. Fire-protection systems.
 - 4. Control systems.
 - 5. Communication systems.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or results in increased maintenance or decreased operational life or safety.
 - 1. Water, moisture, or vapor barriers.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm as applicable.
 - a. Masonry.
 - b. Roofing.
 - c. Soffits.
 - d. Stucco and ornamental plaster.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete, Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

5. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

END OF SECTION 017329

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Record Documents.
 - 4. Warranties.
 - 5. Final cleaning.
 - 6. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Product Data: For warranty maintenance requirements.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Complete startup and testing of systems and equipment.

2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
3. Participate with Owner in conducting inspection.
4. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
5. Complete final cleaning requirements, including touchup painting.
6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 5 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment.
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each incomplete item and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize items by major element.

1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours throughout project duration.
- B. Record Drawings: Maintain and submit two sets of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
- C. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
- D. Certificate of Substantial Completion: Insert, at this point, a copy of the fully executed Certificate of Substantial Completion, AIA document G704, as future reference for Owner.
- E. Contractor's Affidavit of Payment of Debts and Claims: Provide certification, on AIA Document G706 that work covered by Contract Documents has been completed, and that payrolls, bills of materials 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.
- F. Contractor's Affidavit of Release of Liens: Provide certification, on AIA Document G706A, that liens that are or may be filed arising from work covered by Contract Documents have been released or waived, with any exception noted. Provide additional certification from subcontractors, and material and equipment suppliers, with any exceptions noted. Provide a bond satisfactory to cover exceptions.
- G. Lien Waivers: Provide releases and waivers of liens, from the Contractor and Subcontractors as supporting documents to A.I.A. Document G706A.
- H. Consent of Surety: Provide a Consent of Surety to Final Payment, on A.I.A. Document G707.
- I. Warranties, Guarantees, and Bonds: Provide warranties, guaranties, and bonds called for in the Contract Documents.

1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. Remove debris from roof.

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.

END OF SECTION 01 77 00

SECTION 23 05 10 - GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 SUMMARY

- A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 23. It expands and supplements the requirements specified in sections of Division 01.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.
- B. Allow time for inspections. The OWNER, ARCHITECT, ENGINEER or their designated representative will inspect all or any part of this system as they deem necessary, (hereafter referred to as the INSPECTING AUTHORITY). It is the CONTRACTOR'S responsibility to schedule inspections of all work that is to be covered or concealed as part of this project, prior to the work being concealed. In the event of a discrepancy, notice shall be given by the INSPECTING AUTHORITY. Notice shall be verbal followed by a written notice, or by a written notice, whichever is deemed necessary by the INSPECTING AUTHORITY. All additional work on the area in question shall cease until the discrepancy is resolved. The resolution of the discrepancy will be made by the OWNER, ARCHITECT and ENGINEER jointly, and the final decision will be administered by the ARCHITECT. No extension of time or additional cost will be allowed for re-work done as a result of noncompliance or work after the notice of discrepancy has been given, as described above.
- C. Record of inspections: The CONTRACTOR shall maintain a record of inspections in conjunction with the as-built drawings. The inspection record shall indicate the location of all inspections, the name of the person doing the inspections, the results of the inspections, follow-up on discrepancies found, if any, and a final signature showing all items, with respect to that location, are complete. No portion will be covered, concealed, or incorporated into other components without the benefit of an inspection by the Inspecting Authority, and a record of that inspection being made, and maintained. The burden of proof, in the form of an inspection record, shall be the responsibility of the CONTRACTOR. All work covered, concealed, or incorporated into other components and/ or otherwise installed without the benefit of inspection, by the inspecting authority, and the existence of an inspection record, shall be laid bare, uncovered, exposed, or otherwise made fully accessible to the inspecting authority. Demolition, dismantling, or other activities required to accomplish this accessibility, and the subsequent re-assembly, or reconstruction, shall be done by the CONTRACTOR, at no expense to the OWNER, and no additional time extensions of the contract completion date.
- D. Equipment, and/or material installed, inspected, and otherwise considered complete at the time of inspection and at a later date found not to be in accordance with the requirements of the contract, shall be removed, replaced, relocated, or otherwise made acceptable to the ARCHITECT, ENGINEER, and OWNER. These shall include, but not limited to the following;

Equipment that is damaged, and/or becomes damaged, and/or contains concealed damage.

Equipment that becomes non-operational.

Equipment that leaks.

Equipment that becomes excessively noisy, and/or is found to have objectional noise or vibration.

Equipment that is not properly matched or mated to system it is designed to enhance.

Equipment, attachments, or accessories, that restrict accessibility or operation of other equipment, and/or components.

Equipment and/or components of the system that are considered to be adversely affected by additional construction after the installation and inspection.

1.4 MECHANICAL INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- B. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- C. When the removal of all or any part of a concrete masonry unit is necessary, it shall be done by cutting or coring the masonry unit. **Breaking the masonry unit is unacceptable. Broken or damaged masonry units or bricks shall be replaced by a worker skilled in the trade at no cost to the OWNER.**
- D. Where mounting heights are not detailed or dimensions noted, install mechanical services and overhead equipment to provide the maximum headroom possible. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations. Provide adequate accessibility, and clearances for all components requiring service. Maintain clearances as prescribed for all electrical equipment. Provide adequate room to remove components that are integral to the equipment. Provide adequate working room at all access doors and removable panels (36" Minimum). All equipment must be accessible, and maintainable to the satisfaction of the INSPECTING AUTHORITY, as previously described.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.5 DRAWINGS AND SPECIFICATIONS

- A. Separate divisional drawings and specifications shall not relieve the CONTRACTOR from full responsibility to complete all work which may be indicated on any of the drawings or in any division of the specification.
- B. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work.
- C. In order to provide clear and legible drawings, symbols and schematic diagrams are used. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for a complete installation are excluded.
- D. Certain details appear on the drawings which are specific with regard to the dimensions and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.
- E. Examine the architectural, structural, electrical and mechanical drawings and specifications prior to submitting bid. **Architectural and structural drawings take precedence over mechanical drawings with reference to building construction, location of plumbing fixtures, and any similar fixed items.**
- F. The ARCHITECT, ENGINEER and OWNER shall be notified of any discrepancies, omissions, conflicts or

interferences which occur between drawings and specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

- G. Install all ceiling mounted components in strict accordance with the architectural reflected ceiling plan.

1.6 CUTTING AND PATCHING

- A. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Do not cut structural members without prior written approval of the structural ENGINEER or ARCHITECT.
- B. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- C. Perform cutting, fitting, and patching of mechanical equipment and materials required to: uncover Work to provide for installation of ill-timed Work; remove and replace defective Work; remove samples of installed Work as specified for testing; install equipment and materials in existing structures; upon written instructions from the ARCHITECT/ENGINEER, uncover and restore Work to provide for ARCHITECT/ENGINEER observation of concealed Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1.7 PRODUCT LISTING

- A. Prepare listing of major mechanical equipment and materials for the project. Submit this listing as a part of the submittal requirement specified. Products: All fixtures shall be of one manufacturer. All trim shall be of one manufacturer unless specified on Plumbing Schedule.

1.8 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.
- B. Provide permanent identification Plastic Signs on each item of power operated mechanical equipment. Locate Identification Plastic Signs in accessible, obvious locations.
- C. Provide Temporary Identification on each item of power operated mechanical equipment at the time of installation. Temporary identification shall not adversely effect, mark, or otherwise detract from the finish of the equipment when removed for the installation of the permanent identification sign. Equipment installed without identification will not be accepted.
- D. Permanent labels shall be provided for each air handling unit, condensing unit, and fan. Labels shall be laminated, phenolic strips 1/16-inch-thick and engraved to show lack letters on white background not less than 1/2 inch in height. Strips shall be of size to properly fit manufacturer's brackets and be legible. Where brackets are not provided, labels shall be mounted with screws or rivets or approved adhesive.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.
- C. Equipment and materials stored on the job site shall be for the exclusive use of this job. Equipment and materials not approved, submitted or applicable to the plans, design, or specification shall not be delivered and/or stored at the job site. Equipment and materials found on the job site that are not approved, submitted or deemed applicable shall be removed within ten working days or the OWNER reserves the right to remove such items and dispose of them in a manner determined by the OWNER at the CONTRACTOR'S expense.
- D. Equipment and materials delivered and/or stored on the job site shall be protected from damage. Special attention shall be given to the protection of exposed coils, piping, and other components that would normally be protected after installation. Rigid protective covers shall be provided for these exposed surfaces. Equipment or materials not specifically designed for outdoor use or storage shall be provided with adequate protective cover that is approved by the Inspecting Authority.
- E. Equipment or material that becomes damaged shall be removed from the job site. The determination of the extent of damage shall be made by the Inspecting Authority and will be final. Repair and reuse of damaged equipment or materials shall not be acceptable at any time through acceptance of the job. Equipment and materials found on the job site that are damaged shall be removed within ten working days or the OWNER reserves the right to remove such items and dispose of them in a manner determined by the OWNER at the CONTRACTOR'S expense.

1.10 RECORD DOCUMENTS

- A. Refer to the Division 01 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division 01.
- B. Provide and maintain at the site a set of construction prints which indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, coil removal area, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensions for column lines; actual inverts and locations of underground piping; concealed equipment, dimensions to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.
- D. Identify all air handlers, package units, condensing units and exhaust fans directly on the Record Drawings by noting unit's manufacturer, model number, nominal capacity, serial number and voltage. Identify electric heaters with capacity and voltage.
- E. A copy of the original plans in the latest release of AutoCAD in DWG format shall be available to the CONTRACTOR upon request.
- F. At the completion of the project the CONTRACTOR shall prepare record drawings of the project. Transcribe the information on the construction prints to; (1) set of electronic files prepared in the latest release of AutoCAD in DWG format, and (2) sets black line prints.

1.11 OPERATION AND MAINTENANCE DATA

- A. In addition to the information required by Division 1 for Maintenance Data, include the following information:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. Manufacturer's wiring schematics, as-built wiring schematics, point configuration, location of disconnect means, power source description and location, modifications made to equipment, and all other applicable electrical information.
6. Two (2) copies of this information will be bound in a three-ring binder and delivered through the ARCHITECT as a part of the "Close-Out Documents" for this project.

1.12 WARRANTIES

- A. Refer to the Division 01 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
- B. Compile and assemble the warranties specified in Division 23, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses and telephone numbers and procedures for filing a claim and obtaining warranty services.
- D. Warranties/guarantees shall not be voided by emergency repairs deemed necessary and made by the OWNER.
- E. No item warranted and/or guaranteed by its manufacturer shall be installed, used, stored, or otherwise handled in such a manner as to violate the warranties/guarantees as described by the manufacturer. A copy of the manufacturer's certification of conformance and/or compliance shall be provided at the request of the INSPECTING AUTHORITY. Equipment or material that was/is installed, used, stored, or otherwise handled, that violates the manufacturers warranties/guarantees shall be removed and replaced with equipment and/or materials in conformance and/or compliance with the plans and specifications as directed by the ARCHITECT/ENGINEER. The burden of proof of conformance and/or compliance shall be with the CONTRACTOR and shall be to the satisfaction of the ARCHITECT/ENGINEER. Corrections required shall be at no cost to the OWNER.

1.13 CLEANING

- A. Refer to the Division 01 Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.
- B. Refer to Division 23 Section: TESTING, ADJUSTING, AND BALANCING for requirements for cleaning filters and mechanical systems prior to final acceptance.

1.14 SUPERVISION

- A. The CONTRACTOR and/or the job superintendent shall thoroughly understand the operational requirements of the completed system and shall have had experience with, and shall have successfully completed a system of this type under his/her direct supervision. The CONTRACTOR shall maintain a minimum of two (2) journeymen, plumbers and plumbing apprentice's staff of qualified foreman/supervisors in each category of the system construction that have a thorough understanding of that portion of the system, and that have successfully supervised the construction of a system of this type. At all times the individual trade foremen/supervisors will

be under the direct supervision of the CONTRACTOR and/or the job superintendent as described above. Tradesmen and/or laborers shall, at all times, be under the direct supervision of trade foreman/supervisor. It shall be the responsibility of the CONTRACTOR to make known to the Inspecting Authority who these individuals are, and the area of their responsibility. Work will not be conducted nor will it continue without supervision as described above. Upon request by the OWNER, the CONTRACTOR shall obtain the qualifications listed.

1.15 TEMPORARY AND TRIAL USAGE

- A. Temporary and trial usage of any mechanical devices or equipment or materials shall not be construed as evidence of the acceptance of the same.

PART 2 - PRODUCTS

- A. Refer to other sections of Division 23.

PART 3 - EXECUTION

- A. Refer to other sections of Division 23.
- B. Test and Balance shall be provided by the CONTRACTOR. Refer to Section 23 05 93.

END OF SECTION 23 05 10

SECTION 23 05 19 - METERS AND GAUGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of meters and gauges required by this Section is indicated on drawings and/or specified in other Division 23 sections. Types of meters and gauges specified in this Section include the following:
 - 1. Glass Thermometers.
 - 2. Thermometer Wells.
 - 3. Pressure Gauges.
 - 4. Pressure Gauge Cocks.
 - 5. Pressure Gauge Connector Plugs.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of meters and gauges, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of meter and gauge. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gauge schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gauge.

PART 2 - PRODUCTS

2.1 THERMOMETERS

- A. Glass Thermometers: Provide a die cast aluminum case finished in baked epoxy enamel, with glass front, spring secured, and nine inches long. The adjustable joint shall also be die cast aluminum with 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device. Provide a mercury filled tube and capillary with magnifying lens and 1% scale range accuracy. Scale shall be satin faced, non-reflective aluminum, with permanently etched markings. Stem shall be copper-plated steel or brass, for separable socket. Ranges shall be as follows:
 - 1. Chilled Water: 0° F- 120°F with 1°F scale divisions.
- B. Acceptable manufacturers include Terice (H.O.) Co., Weiss Instruments, Inc., and Miljoco Corp.

2.2 THERMOMETER WELLS

- A. Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide extension, length equal to insulation thickness, for insulated piping.

2.3 PRESSURE GAUGES

- A. Provide pressure gauges for general use, 1% accuracy, ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection. Cases shall be drawn steel or brass, with glass lens, 4 1/2" diameter. Provide a brass connector with 1/4" male NPT. Provide glycerin filled models for use on all pumps. Scales shall be white coated aluminum with permanently etched markings. Accuracy shall be 1%. Ranges shall be as follows:
 - 1. Case: Drawn steel or brass, glass lens, four and 4-1/2" diameter.
 - 2. Connector: Brass with 1/4" male NPT.
 - 3. Scale: White coated aluminum, with permanently etched markings.
 - 4. Range: Conform to the following:
 - a. Chilled Water: 0 - 100 psi.
- B. Acceptable manufacturers include Terrice (H.O. Co.), Weiss Instruments, Inc., Miljoco Corp.

2.4 PRESSURE GAUGE COCKS

- A. Provide pressure gauge cocks between pressure gauges and gauge tees on piping systems. Construct gauge cock of brass with 1/4" female NPT on each end, and "T" handle brass plug.

2.5 PRESSURE GAUGE CONNECTOR PLUGS

- A. General: Provide temperature gauge connector plugs rated for 500 psi and 200°F. Construct of brass and finish in nickel-plate, equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.
- B. An acceptable manufacturer is Peterson Equipment Co.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which thermometers and gauges are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Installer.

3.2 INSTALLATION

- A. Install temperature gauges, pressure gauges, and flow meters in accessible location and positioned so as to be easily read by an observer standing on the floor.
- B. Install pressure gauge cocks in piping tees with snubber.

3.3 ADJUSTING AND CLEANING

- A. Adjust faces of meters and gauges to proper angle for best visibility.
- B. Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows; repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION 23 05 19

SECTION 23 05 23 – GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 SUMMARY

- A. This Section includes general duty valves common to most mechanical piping systems.

1.3 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

1.4 QUALITY ASSURANCE

- A. MSS Standard Practices: Comply with the following standards for valves:
 - 1. MSS SP-45: Bypass and Drain Connection Standard.
 - 2. MSS SP-67: Butterfly Valves.
 - 3. MSS SP-72: Ball Valves with Flanged or Butt-Welding Ends For General Service.
 - 4. MSS SP-80: Bronze Gate, Globe, Angle and Check Valves.
 - 5. MSS SP-92: MSS Valve User Guide

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering valves which may be incorporated in the work include, and are limited to, those listed.

2.2 VALVE FEATURES

- A. General: Comply with ASME B31.9 for building services piping.
- B. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
- C. Operators: Provide the following special operator features:
 - 1. Handwheels, fastened to valve stem, for valves other than quarter turn.
 - 2. Lever Handle on quarter-turn valves 6" and smaller.
- D. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- E. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- F. End Connections: As specified in the individual valves specifications.

1. Threads: Comply with ANSI B2.1.
2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
3. Solder-Joint: Comply with ANSI B16.18.
 - a. Caution: Where soldered end connections are used, use solder having a melting point below 840°F for gate, globe, and check valves; below 421°F for ball valves.

G. All valves 2-1/2" and over must be lug-wafer type or flanged and be capable of dead end service.

2.3 BALL VALVES

- A. Ball Valves - 1" and Smaller: Rated for 400 psi WOG pressure; two-piece construction, bronze or brass body conforming to ASTM B62, standard (or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic cold-water service; threaded ends for domestic hot water service.

MANUFACTURERS	THREADED ENDS	SOLDER ENDS
Nibco:	T-585	S-585
Stockham:	S-216 BR-R-T	S-216 BR-R-S
Milwaukee:	BA-100	BA-150

- B. Ball Valves - 1-1/2" to 2": Rated for 400 psi WOG pressure; three-piece construction, bronze body conforming to ASTM B62, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic cold-water service; threaded ends for domestic hot water service.

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Nibco:	T-590-Y	S-590-Y
Stockham:	S-216 BR-R-T	S-216 BR-R-S
Milwaukee:	BA-300	BA-350

2.4 BUTTERFLY VALVES

- A. Butterfly Valves - 2-1/2" and Larger: MSS SP-67; 150 psi, cast iron body conforming to ASTM A 126, Class.
- B. Valves shall have field replaceable EPDM sleeve, with nickel-plated ductile iron disc stainless steel stem, and EPDM O-ring stem seals. Sizes 2" through 6" shall have non-corrosive or stainless lever operators with locks. Valves on dead end service or requiring additional body strength shall be lug-wafer type, drilled and tapped.

MANUFACTURER	LUG LEVER
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Stockham: LG-522-DS3E
Milwaukee: ML122E
Grooved Ends: Victaulic Series 700 and 703.

MANUFACTURER LUG
LEVER

Stockham: LG-522-BS3E
Milwaukee: ML123E
Grooved Ends: Victaulic Series 704.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior through the end ports for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the position in which it was shipped.
- B. Examine threads on both the valve and the mating pipe for form and cleanliness. Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size and material, and for freedom from defects and damage.
- C. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.

3.2 VALVE SELECTION

- A. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size 2" and Smaller: Solder ends.
 - 2. Steel Pipe Sizes 2" and Smaller: Threaded.
 - 3. Steel Pipe Sizes 2-1/2" and Larger: Flanged

3.3 VALVE INSTALLATIONS

- A. General Application: Install gate valves for main service to each building or piping 2 1/2" and larger & ball valves for general shut-off duty.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices.
- D. Install valves in horizontal piping with stem at or above the center of the pipe.
- E. Prepare piping for soldered, threaded, and flanged connections and assemble joints in accordance with recognized industry standards.
- F. Connection of copper or other Water Distribution Piping to PVC or other Water Service Piping to be made in

concrete valve box located outside of sidewalk or other paved area and not more than 12 inches below grade.

- G. Install building service shut off valve inside building with hose bibb installed above it to allow drainage of system.

3.4 FIELD QUALITY CONTROL

- A. Testing: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

3.5 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 1 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of supports and anchors required by this Section is indicated on drawings and/or specified in other Division 23 sections. Types of supports and anchors specified in this Section include the following:
 - 1. Horizontal-Piping Hangers and Supports.
 - 2. Vertical-Piping Clamps.
 - 3. Hanger-Rod Attachments.
 - 4. Building Attachments.
 - 5. Saddles and Shields.
 - 6. Miscellaneous Materials.
 - 7. Equipment Supports.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
- C. UL and FM Compliance: Provide products which are UL-listed and FM approved for sprinkler piping systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering hangers and supports which may be incorporated in work include B-Line Systems, Inc., ITT Grinnell Corp., and Pipe Shields, Inc.

2.2 HANGERS, ATTACHMENTS AND SUPPORTS

- A. Provide factory fabricated anchors, hangers, attachments, and supports complying with MSS SP-58, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers, attachments, and supports for copper-piping systems. All remaining hangers are to be galvanized. Any hangers that have rust appearing on them will be replaced.
- B. Horizontal-Piping Hangers and Supports:
 - 1. Adjustable Steel Clevis Hangers: MSS Type 1 (Grinnell Fig. 260).
 - 2. Steel Pipe Clamps: MSS Type 4 (Grinnell Fig. 212).
 - 3. Adjustable Swivel Pipe Rings: MSS Type 6 (Grinnell Fig. 104).
 - 4. Split Pipe Rings: MSS Type 11 (Grinnell Fig. 108).
 - 5. U-Bolts: MSS Type 24 (Grinnell Fig. 137).

6. Clips: MSS Type 26 (Grinnell Fig. 262).
 7. Adjustable Pipe Saddle Supports: MSS Type 38 (Grinnell Fig. 264), including steel pipe base support and cast-iron floor flange.
 8. Single Pipe Rolls: MSS Type 41 (Grinnell Fig. 171).
 9. Adjustable Roller Hangers: MSS Type 43 (Grinnell Fig. 174).
- C. Vertical - Piping Clamps: Two-Bolt Riser Clamps: MSS Type 8 (Grinnell Fig. 261).
- D. Hanger - Rod Attachments: Steel Turnbuckles: MSS Type 13 (Grinnell Fig. 230).
- E. Building Attachments:
1. Concrete Inserts: MSS Type 18 (Grinnell Fig. 285).
 2. Top Beam C-Clamps: MSS Type 19 (Grinnell Fig. 61).
 3. Side Beam or Channel Clamps: MSS Type 20 (Grinnell Fig. 225 or 226).
 4. Center Beam Clamps: MSS Type 21 (Grinnell Fig. 131).
 5. C-Clamps: MSS Type 23 (Grinnell Fig. 86).
 6. Steel Brackets:
 - a. Light Duty: MSS Type 31 (Grinnell Fig. 194).
 - b. Medium Duty: MSS Type 32 (Grinnell Fig. 195).
 7. Horizontal Travelers: MSS Type 58 (Grinnell Fig. 170).
- 2.3 SADDLES AND SHIELDS
- A. Provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
 - B. Protection Shields: MSS Type 40 (Grinnell Fig. 167); of length recommended by Manufacturer (minimum 12").
- 2.4 MISCELLANEOUS MATERIALS
- A. Metal Framing: Provide products complying with NEMA STD ML 1.
 - B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.
 - C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
 - D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards. Each pipe to be supported by the trapeze will be provided with a saddle support, roller and/or clamps as is required by the location. Pipe will not be supported by a flat or square surface. Each pipe support, roller and/or clamps shall be contoured to the exact fit to mate the piping insulation and the required saddles and shields. The trapeze shall be of rigid design with pipe movement allowances made with rollers. The design shall incorporate bracing.
 - E. Equipment Supports: Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Prime and paint stand with rust inhibiting paint prior to setting equipment.
 - F. Roof Joist Cross Members: Where ductwork, piping or equipment is suspended between roof joists or trusses by providing cross members supported by the joists or trusses, the cross member shall be fabricated from type B22 TH, 12 ga. channel as manufactured by B-Line Systems, Inc. or 1"x1"x1/4" galvanized angle iron.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed. Correct inadequacies including proper placement of inserts, anchors and other building structural attachments. Installation of hangers, supports, anchors and associated work must be coordinated with all work by other disciplines to avoid conflicts.

3.2 INSTALLATION OF HANGERS, ATTACHMENTS AND SUPPORTS

- A. Arrange for grouping of parallel runs of horizontal piping to be supported together on heavy-duty steel trapeze type hangers. Install supports with maximum spacings complying with MSS SP-69. Do not use wire or perforated metal to support piping, and do not support piping from other piping. Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
- B. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment, and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units. Support all vertical or horizontal runs 6'-0" or over in length.
- C. Insulated Piping:
 - 1. Clamps: Attach clamps, including spacers, to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - 2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold water piping, install coated protective shields.
- D. Install building attachments within concrete or on structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional supports at concentrated loads and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.
- E. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with suggested hanger spacing and rod sizes for straight horizontal runs according to MSS SP-69 as tabulated below:

Pipe Size
(Inches)

Hanger Spacing
(Feet)

Rod Size
(Inches)

Schedule 40 Black Steel

1/2	4	1/4
3/4	4	1/4
1	5	1/4
1-1/2	5	3/8
2	5	3/8
2-1/2	6	3/8
3	7	3/8
4	7	1/2

F. Support both legs of all elbows within one foot (1'-0") of the elbow.

G. Paint all exterior hangers and supports with a rust inhibiting primer and final coat enamel paint.

3.3 ADJUSTING AND CLEANING:

A. Adjust hangers so as to distribute loads equally on attachments.

B. Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 05 29

SECTION 23 05 48 – VIBRATION & SEISMIC CONTROLS FOR HVAC PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of work required by this Section is indicated on drawings and/or specified in other Division 23 sections. Types of vibration isolation specified in this Section include equipment support isolators, and flexible pipe connectors.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration isolation, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ASME B31 Series - Code for pressure piping.
- C. All equipment provided under this division shall operate under all conditions of load, free of objectionable sound and vibration. Sound and vibration conditions considered objectionable by the ARCHITECT shall be corrected in an approved manner.

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Submit manufacturer's technical product data, including dimensions, loads, static deflections, etc.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All vibration isolation materials and systems shall be supplied by a single, approved manufacturer. Acceptable suppliers are Amber/Booth Co. (AB), Vibration Eliminator Co. (VEC), General Rubber Corporation (GRC), Mason Industries, Inc. (MI), Peabody Noise Control Inc., (PNC), Vibration Mountings & Controls Inc., (VM&C).

2.2 EQUIPMENT SUPPORT ISOLATORS

- A. Floor Neoprene: Neoprene isolators shall be neoprene-in-shear type with steel reinforced top and base. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be provided in the base and the top shall have a threaded fastener. The mounts shall include leveling bolts that may be rigidly connected to the equipment.
- B. Double Neoprene Pad: Neoprene pad isolators shall be formed by two layers of 5/16 inch thick ribbed or waffled neoprene, separated by a stainless steel or aluminum plate. These layers shall be permanently adhered together. Neoprene shall be forty to fifty durometer. The pads shall be sized so that they will be loaded between forty and fifty psi.
- C. Hanger Spring and Neoprene: Vibration isolation hangers shall consist of a free standing, laterally stable steel spring and a neoprene element in series, contained within a steel housing. A neoprene neck bushing shall be

provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. Spring diameters and hanger housing lower hole sizes shall be large enough to permit the hanger rod to swing through a 30-degree arc before contacting the housing. Spring elements shall have a minimum additional travel to solid equal to fifty percent of the actual deflection at design load. The neoprene element shall be designed to have a 0.3-inch minimum static deflection.

- D. Hanger Neoprene: Vibration isolation hangers shall consist of a neoprene-in-shear element contained in a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30-degree arc before contacting the hanger housing.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Unless otherwise shown or specified, all floor-mounted major equipment items shall be set on four-inch-high housekeeping type concrete pads. All equipment having moving parts shall be vibration isolated from the building structure. Electrical connections to vibration isolated equipment shall be flexible.
- B. Vibration isolation devices shall be installed for all piping, sheet metal ducts, and plenums as recommended by the manufacturer at the vibration products, and in accordance with recognized industry standards.

3.2 INSTALLATION

- A. Location of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as for proper operation. Installation of vibration isolation equipment shall be in accordance with the manufacturer's written instructions.
- B. Sealed resilient penetration sleeves shall maintain an airtight seal around the penetrating element and shall prevent rigid contact of the penetrating element and the building structure.
- C. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment. Hanger rods for vibration isolated support shall be connected to structural beams or joists, not from the floor slab between beams and joist. Provide intermediate support members as necessary.
- D. Vibration isolation hanger elements shall be positioned so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting the building structure or any object.
- E. No pipes or equipment shall be supported from other pipes or equipment. Resiliently isolated pipes shall not contact any rigid building structure or equipment.
- F. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.

END OF SECTION 23 05 48

SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of mechanical identification work required by this Section is indicated on drawings and/or specified in other Division 23 sections. Types of identification devices specified in this Section include painted identification materials, plastic pipe markers, valve tags, valve schedule frames, and plastic equipment markers.
- B. Refer to Division 26 sections for identification requirements of electrical work; not work of this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ANSI A13.1 for lettering sizes, enamel paint and plastic tape colors, and pressure sensitive vinyl pipe markers.

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.
- C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8 1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation location of valve and variations for identification. Mark valves which are intended for emergency shut-off and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering mechanical identification materials which may be incorporated in the work include Allen Systems, Inc., Brady (W.H.) Co. (Signmark Div.), Industrial Safety Supply Co., Inc., and Seton Name Plate Corp.

2.2 MECHANICAL IDENTIFICATION MATERIALS

- A. Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 15 sections. Provide single selection for each product category.
- B. Painted Identification Materials: Provide standard fiberboard stencils, with not less than 1-1/4" high letters for ductwork and not less than 3/4" high letters for access door signs and similar operational instructions. Provide standard exterior type stenciling enamel, either brushing grade or pressurized spray-can form and grade, and standard identification enamel of colors indicated.

- C. Plastic Pipe Markers: Provide manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers. Print each pipe marker with arrows to indicate flow direction. For pipes with external diameters less than 6" (including insulation), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by adhesive lap joint in pipe marker overlap. For pipes with external diameters of 6" and larger (including insulation) provide either full-band or strip-type pipe markers, but not narrower than three times letter height, laminated or bonded to pipe (or insulation), or taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 3".
- D. Plastic Tape: Provide manufacturer's standard color-coded pressure sensitive (self-adhesive) vinyl tape, not less than three mils thick. Provide 1" wide tape markers on pipes with outside diameters (including insulation) of less than 6", 2-1/2" wide tape for larger pipes.
- E. Valve Tags: Provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and valve numbers 1/2" high, and with 5/32" hole for fastener. Provide 1-1/2" diameter tags and manufacturer's standard solid brass chain or solid brass S-hooks for attachment of tags to valves. Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to the concealed valve.
- F. Valve Schedule Frames: For each page of valve schedule, provide removable glazed display frame. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.
- G. Plastic signs, Laminated, Engraved: 1/8" thick blanks for signs shall be a minimum of 1 3/4" high, with 1/2" high letters. Length of the sign shall be the sum of the letters/numbers plus 3/4" each end. Signs designated for installation on the outside, in open areas, or located in a protected area that is subject to direct sunlight, shall be UV rated, designated and manufactured to be exposed to the elements. Submittal data indicating the above will be required.

2.3 LETTERING AND GRAPHICS

- A. Designations used in mechanical identification work should correspond with those shown on plans. If not otherwise indicated, provide designations which allow proper identification and operation/maintenance of mechanical systems and equipment.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install identification after completion of surfacing covering and painting, and prior to installation of acoustical ceilings and similar removable concealment.
- B. Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information. Where access doors are concealed, plasticize tags may be installed for identification in lieu of specified signs.

3.2 PIPING SYSTEM IDENTIFICATION

- A. Install stenciled pipe markers including color-coded background band or rectangle, and contrasting lettering, for each system indicated to receive identification, and include arrows to show normal direction of flow.
- B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces,

machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ ceilings, or enter non-accessible enclosures.
4. At access doors, manholes and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50'-0" along each piping run, except reduce spacing to 25'-0" in congested areas of piping and equipment.

3.3 VALVE IDENTIFICATION

- A. Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, hose bibbs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
- B. To identify zone isolation valves above finished ceiling, identification shall be placed on access panel, next to access panel, or on to a non-movable part of the ceiling system such as a tee-bar grid of a lay-in type ceiling. Mount signs with stainless steel screws or rivet.
- C. Mount valve schedule frames and schedules in machine rooms where indicated or where directed by ARCHITECT/ENGINEER.

3.4 EQUIPMENT IDENTIFICATION

- A. Provide plastic, laminated, engraved signs for all air handling units, exhaust/supply fans and control panels.

3.5 ADJUSTING AND CLEANING

- A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
- B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.6 EXTRA STOCK

- A. Furnish minimum of five percent extra stock of each mechanical identification material required, including additional numbered valve tags for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 – GENERAL

1.1 EXTENT OF SECTION

- A. This section includes the requirements for:
 - 1. Testing, adjusting, and balancing of air systems.
 - 2. Testing, adjusting, and balancing of hydronic systems.
 - 3. Measurement of final operating condition of HVAC systems.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 sections, apply to work of this section.
- B. Related Sections:
 - 1. Other Division 23 sections specify balancing devices and their installation, and materials and installations of mechanical systems.
 - 2. Individual Division 23 system sections specify leak testing requirements and procedures.

1.3 SUMMARY

- A. This section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- B. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems.
 - 2. Return air systems.
 - 3. Exhaust air systems.
 - 4. Hydronic systems.
 - 5. Verify temperature control system operation.
- C. Test systems for proper sound and vibration levels.
- D. This section does not include:
 - 1. Testing boilers and pressure vessels for compliance with safety codes.
 - 2. Specifications for materials for patching mechanical systems.
 - 3. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.
 - 4. Requirements and procedures for piping system leakage tests.

1.4 DEFINITIONS

- A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
 - 1. The balance of air and water distribution.
 - 2. Adjustment of total system to provide design quantities.
 - 3. Electrical measurement.
 - 4. Verification of performance of all equipment and automatic controls.
 - 5. Sound and vibration measurement.
- B. Test: To determine quantitative performance of equipment.
- C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
- D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
- E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- F. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- H. Main: Duct or pipe containing the system's major or entire fluid flow.
- I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
- J. Branch Main: Duct or pipe serving a single terminal.

1.5 SUBMITTALS

- A. Engineer and Technicians Data: Submit proof that the Test and Balance Engineer assigned to supervise the procedures and the technicians proposed to perform the procedures meet the qualifications specified below.
- B. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

1. Pre-Construction Plan Check: The CONTRACTOR shall review the plans and/or visit the site prior to the start of construction of the project (new or existing systems). Provide a plan review (in writing) within thirty (30) days upon receipt of contract to include any recommended modifications or changes to the system(s), and how they should be made to allow the most effective total system balance. Provide one (1) copy to the CONTRACTOR and two (2) copies to the DP.
- C. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.
- D. Submit agenda of test procedures for each system, describing balancing standards for the testing, balancing and commissioning of the air conditioning, heating and ventilating systems for the approval of the DP. This agenda shall include all forms for each system and component, with specified data from the project plans and specifications included on the forms.
- E. Make inspections of the systems during construction for proper installation of balancing devices and general construction as related to the test and balance work. The number of inspections will vary with size and complexity of the project, but a minimum of two inspections are required: one at 50% completion of ductwork installation, the second at 80% completion of ductwork installation. A written report of each job visit shall be sent to the DP with copies to the PROJECT COORDINATOR and CONTRACTOR.
- F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the test and balance engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.
- G. Draft Reports: Within one week of completion of testing, adjusting, and balancing procedures, submit draft report directly to the DP on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit two (2) complete sets of draft reports. Only 1 complete set of draft reports will be returned.
 1. Immediately notify the DP in writing of any system(s) that do not provide the design quantities as scheduled and specified.
 2. Coordinate with the Installing CONTRACTOR, those items or systems that requires corrective action to meet design performance, in a timely manner. Retest after corrections have been accomplished.
- H. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as specified below. Submit four (4) complete sets of final reports.
- I. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 1. General Information and Summary

2. Air Systems
3. Hydronic Systems
4. Temperature Control Systems
5. Special Systems
6. Sound and Vibration Systems

J. Report Contents: Provide the following minimum information, forms and data:

1. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, the CONTRACTOR, PROJECT COORDINATOR, and DP. Include addresses and contact names and telephone numbers. Also, include a certification sheet containing the seal and name, address telephone number and signature of the certified test and balance engineer. Include in the division a listing of the instrumentation used for the procedures along with the proof of calibration.
2. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each time of equipment and system to accompany each respective report form.

K. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.6 SCHEDULING

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement, and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
2. The independent testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one professional engineer, registered in the state in which the services are to be performed, certified as a test and balance engineer.

B. Codes and Standards:

1. AABC: "National Standards for Total System Balance"
2. ASHRAE: "ASHRAE Handbook", HVAC Applications Volume, Chapter 37, "Testing, Adjusting, and Balancing".

C. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the DP and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

D. Compliance with the latest approved edition of the Florida Building Code – Energy Efficiency Chapter.

1.7 PROJECT CONDITIONS:

- A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.8 SEQUENCING AND SCHEDULING

- A. Test ducts for leakage prior to the application of insulation or concealment in soffits or chases.
- B. Test, adjust, and balance the air systems before hydronic, steam, and refrigerant systems.
- C. Test, adjust, and balance air conditioning systems during summer season and heating systems during winter season, within 5°F dry bulb temperature of design condition. Take final temperature readings during seasonal operation.
- D. Minimum of one after-occupancy inspection shall be made within 90 days of the final test and balance. At this time, any minor adjustments shall be made for occupant comfort. Major problems, which will require major readjustments, shall be addressed to the DP prior to any readjustments. Any alterations to the final test and balance report shall be transmitted as a revised report to the PROJECT COORDINATOR/DP.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 DUCT LEAKAGE TEST

- A. The mechanical CONTRACTOR shall make all the supply return, outside air, and exhaust duct systems operationally air-tight, to be not more than 2% leakage for duct systems rated at 2" w.c. pressure class, and 1% leakage for systems exceeding 2" w.c. pressure class. Leakage test to be performed by the Mechanical CONTRACTOR with all air device openings and fan connections sealed airtight. Test the systems prior to applying any insulation or concealing in soffits or chases. The ductwork shall be tested after the installation of the take-offs for VAV boxes (variable air volume systems) or air devices (for constant volume systems) on supply ductwork and return / exhaust air devices for the return and exhaust ductwork. All take-offs shall be installed prior to the duct leakage test. Use a portable fan capable of producing a static pressure equal or greater than the duct test pressure. Fan shall have a flow measuring assembly consisting of a straight section of duct with an orifice plate, pressure taps, and a calibrated performance curve for determining leakage rates. The leakage test shall be witnessed by the Test & Balance CONTRACTOR. It is the Mechanical CONTRACTOR'S responsibility to schedule the test; a minimum of five business days' notice shall be given to the Test & Balance CONTRACTOR.
- B. Test each section equal to the external static pressure indicated for that fan or air handler with the portable fan assembly. After the fan achieves that steady state design pressure, record the air flow quantity across the orifice and the percent of design air flow. If the test fails, the CONTRACTOR shall reseal and retest at no additional cost to the contract.
- C. Repair all duct leaks that can be heard or felt, even if the system has passed the leakage test.
- D. Submit duct leakage reports to the DP for review and approval.

3.2 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

- A. Before operating the system, perform these steps:
1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
 2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust), and temperature control diagrams.
 3. Compare design to installed equipment and field installations.
 4. Walk the system from the central equipment to terminal units to determine variations of installation from design.
 5. Check filters for cleanliness.
 6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 7. Prepare report test sheets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check.
 8. Determine best locations in main and branch ductwork for most accurate duct traverses.
 9. Place outlet dampers in the full open position.
 10. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
 11. Lubricate all motors and bearings.
 12. Check fan belt tension.
 13. Check fan rotation.

3.3 PRELIMINARY PROCEDURES FOR HYDRONIC SYSTEM BALANCING

- A. Before operating the system perform these steps:
1. Open valves to full open position. Close coil bypass valves. Set modulating valve to full coil flow.
 2. Remove and clean all strainers.
 3. Examine hydronic systems and determine if water has been treated and cleaned.
 4. Check pump rotation.
 5. Clean and set automatic fill valves for required system pressure.
 6. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
 7. Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).
 8. Set temperature controls so all coils are calling for full flow.
 9. Check operation of automatic bypass valves.
 10. Check and set operating temperatures of chillers/boilers to design requirements.
 11. Lubricate all motors and bearings.

3.4 MEASUREMENTS

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the

function being measured.

- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all readings with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuating readings.
- I. Take measurements in the system where best suited to the task.

3.5 RESPONSIBILITIES OF THE TEST AND BALANCE CONTRACTOR

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- B. Air Balance:
 - 1. Record minimum data required by AABC forms.
 - 2. Test and adjust fan rpm to design requirements.
 - 3. Test and record motor full load amperage/voltage and operating amperage/voltage.
 - 4. Make pitot tube traverse of main supply, return OA and exhaust ducts and obtain design cfm at fans (where possible).
 - 5. Test and adjust system for deigned cfm recirculated air.
 - 6. Test and adjust system for design cfm outside air.
 - 7. Test and record system static pressure profile.
 - 8. Adjust all main supply and return air ducts to proper design cfm.
 - 9. Adjust all zones to proper design cfm, supply, return and exhaust.
 - 10. Adjust all VV terminals to design minimum, maximum and/or heat cfm and record controller setpoint.
 - 11. Provide suggestion/corrective measures pertaining to performance related issues.
 - 12. Test and adjust each diffuser, grille, and register to within % of design requirements.
 - 13. Each grille, diffuser and register shall be identified as to the location, area and system.
 - 14. Test and adjust fan to within 100%-105% of design.
 - 15. Test and adjust kitchen hoods and fume hoods. On hoods with multiple section, adjust the exhaust / make-up airflow of each section to airflows indicated by the kitchen consultant.
 - 16. Test and adjust kitchen hoods and fume hoods. On hoods with multiple section, adjust the exhaust / make-up airflow of each section to airflows indicated by the kitchen consultant.
 - 17. Test and adjust kitchen hoods and fume hoods. On hoods with multiple section, adjust the exhaust / make-up airflow of each section to airflows indicated by the kitchen consultant.

- a. Provide all readings at all filters sections (velocity, airflow) and indicate corrections factor used for determining final airflow.
- C. Chilled Water/Hot Water Balance:
1. Set pumps to 100%-105% of design flow.
 2. Adjust flow of water through chillers/boilers.
 3. Check leaving water temperatures and return water temperature through chillers/boilers. Reset to correct design temperatures.
 4. Check water temperature at inlet side of coils.
 5. Proceed to balance each water coil. Upon completion of flow readings and adjustments at coils, mark all settings and record data.
 6. After adjustments to coils are made, recheck settings at the pumps and chillers/boilers, and readjust if required.
 7. All flow devices to be balanced to within $\pm 5\%$ of design.
- D. Record and check the following items at each cooling/heating element:
1. Test and record entering air temperature (DB heating and cooling).
 2. Test and record entering air temperatures (WB cooling).
 3. Test and record leaving air temperatures (DB heating and cooling).
 4. Test and record leaving air temperatures (WB cooling).
 5. Entering and leaving water temperature.
 6. Pressure drop of each coil or vessel.
 7. Calculate gpm.
 8. Calculate total cooling and heating coil capacities.
 9. If test conditions are not within design tolerance, then convert the test conditions to design conditions, or retest when conditions are closer to design (e.g. opposite season test).
- E. Record and check the following items at each motor:
1. Amperage; provide readings for each phase on 3-phase motors.
 2. Voltage; provide readings for each phase on 3-phase motors.
 3. Power factor; coordinate with the Electrical CONTRACTOR, as necessary.
 4. Motor efficiency; coordinate with the motor supplier and provide accurate data.
- F. Check all controls for proper calibrations and list all controls requiring adjustment by control installers. A software point-by-point checkout and test, along with verification forms, will be required.
- G. Test each sequence of operation for all systems to verify proper operation. Include description of operating in report.
- H. Record the dry bulb temperature and relative humidity in each.
- I. Deficiencies: All deficiencies shall be noted by the agency in a field report and submitted to the CONTRACTOR and DP on a daily basis.
- J. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

- K. Patch insulation, ductwork, and housings, using materials identical to those removed.
- L. Seal ducts and piping, and test for and repair leaks.
- M. Seal insulation to re-establish integrity of the vapor barrier.
- N. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- O. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.6 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

- A. The Mechanical CONTRACTOR shall complete the installation and start all HVAC systems to insure they are working properly, and shall perform all other items as described hereinafter to assist the balancing agency in performing the testing and balancing of the HVAC systems.
- B. Air Distribution Systems:
 - 1. Verify installation for conformity to design.
 - 2. Insure that all supply, return, and exhaust ducts are installed in such a manner that maximum allowable leakage rates as required by specifications are not exceeded. Notify the Test and Balance CONTRACTOR and the PROJECT COORDINATOR when duct system is ready for leak testing. Provide test openings and temporary end caps or otherwise seal off ends of ductwork to permit leakage testing prior to installation of air devices.
 - 3. Insure that all volume, splitter, extractor, and fire dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return, relief and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
 - 4. Verify that all supply, return, exhaust, and transfer grilles, registers, diffusers, and high-pressure terminal units are installed and operational.
 - 5. Insure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air.
 - 6. Insure that all fans (supply, return, relief, and exhaust) are operating and free of vibrations. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protections shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
 - 7. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost to the PROJECT COORDINATOR.
 - 8. Install clean filters.
- C. Water Circulating Systems:

1. Verify installation for conformity to design.
2. Check all pumps to verify pump alignment and rotation.
3. Insure that systems are clean, with the proper strainer screens installed for normal operation.
4. Check all pump motors for current and voltage, to insure that motors do not exceed nameplate rating.
5. Provide overload protection of proper size and rating.
6. Insure that all water circulating systems shall be full and free of air; that expansion tanks are set for proper water level; and that all air vents were installed at high point of systems and are operating.
7. Check and set operating temperatures of heat exchangers to design requirements.

3.7 RESPONSIBILITIES OF THE TEMPERATURE CONTROL CONTRACTOR

- A. The Temperature Control CONTRACTOR shall complete the installation of the temperature control system, and operate and test all controls systems to insure they are functioning properly as designed. The Temperature Control CONTRACTOR shall assist the balancing agency in testing and balancing the HVAC systems, as described hereinafter:
1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
 3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
 4. The Temperature Control CONTRACTOR shall allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components such as, but not limited to; computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

3.8 RECORD AND REPORT DATA

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by, the referenced standards and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
- C. A copy of the Test and Balance Report, which is reviewed and accepted by the Engineer of Record, shall be made available at the final AHCA inspection.

END OF SECTION 23 05 93

SECTION 23 07 13 – DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of mechanical insulation required by this Section is indicated on drawings and schedules, and by requirements of this Section. Types of mechanical insulation specified in this Section include the following:
 - 1. Insulation of piping, tanks, fittings and other surfaces.
 - 2. Insulation of ductwork, air devices and all equipment pertaining to the air distribution system.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Installer's Qualifications: Firm with at least five years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of twenty-five or less, and smoke-developed index of fifty or less, in accordance with NFPA 90A-1989.
- D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, K-value, thickness, and furnished accessories for each mechanical system requiring insulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering products which may be incorporated in the work include Armstrong World Industries, Inc., CertainTeed Corp., Knauf Fiber Glass GmbH., Manville Products Corp., Owens-Corning Fiberglass Corp., Pittsburgh Corning Corp., and Rubatex Corp.

2.2 DUCTWORK INSULATION MATERIALS

- A. Flexible Fiberglass Ductwork Insulation: Foil, scrim reinforced backed, 0.75 pound per cubic foot density blanket, two and two tenths inch (2.2") minimum thickness.
- B. Rigid Fiberglass Insulation: Foil backed, 3 pounds per cubic foot density, two inch minimum thickness,

operating range of -60°F to $+450^{\circ}\text{F}$.

- C. Jackets: Pre-sized reinforced glass mesh adhered to insulation or ductwork with fire retardant vapor barrier lagging adhesive.
- D. Provide accessories (staples, bands, wires, etc.) and compounds (cements, adhesives, coatings, etc.) as recommended by insulation manufacturer.

2.3 EQUIPMENT INSULATION MATERIALS

- A. Rigid Fiberglass Insulation: Board with factory applied all service jacket, suitable for operating temperatures of -60°F to $+450^{\circ}\text{F}$.
- B. Flexible Unicellular Equipment Insulation: Closed-cell insulation suitable for operating temperatures of -40°F to $+220^{\circ}\text{F}$.
- C. Jacketing Material: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard.
- D. Provide accessories (staples, bands, wire, etc.) and compounds (adhesives, cements, sealers, etc.) as recommended by insulation manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSULATION INSTALLATION, GENERAL

- A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.
- B. Install insulation materials with smooth and even surfaces. Do not use cut pieces or scraps abutting each other.
- C. Clean and dry surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered. Maintain integrity of vapor-barrier, and protect to prevent puncture or other damage. All surfaces scheduled or requiring primer will be primed, inspected and approved prior to installation of insulating materials. Insulation installed over surfaces that are not properly prepared or inspected will be removed and replaced after proper preparation and inspection by the Inspecting Authority, at no additional cost to OWNER or time extensions to completion date.
- D. Should condensation occur after the installation of the insulating material or in the event the insulation becomes wet due to other circumstances, the insulation will be removed and replaced, at no cost to OWNER and no time extension to the completion date.
- E. The CONTRACTOR shall be responsible to coordinate the installation of all insulation materials, and the protection after installation of all finished surfaces through the completion and the acceptance of the project as previously described. Repair any damaged insulation completely prior to the installation of the ceilings.

3.3 DUCTWORK SYSTEM INSULATION

- A. Insulate HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet,

including neck and back pan of supply diffusers; HVAC return ductwork between room terminal inlet and return fan inlet or HVAC unit inlet; and HVAC plenums and unit housings not preinsulated at factory or lined.

- B. Insulate the back pans of all ceiling diffusers and seal to provide a complete vapor barrier.
- C. Overlap ductwrap a minimum of 2" at seam, staple seam 6" o.c. minimum and seal with pressure sensitive tape. Install two (2) runs of glass fab/mesh tape over pressure sensitive tape. Mesh tape shall lap over edge of pressure sensitive tape minimum 1" onto duct insulation. Also, lap the two runs minimum 1" at center of pressure sensitive tape. Seal complete assembly with suitable vapor barrier coating (Foster 30-65, Chiders CP-34) or approved equal. Do not compress duct wrap below the 2" prescribed during the installation process. Seal vapor barrier penetration at all equipment and air devices completely. For ducts over 18" wide secure wrap to bottom of duct with mechanical fasteners spaced on 12" centers. Insulate the back pans of all diffusers and return air plenums. Seal vapor barrier with pressure sensitive tape completely between back pan/plenum and ductwrap.

3.4 EQUIPMENT INSULATION

- A. Insulate pumps with preformed foamglass sections or 1" thick sheet Armaflex.

3.5 REPAIR, REPLACEMENT AND PROTECTION

- A. Insulation installer shall advise CONTRACTOR of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 23 07 13

SECTION 23 07 19 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of mechanical insulation required by this Section is indicated on drawings and schedules, and by requirements of this Section. Types of mechanical insulation specified in this Section include the following:
 - 1. Insulation of piping, tanks, fittings and other surfaces.
 - 2. Insulation of ductwork, air devices and all equipment pertaining to the air distribution system.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Installer's Qualifications: Firm with at least five years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of twenty-five or less, and smoke-developed index of fifty or less, in accordance with NFPA 90A-1989.
- D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, K-value, thickness, and furnished accessories for each mechanical system requiring insulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering products which may be incorporated in the work include Armstrong World Industries, Inc., CertainTeed Corp., Knauf Fiber Glass GmbH., Manville Products Corp., Owens-Corning Fiberglass Corp., Pittsburgh Corning Corp., and Rubatex Corp.

2.2 PIPING INSULATION MATERIALS

- A. Flexible Unicellular Piping Insulation (Armaflex): Performed split sectional closed pipe insulation. Suitable for operating temperatures of -40°F to +220°F. Thermal conductivity "K" factor of 0.27.
- B. Cellular Glass Piping Insulation: Preformed split sectional pipe insulation of rigid foamed cellular glass for

pipings and flat block formed to fit for equipment. Apply with all joints tightly butted and buttered with joint sealer. Secure in place with tape, twelve inches on center, secured with at least two points per section. Cover outdoor insulation with one-eighth inch layer of white fire-retardant vapor-barrier mastic; apply layer of white open weave glass fabric (10x20 mesh) with all joints overlapped two inches, and cover with second one-eighth inch layer of same mastic. Cover exterior piping valves, elbows, tee's, flanges, etc...with aluminum jacket.

C. Jackets:

1. Type A: Smooth or embossed aluminum jacket, 0.016" minimum thickness secured with one-half inch aluminum bands, for all exterior installations.

D. Fittings: Provide fitting coverings of a similar material and thickness as adjacent pipe coverings. Cover all elbows, tees, valves, flanges and other fittings of piping system.

E. Accessories: All staples, bands, wires, adhesives, cements, sealers and protective finishes to be as recommended by insulation manufacturers.

2.3 EQUIPMENT INSULATION MATERIALS

A. Flexible Unicellular Equipment Insulation: Closed-cell insulation suitable for operating temperatures of -40°F to +220°F.

B. Jacketing Material: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard.

C. Provide accessories (staples, bands, wire, etc.) and compounds (adhesives, cements, sealers, etc.) as recommended by insulation manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSULATION INSTALLATION, GENERAL

A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.

B. Install insulation materials with smooth and even surfaces. Do not use cut pieces or scraps abutting each other.

C. Clean and dry surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered. Maintain integrity of vapor-barrier, and protect to prevent puncture or other damage. All surfaces scheduled or requiring primer will be primed, inspected and approved prior to installation of insulating materials. Insulation installed over surfaces that are not properly prepared or inspected will be removed and replaced after proper preparation and inspection by the Inspecting Authority, at no additional cost to OWNER or time extensions to completion date.

D. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where expressly indicated or directed by the Inspecting Authority.

E. Protect all outdoor insulation from weather or ultraviolet deterioration by installing outdoor protective jacketing or painting insulation with appropriate U.V. inhibiting paint. Outdoor ductwork insulation shall be wrapped and

banded with an aluminum jacket.

- F. Should condensation occur after the installation of the insulating material or in the event the insulation becomes wet due to other circumstances, the insulation will be removed and replaced, at no cost to OWNER and no time extension to the completion date.
- G. The CONTRACTOR shall be responsible to coordinate the installation of all insulation materials, and the protection after installation of all finished surfaces through the completion and the acceptance of the project as previously described. Repair any damaged insulation completely prior to the installation of the ceilings.

3.3 HVAC PIPING SYSTEM INSULATION

- A. Omit insulation on cold piping within unit cabinets provided piping is located over drain pan.
- B. Insulate refrigerant suction lines between evaporators and compressors, and refrigerant hot gas piping with flexible unicellular insulation, 1" thick for pipe sizes up to 2"; 1 1/2" thick for pipe sizes 2 1/2" and larger.
- C. Insulate condensate drain piping inside of the building with flexible unicellular insulation 1/2" thick for all pipe sizes.
- D. Insulate HVAC chilled water supply and return piping with cellular glass insulation, 1 1/2" thick for pipe sizes up to and including 5"; 2 1/2" thick for pipe 6" and larger. At the Contractor's discretion, Armaflex type insulation may be utilized on pipes 1" and smaller.
- E. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- F. Miter all insulation elbows and properly seal all joints. Elbows which are not mitered correctly will be rejected and redone at no additional expense to the Owner.

3.4 EQUIPMENT INSULATION

- A. Insulate pumps with preformed foamglass sections or 1" thick sheet Armaflex.

3.5 REPAIR, REPLACEMENT AND PROTECTION

- A. Insulation installer shall advise CONTRACTOR of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 23 07 19

SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.
- B. The following sections constitute related work:
 - 1. Section 01 30 00 - Administrative Requirements
 - 2. Section 01 60 00 - Product Requirements
 - 3. Section 01 80 00 - Performance Requirements
 - 4. Section 01 90 00 – Life Cycle Activities
 - 5. Section 23 05 10 – General Mechanical Requirements
 - 6. Section 23 21 13 –Hydronic Pumps
 - 7. Section 23 64 23 – Scroll Water Chillers
 - 8. Section 23 73 13 – Modular Indoor Central Station Air Handling Units
 - 9. Section 23 91 00 – Variable Frequency Drives
 - 10. Section 26 05 26 – Grounding & Bonding for Electrical Systems
 - 11. Section 26 05 53 – Identification for Electrical Systems
 - 12. Section 26 27 26 – Wiring Devices

1.2 DESCRIPTION

- A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface.
- B. System software shall be based on a server/thin-client architecture, designed around the open standards of web technology. The control system server shall be accessed using a Web browser over the control system network, the owner’s local area network and (at the owner’s discretion) over the Internet. The server shall also act as a “workstation” when running as a server/client platform. Additional clients shall have concurrent access to the “workstation” in this mode.
- C. The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends, configure trends, configure points and controllers, or to download programming into the controllers.
- D. System shall use BACnet protocol for communication between the control modules and web server. Communication between the web server and the user’s browser shall be HTTP or HTTPS protocol utilizing HTML5. Use of Adobe Flash technology is not acceptable. I/O points, schedules, setpoints, trends, and alarms indicated in the Contract Documents.

1.3 APPROVED CONTROL SYSTEMS

A. The following are approved control system suppliers, manufacturers, and product lines:

1. Automated Logic Corporation, WebCTRL.
2. ESSI, Inc.

1.4 ABBREVIATIONS

A. The following abbreviations are utilized within this section and the sequences of operations. Refer to mechanical drawings for additional abbreviations.

1. AC: Air Conditioning
2. ACU: Air Conditioning Unit
3. AHU: Air Handling Unit
4. AHU: Air Handling Unit.
5. AI: Analog Input
6. AO: Analog Output
7. ATC: Automatic Temperature Control.
8. AUTO: Automatic
9. AUX: Auxiliary
10. AV: Analog Value
11. BAS: Building Automation System.
12. BI: Binary Input
13. BO: Binary Output
14. BV: Binary Value
15. C: Common
16. CFM: Cubic Feet per Minute.
17. CHW: Chilled Water
18. CHWP: Chilled Water Pump
19. CHWR: Chilled Water Return
20. CHWS: Chilled Water Supply
21. COND: Condenser
22. CV: Constant Volume
23. CW: Condenser Water

- 24. CWP: Condenser Water Pump
- 25. CWR: Condenser Water Return
- 26. CWS: Condenser Water Supply
- 27. DA: Discharge Air
- 28. DDC: Direct-digital controls.
- 29. DI: Digital Input.
- 30. DO: Digital Output.
- 31. EA: Exhaust Air
- 32. EF: Exhaust Fan
- 33. EVAP: Evaporator
- 34. FAS: Fire Alarm System.
- 35. FCU: Fan Coil Unit
- 36. HOA: Hand / Off / Auto
- 37. HP: Heat Pump
- 38. HRU: Heat Recovery Unit
- 39. HVAC: Heating, Ventilating and Air Conditioning.
- 40. HW Hot Water
- 41. HWP Hot Water Pump
- 42. HWR Hot Water Return
- 43. HWS Hot Water Supply
- 44. HX Heat Exchanger
- 45. IU: Induction Unit
- 46. LAN: Local area network.
- 47. MER: Mechanical Equipment Room.
- 48. NC: Normally Closed
- 49. NO: Normally Open
- 50. OA: Outdoor Air
- 51. PID: Proportional Integral Derivative.
- 52. POT: Portable Operators Terminal.
- 53. RA: Return Air

- 54. RF: Return Fan
- 55. RH: Relative Humidity
- 56. RTU: Roof-top Unit
- 57. SA: Supply Air
- 58. SF: Supply Fan
- 59. SP: Static Pressure
- 60. TEMP: Temperature
- 61. UH: Unit Heater
- 62. UV: Unit Ventilator
- 63. VAV: Variable Air Volume
- 64. VFD: Variable Frequency Drive.
- 65. VRF: Variable Refrigerant Flow
- 66. VRV: Variable Refrigerant Volume
- 67. WSHP: Water Source Heat Pump

1.5 DEFINITIONS

- A. Adjustable (adj.): Adjustable by the end user, through the supplied user interface.
- B. Advanced Application Controllers (AACs): A fully programmable control module. This control module may be capable of some of the advanced features found in Building Controllers (storing trends, initiating read & write requests, etc.) but it does not serve as a master controller. Advanced Application Controllers may reside on either the Ethernet/IP backbone or on a subnet.
- C. Alarm: The control system shall be configured to generate an alarm when this object exceeds user definable limits, as described in the Sequence of Controls.
- D. Analog Value: An intermediate (software) point that may be editable or read-only. Editable AVs are typically used to allow the user to set a fixed control parameter, such as a setpoint. Read Only AVs are typically used to display the status of a control operation.
- E. Application Specific Controllers (ASCs): A pre-programmed control module which is intended for use in a specific application. ASCs may be configurable, in that the user can chose between various pre-programmed options, but it does not support full custom programming. ASCs are often used on terminal equipment such as VAV boxes or fan coil units. In many vendors' architectures ASCs do not store trends or schedules but instead rely upon a Building Controller to provide those functions.
- F. BACnet Interoperability Building Blocks (BIBB): A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.
- G. BACnet/BACnet Standard: BACnet communication requirements as defined by the latest version of ASHRAE/ANSI 135 and approved addenda.

- H. Binary Value: An intermediate (software) point that may be editable or read-only. Editable BVs are typically used to allow the user to set a fixed control parameter, such as a setpoint. Read Only BVs are typically used to display the status of a control operation.
- I. Building Controllers (BCs): A fully programmable control module which is capable of storing trends and schedules, serving as a router to devices on a subnet, and initiating read and write requests to other controllers. Typically, this controller is located on the Ethernet/IP backbone of the BAS. In many vendors' architectures a Building Controller will serve as a master controller, storing schedules and trends for controllers on a subnet underneath the Building Controller.
- J. Control Systems Server: A computer(s) that maintain(s) the systems configuration and programming database.
- K. Controller: Intelligent stand-alone control device. Controller is a generic reference to building controllers, custom application controllers, and application specific controllers.
- L. Direct Digital Control: Microprocessor-based control including Analog/Digital conversion and program logic.
- M. Furnished or Provided: The act of supplying a device or piece of equipment as required meeting the scope of work specified and making that device or equipment operational. All costs required to furnish the specified device or equipment and make it operational are borne by the division specified to be responsible for providing the device or equipment.
- N. Gateway: Bi-directional protocol translator connecting control systems that use different communication protocols.
- O. Install or Installed: The physical act of mounting, piping or wiring a device or piece of equipment in accordance with the manufacturer's instructions and the scope of work as specified. All costs required to complete the installation are borne by the division specified to include labor and any ancillary materials.
- P. Integrate: The physical connections from a control system to all specified equipment through an interface as required to allow the specified control and monitoring functions of the equipment to be performed via the control system.
- Q. Interface: The physical device required to provide integration capabilities from an equipment vendor's product to the control system. The equipment vendor most normally furnishes the interface device. An example of an interface is the chilled water temperature reset interface card provided by the chiller manufacturer in order to allow the control system to integrate the chilled water temperature reset function into the control system.
- R. Local Area Network: Computer or control system communications network limited to local building or campus.
- S. Loop or control loop: Most commonly a PID control loop. Typically, a control loop will include a setpoint, an input which is compared to the setpoint, and an output which controls some action based upon the difference between the input and the setpoint. A PID control loop will also include gains for the proportional, integral, and derivative response as well as an interval which controls how frequently the control loop updates its output. These gains may be adjustable by the end user for control loop "tuning," but in self-tuning control loops or loops which have been optimized for a specific application the gains may not be adjustable.
- T. Master-Slave/Token Passing (MS/TP): Data link protocol as defined by the BACnet standard.
- U. Point-to-Point: Serial communication as defined in the BACnet standard.

- V. Primary Controlling LAN: High speed, peer-to-peer controller LAN connecting BCs and optionally AACs and ASCs. Refer to System Architecture below.
- W. Protocol Implementation Conformance Statement (PICS): A written document that identifies the particular options specified by BACnet that are implemented in a device.
- X. Router: A device that connects two or more networks at the network layer.
- Y. Schedule: The control algorithm for this equipment shall include a user editable schedule.
- Z. Trend: The control system shall be configured to collect and display a trend log of this object. The trending interval shall be no less than one sample every 5 minutes. (Change of Value trending, where a sample is taken every time the value changes by more than a user-defined minimum, is an acceptable alternative.)
- AA. Web Services: Web services are a standard method of exchanging data between computer systems using the XML (extensible markup language) and SOAP (simple object access protocol) standards. Web services can be used at any level within a Building Automation System (BAS), but most commonly they are used to transfer data between BAS using different protocols or between a BAS and a non-BAS system such as a tenant billing system or a utility management system.
- BB. Wiring: Raceway, fittings, wire, boxes and related items.

1.6 QUALITY ASSURANCE

A. Installer and Manufacturer Qualifications

1. Installer shall have an established working relationship with the Control System Manufacturer and have, as a minimum, 5 years demonstrated experience with installation and support of the manufacturer's product
2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

1.7 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances for these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)
2. Florida Building Code, 2014 Edition (FBC)
3. International Mechanical Code (IMC)
4. ANSI/ASHRAE Standard 135, BACnet – A Data Communication Protocol for Building Automation and Control Systems

1.8 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for display through the user's web browser.

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.
3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
5. Alarm Response Time. An object that goes into alarm shall be annunciated at the browser within 45 sec.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec.
7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
8. Multiple Alarm Annunciation. Each user, connected to network accessing the system through their browser (workstation), shall receive alarms within 5 seconds of one another.
9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
 - a. Table 1: Reporting Accuracy
 - 1) Note 1: Accuracy applies to 10%–100% of scale
 - 2) Note 2: For both absolute and differential pressure
 - 3) Note 3: Not including utility-supplied meters

MEASURED VARIABLE	REPORTED ACCURACY
SPACE TEMPERATURE	±0.5°C (±1°F)
DUCTED AIR	±0.5°C (±1°F)
OUTSIDE AIR	±1.0°C (±2°F)
DEW POINT	±1.5°C (±3°F)
WATER TEMPERATURE	±0.5°C (±1°F)
DELTA-T	±0.15° (±0.25°F)
RELATIVE HUMIDITY	±5% RH
WATER FLOW	±2% OF FULL SCALE
AIRFLOW (TERMINAL)	±10% OF FULL SCALE (<i>SEE NOTE 1</i>)
AIRFLOW (MEASURING STATIONS)	±5% OF FULL SCALE
AIRFLOW (PRESSURIZED SPACES)	±3% OF FULL SCALE
AIR PRESSURE (DUCTS)	±25 PA (±0.1 IN. W.G.)
AIR PRESSURE (SPACE)	±3 PA (±0.01 IN. W.G.)
WATER PRESSURE	±2% OF FULL SCALE (<i>SEE NOTE 2</i>)
ELECTRICAL (A, V, W, POWER FACTOR)	±1% OF READING (<i>SEE NOTE 3</i>)
CARBON MONOXIDE (CO)	±5% OF READING
CARBON DIOXIDE (CO ₂)	±50 PPM

10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

a. Table 2: Control Stability and Accuracy

CONTROLLED VARIABLE	CONTROL ACCURACY	RANGE OF MEDIUM
AIR PRESSURE	±50 PA (±0.2 IN. W.G.) ±3 PA (±0.01 IN. W.G.)	0–1.5 KPA (0–6 IN. W.G.) –25 TO 25 PA (–0.1 TO 0.1 IN. W.G.)
AIRFLOW	±10% OF FULL SCALE	
SPACE TEMPERATURE	±1.0°C (±2.0°F)	
DUCT TEMPERATURE	±1.5°C (±3°F)	
HUMIDITY	±5% RH	
FLUID PRESSURE	±10 KPA (±1.5 PSI) ±250 PA (±1.0 IN. W.G.)	MPA (1–150 PSI) 0–12.5 KPA (0–50 IN. W.G.) DIFFERENTIAL

1.9 SUBMITTALS

A. Product Data and Shop Drawings: Meet requirements of Section 01 30 00 on Shop Drawings, Product Data, and Samples. In addition, the contractor shall provide shop drawings or other submittals on hardware, software, and equipment to be installed or provided. No work may begin on any segment of this project until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD compatible files on suitable solid-state media (file format: .DWG, .DXF, .VSD, or comparable) and three 11” x 17” prints of each drawing. When manufacturer’s cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawing shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:

1. DDC System Hardware

- a. A complete bill of materials to be used indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
- b. Manufacturer’s description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
 - 1) Direct digital controllers (controller panels)
 - 2) Transducers and transmitters
 - 3) Sensors (including accuracy data)
 - 4) Actuators
 - 5) Valves
 - 6) Relays and switches
 - 7) Control panels
 - 8) Power supplies
 - 9) Batteries

- 10) Operator interface equipment
 - 11) Wiring
 - c. Wiring diagrams and layouts for each control panel. Show termination numbers.
 - d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware. Riser diagrams showing control network layout, communication protocol, and wire types.
2. Central System Hardware and Software
- a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and relevant technical.
 - b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:
 - 1) Central Processing Unit (CPU) or web server
 - 2) Monitors
 - 3) Keyboards
 - 4) Power supplies
 - 5) Battery backups
 - 6) Interface equipment between CPU or server and control panels
 - 7) Operating System software – web server
 - 8) Color graphic software
 - 9) Third-party software
 - c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show interface wiring to control system.
 - d. Network riser diagrams of wiring between central control unit and control panels.
3. Controlled Systems
- a. Riser diagrams showing control network layout, communication protocol, and wire types.
 - b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
 - c. A schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.

- d. An instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
 - e. A mounting, wiring, and routing plan-view drawing. The design shall take into account HVAC, electrical and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
 - f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
 - g. A point list for each control system. List I/O points and software points specified in Section 23 09 93. Indicate alarmed and trended points.
4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor
 5. Description of process, report formats, and checklists to be used in Section 23 09 23 Article 3.17 (Control System Demonstration and Acceptance).
 6. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.
- B. Schedules
1. Within one month of contract award, provide a schedule of the work indicating the following:
 - a. Intended sequence of work items
 - b. Start date of each work item
 - c. Duration of each work item
 - d. Planned delivery dates for ordered material and equipment and expected lead times
 - e. Milestones indicating possible restraints on work by other trades or situations
 2. Provide monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.
- C. Project Record Documents. Upon completion of installation, submit three copies of record (as-built) documents of the documents shall be submitted for approval prior to final completion and shall include:
1. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD compatible files on suitable solid-state media (file format: .DWG, .DXF, .VSD, or comparable) and as 11" x 17" prints.
 2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 23 09 23 Article 3.17 (Control System Demonstration and Acceptance).
 3. Operation and Maintenance (O&M) Manual.
 4. As-built versions of submittal product data.

5. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
 6. Operator’s manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
 7. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
 8. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
 9. Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
 10. Graphic files, programs, and database on suitable solid-state media.
 11. List of recommended spare parts with part numbers and suppliers.
 12. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
 13. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
 14. Licenses, guarantees, and warranty documents for equipment and systems.
 15. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
- D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner’s needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

1.10 WARRANTY

- A. Warrant work as follows:
1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner’s warranty service request.
 2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
 3. If the engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, the engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

4. Provide updates to web server software, project-specific software, graphic software, database software, and firmware that resolve the contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired and factory recertified. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.11 OWNERSHIP OF PROPRIETARY MATERIAL

- A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
 1. Graphics
 2. Record drawings
 3. Database
 4. Application programming code
 5. Documentation

1.12 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 23 09 13.23 - Sensors and Transmitters:
 1. Airflow stations
 2. Flow Meters
 3. Flow switches
 4. Hydronic Temp sensor wells and sockets

1.13 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 23 09 13.23 - Sensors and Transmitters:
 1. Duct static pressure sensors
 2. H2O Pressure Differential/Flow Switches

1.14 PRODUCTS NOT FURNISHED OR INSTALLED UNDER BUT INTEGRATED WITH THE WORK OF THIS SECTION

- A. General: The Installer furnishing the DDC network shall meet with the Installer(s) furnishing each of the following products to coordinate details of the interface between these products and the DDC network. The Owner or his designated representative shall be present at this meeting. Each Installer shall provide the Owner and all other Installers with details of the proposed interface including PICS for BACnet equipment, hardware and software identifiers for the interface points, network identifiers, wiring requirements, communication speeds, and required network accessories. The purpose of this meeting shall be to insure there are no unresolved issues regarding the integration of these products into the DDC network. Submittals for these products shall not be approved prior to the completion of this meeting.
- B. Section 23 60 00 Central Cooling Equipment:

1. The chiller vendor shall furnish chillers with an interface to the control and monitoring points specified in Section 23 09 93. These specified points shall be the minimum acceptable interface to the chiller. The connection to these points shall be by one of the following methods:
 - a. Hardwired connection such as relay, 0-10VDC, or 4-20mA.
 - b. BACnet/IP network connection.
 - c. BACnet over ARCNET network connection.
 - d. BACnet MS/TP network connection.
 - e. Modbus MS/TP or IP is an acceptable alternative.
- C. Central Modular Air Handling Units
 1. Unit shall be furnished configured to accept control inputs from an external building automation system controller. Factory mounted safeties and other controls shall not interfere with this controller.
- D. Air terminal unit:
 1. VAV boxes: VAV Terminal Units shall be furnished configured to accept control inputs from an external building automation system controller. Factory mounted safeties and other controls shall not interfere with this controller.
- E. Low-Voltage Controllers:
 1. The variable frequency drive (VFD) vendor shall furnish VFDs with an interface to the control and monitoring points specified in Section 23 91 00. These specified points shall be the minimum acceptable interface to the VFD. The connection to these points shall be by one of the following methods:
 2. Hardwired connection such as relay, 0-10VDC, or 4-20mA.
 3. BACnet/IP network connection.
 4. BACnet over ARCNET network connection.
 5. BACnet MS/TP network connection.
 6. Modbus MS/TP or IP is an acceptable alternative.
 7. Communications with Third Party Equipment:
- F. Any additional integral control systems included with the products integrated with the work of this section shall be furnished with a BACnet interface for integration into the Direct Digital Control System described in this specification.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use new 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.

2.2 COMMUNICATION

- 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, BACnet.
- B. Install new wiring and network devices as required to provide a complete and workable control network.
- C. Use existing Ethernet backbone for network segments marked “existing” on project drawings.
- D. 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.
- E. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 - 1. 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.
 - 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 23 09 93. 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.
- F. 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.
- G. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.
- H. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.
 - 1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.
 - 2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.
 - 3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.
 - 4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third-party Web services device to read data from or write data to any object in the system which supports this service.
 - 5. Direct access to trend data shall be provided in order to facilitate historical information stored by the system.

2.3 OPERATOR INTERFACE

- A. Operator Interface. The web server shall reside on a high-speed network with the building controllers. Web pages generated by this server shall be compatible with the latest versions of Microsoft Internet Explorer or Edge, Google Chrome, Mozilla Firefox, and Apple Safari browsers. Any of these supported browsers connected to the server shall be able to access all system information. Mobile devices shall be recognized by the web server and shall supply the appropriate system content as needed. The Operator Interface (web server with client devices) shall conform to the BACnet Operator Workstation (B-OWS) or BACnet Advanced Workstation (B-AWS) device profile as specified in ASHRAE/ANSI 135 BACnet Annex L. This includes the ability to configure and/or reconfigure the system from the client device (change programs, graphics, labels, etc.).
- B. Communication. Web server and controllers shall communicate using BACnet protocol. Web server and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J. Communication between the web server and client (workstation) shall be HTTP or HTTPS protocol utilizing HTML5 language. Use of Adobe Flash in any part of the communication infrastructure is not acceptable.
- C. Hardware.
1. Web server and/or workstation. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times specified elsewhere in this document. The web server may also be configured in client/server fashion to accommodate a "workstation" definition. In "workstation" configuration, the workstation will also perform as a server supplying additional clients as needed. The following hardware requirements apply:
 - a. System storage shall have sufficient memory to accommodate:
 - 1) All required system software.
 - 2) A DDC database to accommodate, as a minimum, twice the size of the delivered system database.
 - 3) One year of archival trend data based on the points specified to be trended at their specified trend intervals.
 - b. Provide additional hardware (communication ports, video drivers, network interface cards, cabling, etc.) to facilitate all control functions and software requirements specified for the DDC system.
 - c. Minimum hardware configuration shall include the following:
 - 1) Dual or Quad Core Processor
 - 2) 2- 6 GB RAM
 - 3) 500 GB hard disk providing data at 3.0 Gb/sec (size dependent on historical data storage requirements)
 - 4) 16x DVD+/-RW drive
 - 5) [Operator Workstation Only – Not for Browser Option] Keyboard
 - 6) [Workstation Only] Mouse
 - 7) [Workstation Only] 22-inch 24-bit color monitor with at least 1024 x 768 resolution

- 8) Serial (USB) and network communication ports, with cables as required for proper DDC system operation
2. [Sustainability Kiosk Option] Sustainability Kiosks. Contractor shall furnish two (2) computers with touchscreen monitors that meet or exceed the following requirements:
 - a. 2.33 GHz or faster x86 compatible processor
 - b. 2 GB RAM
 - c. 500 GB Hard Drive
 - d. Windows 7 or 8 operating system
 - e. 27 inches or larger LED touchscreen monitor with 1920 x 1080 (minimum) full HD resolution and 16:9 aspect ratio.
- D. System Software.
1. Operating System. Web server shall have an industry-standard professional-grade operating system. Operating system shall meet or exceed the DDC System manufacturer's minimum requirements for their software. Acceptable systems include Microsoft Windows 7, 8 or 10, Microsoft Vista, Windows Server 2008 or 2012, Red Hat Enterprise Linux, or Ubuntu Desktop 12.04.
 2. Security. The web server application shall support Transport Layer Security (TLS) with a capability of 256-bit encryption for transmitting private information over the Internet using HTTPS. Additionally, the web server shall have SHA-2 certificate support.
 3. Database. System shall support any JDBC (Java DataBase Connectivity) compliant engine. This includes: MS SQL, My SQL, PostgreSQL and Oracle.
 4. System Graphics. The operator interface software shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
 - a. Minimum graphics resolution shall be 1920 x1080 for display of detailed system graphics.
 - b. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
 - c. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
 - d. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
 - e. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in) or shall only require widely available no-cost plug-ins (such as Active-X or Adobe Flash).

5. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system to create and modify graphics that are saved in the same formats as are used for system graphics.
 6. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.
- E. System Applications. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.
1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
 2. Manual Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
 3. System Configuration. The workstation software shall provide a method of configuring the system. This shall allow for future system changes or additions by users under proper password.
 4. On-Line Help. Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
 5. Video Training. Provide on-line video support to supplement on-line help assistance. Video content shall be relevant and support existing system documentation.
 6. Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data.
 - a. Operator Access. The user name and password combination shall define accessible viewing, editing, adding, and deleting privileges for that operator. Users with system administrator rights shall be able to create new users and edit the privileges of all existing users. System Administrators shall also be able to vary and deny each operator's privileges based on the geographic location, such as the ability to edit operating parameters in Building A, to view but not edit parameters in Building B, and to not even see equipment in Building C.
 - b. Password Policy Rules. System administrator shall invoke policies for minimum password strength, including number of characters, special characters and numbers, upper and lower case, etc.
 - c. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. This auto logoff time shall be user adjustable.
 - d. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

7. System Diagnostics. The system shall automatically monitor the operation of all building management panels and controllers. The failure of any device shall be annunciated to the operator
8. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Section 23 09 93 (Sequences of Operation). Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
9. Alarm Messages. Alarm messages shall use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying on acronyms or mnemonics.
10. Alarm Reactions. Operator shall be able to configure (by object) what, if any actions are to be taken during an alarm. As a minimum, the workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send SMS text, and audibly annunciate.
11. Alarm and Event log. Operators shall be able to view all system alarms and changes of state from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and delete alarms, and archive closed alarms to the workstation or web server hard.
12. Trend Logs. The operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Section 23 09 93 (Sequences of Operation). Trends shall be BACnet trend objects. As a minimum, all physical points in the system shall be trended within the local controller (AAC, ASC, BC) for at least 277 samples per point. Selected points, as desired, shall be available for historical archiving within the server. The historical archiving capability cannot be less than 2 years.
13. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object or property in the system. The status shall be available by menu, on graphics, or through custom programs.
14. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
15. Audit and Security Detail. All users accessing the system shall have their actions recorded. Information recorded shall include: login/logout time and date; system modifications – with before and after values; ability to report user activity based on individual and/or date and time.
16. Standard Reports. Furnish the following standard system reports:
 - a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
 - b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
 - c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:
 - 1) Alarm History.
 - 2) Trend Data. Operator shall be able to select trends to be logged.

17. Energy Reports. System shall include an easily configured energy reporting tool that provides the capabilities described in this section.
 - a. The energy reporting tool shall be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BAS.
 - b. The energy reporting tool shall be preconfigured by the Contractor to gather and store energy demand and consumption data from each energy source that provides metered data to the BAS. Meter data shall be stored at 5-minute intervals unless otherwise specified in the Sequence of Operation provided in section 23 09 93. This data shall be maintained in an industry standard SQL database for a period of not less than five years.
 - c. The energy reporting tool shall allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and shall provide options to view the data in a table, line graph, bar graph, or pie chart. The tool shall also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.
 - d. The energy reporting tool shall allow the operator to select an energy source and two time periods of interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool shall also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.
 - e. The energy reporting tool shall allow the operator to easily generate the previously described graphs “on the fly,” and shall provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool shall also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports shall be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.
 - f. The energy reporting tool shall be capable of collecting and displaying data from the following types of meters:
 - 1) Electricity
 - 2) Chilled Water
 - 3) Heating and cooling degree days. (May be calculated from sensor data rather than metered.)
 - g. The user shall have the option of using Kw (Kwh) or Btu/hr (Btu) as the units for demand and consumption reports. Multiples of these units (MWH, kBtu, etc.) shall be used as appropriate. All selected sources shall be automatically converted to the selected units. The user shall similarly have the option of entering facility area and occupancy hours and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.
 - h. The user shall have the option of entering benchmark data for an individual facility or a group of facilities.

- i. The user shall have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:
 - 1) Low/High/Average value of the metered value being displayed.
 - 2) Heating and/or Cooling Degree Days for the time period(s) being displayed.
 - 3) The Environmental Index for the facilities and time periods being displayed.
18. Environmental Index. System shall monitor all occupied zones and compile an index that provides a numerical indication of the environmental comfort within the zone. As a minimum, this indication shall be based upon the deviation of the zone temperature from the heating or cooling setpoint. If humidity is being measured within the zone, then the environmental index shall be adjusted to reflect a lower comfort level for high or low humidity levels. Similarly, if carbon dioxide levels are being measured as an indication of ventilation effectiveness then the environmental index shall be adjusted to indicate degraded comfort at high carbon dioxide levels. Other adjustments may be made to the environmental index based upon additional measurements. The system shall maintain a trend of the environmental index for each zone in the trend log. The system shall also compute an average comfort index for every building included in this contract and maintain trend logs of these building environmental indices. Similarly, the system shall compute the percentage of occupied time that comfortable conditions were maintained within the zones. Through the UI the user shall be able to add a weighting factor to adjust the contribution of each zone to the average index based upon the floor area of the zone, importance of the zone, or other static criteria.
19. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
20. Time Lapse Graphic Replay. Operator shall be able to “replay” any graphic in the system to see how key values changed over an operator-selected period of time. Operator shall be able to select the starting date/time for this display and the end date/time or the display period. System shall then display the graphic as it would have looked at the beginning of that period, displaying key data, dynamic colors, etc. based upon values recorded at the start time. When the operator starts the replay the graphics and key values shall dynamically change to produce the effect of “fast forwarding” through the designated period of time. Once the system has been operational for at least 30 days, the contractor shall demonstrate that up to 24 hours of data from within the last 30 days can be replayed on any graphic page. Owner’s representative shall choose the graphic pages for this demonstration at the time of the demonstration.
21. Sustainability Kiosk. Contractor shall provide all software, programming, content, computer or web server hardware, touchscreen panels, and configuration to display building sustainability features on touchscreen panels as specified in 2.3. C.2. The purpose of this display is to inform and educate visitors and building occupants on the various systems and sustainability features of the building or buildings included in this project. The display shall allow a user to navigate through the screens by touching icons or other controls. Screens shall also be viewable through a standard web browser with a network connection to the contractor supplied hardware. Display shall highlight the sustainability features of the project by displaying automatically updated graphs that show energy use, water consumption, natural gas consumption, and sustainable features incorporated into the building such as solar panels, solar water heating, rainwater collection, geothermal heating and cooling, and similar features as applicable to the project. Display shall provide educational material about the resource being trended as well as tips on how building occupants can help reduce the use of these resources. Display shall also provide animated graphics and simple explanations about how basic building systems included in this project operate and how they affect energy consumption. Systems covered shall as a minimum include air

handling units, boilers, chilled beam systems, energy recovery wheels, geothermal heat pump systems, rainwater recovery systems, solar water heating systems, solar photovoltaic panels, and wind turbine generators if such equipment is included in the project.

22. The system shall support additional functionality which may not be part of the base system. These additional features shall include Open ADR 2.0a &b and NOAA weather interface as a minimum.
- F. Workstation Application Editors. Each PC or browser workstation shall support editing of all system applications. The applications shall be downloaded and executed at one or more of the controller panels
1. Controller. Provide a full-screen editor for each type of application that shall allow the operator to view and change the configuration, name, control parameters, and set points for all controllers.
 2. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a method of selecting the desired schedule and schedule type. Exception schedules and holidays shall be shown clearly on the calendar. The start and stop times for each object shall be adjustable from this interface.
 3. Custom Application Programming. Provide the tools to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:
 - a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.
 - b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
 - c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
 - d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
 - e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
 - g. Variables. Operator shall be able to use variable values in program conditional statements and mathematical functions.
 - 1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

- G. System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

2.4 CONTROLLER SOFTWARE

- A. Furnish the following applications for building and energy management. All software applications shall reside and operate in the system controllers. Applications shall be editable through operator workstation, web browser interface, or workstation.
- B. System Security. See Paragraph 2.3.E.5 (Security) and Paragraph 2.3.E.14.c (Operator Activity).
- C. 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:
 - 1. 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).
 - 2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule 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. 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.
- E. 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.
- F. Analog Alarms. Each analog object shall have both high and low alarm limits. The operator shall be able to enable or disable these alarms.
- G. 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.
- H. Fault Detection Diagnostics (FDD). The system shall provide the ability to follow NIST and ASHRAE standards for enhanced monitoring and alarming. The capability of FDD shall reside in the controller and integral to the programming. Overlay software for primary FDD reporting is not acceptable. FDD capabilities shall include diagnostics for: Simultaneous Heating and Cooling; Continuous Operation; Fraction of Outdoor Air; Analog Output Cycling; Discrete Output Cycling; Sensor Failures; and Run Requests Analytics. Equipment using these FDD capabilities, as a minimum, shall include: Single Zone Units (SZU), VAV Air Handlers, VAV Terminal Units, Fan Coils, Unit Ventilators, Air Source & Water Source Heat Pumps.
- I. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.
- J. Demand Limiting.
 - 1. The demand-limiting program shall monitor building power consumption from a building power meter (provided by others) which generates pulse signals or a BACnet communications interface. An acceptable alternative is for the system to monitor a watt transducer or current transformer attached to the building feeder lines.

2. When power consumption exceeds adjustable levels, system shall automatically adjust setpoints, de-energize low-priority equipment, and take other programmatic actions to reduce demand as specified in Section 23 09 93 (Sequences of Operation). When demand drops below adjustable levels, system shall restore loads as specified.
- K. Maintenance Management. The system shall be capable of generating maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as specified in 23 09 93 (Sequences of Operation).
- L. Sequencing. Application software shall sequence chillers, boilers, and pumps as specified in Section 23 09 93 (Sequences of Operation).
- M. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, 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.
- N. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
- O. Energy Calculations.
 1. The system shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.
 2. The system shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.
- P. Anti-Short Cycling. All binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.
- Q. On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm shall be direct-acting or reverse-acting..
- R. 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. Configure and enable runtime totalization and alarms as specified in Section 23 09 93 (Sequence of Operations).

2.5 CONTROLLERS

- A. General. Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 23 09 23 Article 1.9 (System Performance). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors
- B. BACnet.
 1. Building Controllers (BCs): Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
 2. Advanced Application Controllers (AACs): Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet

Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

3. Application Specific Controllers (ASCs): Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
4. Smart Actuators (SAs): An actuator which is controlled by a network connection rather than a binary or analog signal (0-10v, 4-20mA, relay, etc.). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
5. Smart Sensors (SSs): A sensor which provides information to the BAS via network connection rather than a binary or analog signal (0-10000 ohm, 4-20mA, dry contact, etc.). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
6. BACnet Communication.
 - a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 - c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Security.

1. Provide BACnet firewall capability, as defined in the BACnet standard, for controllers that are IP capable.

D. Communication.

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.

4. Stand-Alone Operation. Each piece of equipment specified in Section 23 09 93 shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.
- E. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
 1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at $\square 29^{\circ}\text{C}$ to 60°C ($\square 20^{\circ}\text{F}$ to 140°F).
 2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- F. Local graphical keypad and display (where applicable). Provide a local graphical keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. The local interface shall be customizable with graphics particular the equipment and function. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.
- G. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to a field-removable modular terminal strip or to a termination card connected by a ribbon cable. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
- H. Memory.
 1. Controller memory shall support operating system, database, and programming requirements.
 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
 3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.
- I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.6 INPUT AND OUTPUT INTERFACE

- A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
- B. Protection. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.
- C. Binary Inputs. Binary inputs shall allow the monitoring of ON/OFF signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

- D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall also accumulate up to 10 pulses per second.
- E. Analog Inputs. Analog inputs shall monitor low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- F. Binary Outputs. Binary outputs shall provide for ON/OFF operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on Building Controllers have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
- G. Analog Outputs. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
- H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.
- I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.
- J. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system

2.7 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
 - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
 - a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
 - b. Line voltage units shall be UL recognized and CSA listed.
- B. Power Line Filtering.
 - 1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:
 - a. Dielectric strength of 1000 V minimum
 - b. Response time of 10 nanoseconds or less

- c. Transverse mode noise attenuation of 65 dB or greater
- d. Common mode noise attenuation of 150 dB or greater at 40–100 Hz

2.8 AUXILIARY CONTROL DEVICES

A. Motorized Control Dampers, unless otherwise specified elsewhere, shall be as follow.

1. Type. Control dampers shall be the parallel or opposed-blade type as specified below or as scheduled on drawings.
 - a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.
 - b. Other modulating dampers shall be opposed-blade.
 - c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.
2. Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (1/8 in.) extruded aluminum with reinforced corner bracing.
3. Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).
4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.
5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s·m² (10 cfm per ft²) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).
6. Sections. Individual damper sections shall not exceed 125 cm × 150 cm (48 in. × 60 in.). Each section shall have at least one damper actuator.
7. Modulating dampers shall provide a linear flow characteristic where possible.
8. Linkages. Dampers shall have exposed linkages.

B. Electric Damper and Valve Actuators.

1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.
2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).
3. Signal and Range. Proportional actuators shall accept a 0–10 Vdc or a 0–20 mA control signal and shall have a 2–10 Vdc or 4–20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

C. Control Valves.

1. Control valves shall be two-way or three-way type for two-position or modulating service as
2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - a. Water Valves:
 - 1) Two-way: 150% of total system (pump) head.
 - 2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - b. Steam Valves: 150% of operating (inlet) pressure.
3. Water Valves.
 - a. Body and trim style and materials shall be in accordance with manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
 - b. Sizing Criteria:
 - 1) Two-position service: Line size.
 - 2) Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater.
 - 3) Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 35 kPa (5 psi) maximum.
 - c. Valves ½ in. through 2 in. shall be bronze body or cast brass ANSI Class 250, spring-loaded, PTFE packing, quick opening for two-position service. Two-way valves to have replaceable composition disc or stainless-steel ball.
 - d. Valves 2½ in. and larger shall be cast iron ANSI Class 125 with guided plug and PTFE packing.
 - e. Water valves shall fail normally open or closed, as scheduled on plans, or as follows:
 - 1) Water zone valves—normally open preferred.
 - 2) Heating coils in air handlers—normally open.
 - 3) Chilled water control valves—normally closed.
 - 4) Other applications—as scheduled or as required by sequences of operation.

D. Temperature Sensors.

1. Type. Temperature sensors shall be thermistor (10k Type2).
2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m² (10 ft²) of duct cross-section.

3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
 4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.
 5. Differential Sensors. Provide matched sensors for differential temperature measurement.
- E. Humidity Sensors.
1. Duct and room sensors shall have a sensing range of 20%–80%.
 2. Duct sensors shall have a sampling chamber.
 3. Outdoor air humidity sensors shall have a sensing range of 20%–95% RH and shall be suitable for ambient conditions of $\square 40^{\circ}\text{C}–75^{\circ}\text{C}$ ($\square 40^{\circ}\text{F}–170^{\circ}\text{F}$).
 4. Humidity sensors shall not drift more than 1% of full scale annually.
- F. Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).
1. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.
 2. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.
- G. Relays.
1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
 2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable $\pm 100\%$ from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.
- H. Override Timers.
1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0–6-hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.
- I. Current Transmitters.
1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be $\pm 1\%$ full-scale at 500-ohm maximum burden.
 2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
 3. Unit shall be split-core type for clamp-on installation on existing wiring.

J. Current Transformers.

1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.
3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

K. Voltage Transmitters.

1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4–20 mA output with zero and span adjustment.
2. Adjustable full-scale unit ranges shall be 100–130 Vac, 200–250 Vac, 250–330 Vac, and 400–600 Vac. Unit accuracy shall be $\pm 1\%$ full-scale at 500-ohm maximum burden.
3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

L. Voltage Transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C–55°C (40°F–130°F) and shall provide $\pm 0.5\%$ accuracy at 24 Vac and 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

M. Power Monitors.

1. Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0-amp current inputs or 0–0.33-volt inputs.
2. 1.0% full-scale true RMS power accuracy, +0.5 Hz, voltage input range 120–600 V, and auto range select.
3. Under voltage/phase monitor circuitry.
4. NEMA 1 enclosure.
5. Current transformers having a 0.5% FS accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

N. Hydronic Flowmeters

1. Insertion-Type Turbine Meter
 - a. Dual counter-rotating axial turbine elements, each with its own rotational sensing system, and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Single turbine for piping 2 inches and smaller. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag.

- b. Insertion type complete with ‘hot-tap’ isolation valves to enable sensor removal without water supply system shutdown.
 - c. Sensing method shall be impedance sensing (nonmagnetic and nonphotoelectric)
 - d. Volumetric accuracy
 - 1) $\pm 0.5\%$ of reading at calibrated velocity
 - 2) $\pm 1\%$ of reading from 3 to 30 ft/s (10:1 range)
 - 3) $\pm 2\%$ of reading from 0.4 to 20 ft/s (50:1 range)
 - e. Each sensor shall be individually calibrated and tagged accordingly against the manufacturer’s primary standards which must be accurate to within 0.1% of flow rate and traceable to the National Institute of Standards and Technology (NIST).
 - f. Maximum operating pressure of 400 psi and maximum operating temperature of 95°C (200°F) continuous or 105°C (220°F) peak.
 - g. All wetted metal parts shall be constructed of 316 stainless steel.
 - h. Analog outputs shall consist of noninteractive zero and span adjustments, a DC linearly of 0.1% of span, voltage output of 0-10 Vdc, and current output of 4-20 mA.
2. Magnetic Flow-Tube Type Flowmeter
- a. Sensor shall be a magnetic flowmeter, which utilizes Faraday’s Law to measure volumetric fluid flow through a pipe. The flowmeter shall consist of two elements, the sensor and the electronics. The sensor shall generate a measuring signal proportional to the flow velocity in the pipe. The electronics shall convert this EMF into a standard current output.
 - b. Electronic replacement shall not affect meter accuracy (electronic units are not matched with specific sensors).
 - c. Four-wire, externally powered, magnetic type flow transmitter with adjustable span and zero, integrally mounted to flow tube. Output signal shall be a digital pulse proportional to the flow rate (to provide maximum accuracy and to handle abrupt changes in flow). Standard 4-20 mA or 0-10 Vdc outputs may be used provided accuracy is as specified.
 - d. Flow Tube:
 - 1) ANSI class 150 psig steel
 - 2) ANSI flanges
 - 3) Protected with PTFE, PFA, or ETFE liner rated for 120°C (245°F) minimum fluid temperature
 - e. Electrode and grounding material
 - 1) 316L Stainless steel or Hastelloy C
 - 2) Electrodes shall be fused to ceramic liner and not require o-rings.
 - f. Electrical Enclosure: NEMA 4, 7
 - g. Approvals:

- 1) UL or CSA.
- 2) NSF Drinking Water approval for domestic water applications
- h. Performance
 - 1) Accuracy shall be $\pm 0.5\%$ of actual reading from 3 to 30 ft/s flow velocities, and 0.015 ft/s from 0.04 to 3 ft/s.
 - 2) Stability: 0.1% of rate over six months.
 - 3) Meter repeatability shall be $\pm 0.1\%$ of rate at velocities > 3 ft/s.
3. Magnetic Insertion-Type Flowmeter
 - a. Magnetic Faraday point velocity measuring device.
 - b. Insertion type complete with hot-tap isolation valves to enable sensor removal without water supply system shutdown.
 - c. 4-20 mA transmitter proportional to flow or velocity.
 - d. Accuracy: larger of 1% of reading and 0.2 ft/s.
 - e. Flow range: 0.2 to 20 ft/s, bidirectional.
 - f. Each sensor shall be individually calibrated and tagged accordingly against the manufacturer's primary standards which must be accurate to within 0.1% of flow rate and traceable to the National Institute of Standards and Technology (NIST).
4. Vortex Shedding Flowmeter
 - a. Output: 4-20 mA, 0-10 Vdc, 0-5 Vdc.
 - b. Maximum Fluid Temperature: 427 °C (800 °F).
 - c. Wetted Parts: Stainless Steel.
 - d. Housing: NEMA 4X.
 - e. Turndown: 25:1 minimum.
 - f. Accuracy: 0.5% of calibrated span for liquids, 1% of calibrated span for steam and gases.
 - g. Body: Wafer style or ANSI flanged to match piping specification.
5. Transit-Time Ultrasonic Flowmeter
 - a. Clamp-On transit-time ultrasonic flowmeter
 - b. Wide-Beam transducer technology
 - c. 4-20 mA transmitter proportional to flow or velocity.
 - d. Accuracy: 0.5% of reading in range 1 to 30 ft/s, 0.001 ft/s sensitivity.
- O. Thermal Energy Meters

1. Matched RTD, solid state, or thermistor temperature sensors with a differential temperature accuracy of $\pm 0.08^{\circ}\text{C}$ ($\pm 0.15^{\circ}\text{F}$).
 2. Flow meter: See “Hydronic Flowmeters” section.
 3. Unit accuracy of $\pm 1\%$ factory calibrated, traceable to NIST with certification.
 4. NEMA 1 enclosure.
 5. Panel mounted display.
 6. UL listed.
 7. Isolated 4–20 ma signals for energy rate and supply and return temperatures and flow.
- P. Current Switches.
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.
- Q. Pressure Transducers.
1. Transducers shall have linear output signal and field-adjustable zero and span.
 2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
 3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4–20 mA output, suitable mounting provisions, and block and bleed valves.
 4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer shall have 4–20 mA output, suitable mounting provisions, and 5-valve manifold.
- R. Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.
- S. Pressure-Electric (PE) Switches.
1. Shall be metal or neoprene diaphragm actuated, operating pressure rated for 0–175 kPa (0–25 psig), with calibrated scale minimum setpoint range of 14–125 kPa (2–18 psig) minimum, UL listed.
 2. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required by application Electrically rated for pilot duty service (125 VA minimum) and /or for motor control.
 3. Switches shall be open type (panel-mounted) or enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.
 4. Each pneumatic signal line to PE switches shall have permanent indicating gauge.
- T. Occupancy Sensors. Occupancy sensors shall utilize Passive Infrared (PIR) and/or Microphonic Passive technology to detect the presence of people within a room. Sensors shall be mounted as indicated on the approved drawings. The sensor output shall be accessible by any lighting and/or HVAC controller in the

system. Occupancy sensors shall be capable of being powered from the lighting or HVAC control panel, as shown on the drawings. Occupancy sensor delay shall be software adjustable through the user interface and shall not require manual adjustment at the sensor.

2.9 LOCAL CONTROL PANELS.

- A. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
- B. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
- C. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

2.10 WIRING AND RACEWAYS

- A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.
- B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

2.11 FIBER OPTIC CABLE SYSTEM

- A. Optical Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. Sheath shall be UL listed OFNP in accordance with NEC Article 770. Optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm.
- B. Connectors. Field terminate optical fibers with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.
- B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor

3.2 PROTECTION

- A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.

- B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects

3.3 COORDINATION

A. Site.

1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Submittals.

C. Test and Balance.

1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
4. The tools used during the test and balance process will be returned at the completion of the testing and balancing

D. Life Safety.

1. Duct smoke detectors required for air handler shutdown are provided under Division 28. Interlock smoke detectors to air handlers for shutdown.
2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 15. Interlock smoke dampers to air handlers.
3. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 23. Fire and smoke damper control is provided under Division 28.

E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

1. All communication media and equipment shall be provided.
2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the sequences of operation described.

3. The contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described
5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.4 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install equipment in readily accessible locations as defined by Chapter 1 Article 100 Part A of the National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.
- C. Contractor shall have work inspection by local and/or state authorities having jurisdiction over the work.

3.6 EXISTING EQUIPMENT

- A. Wiring. The contractor may reuse any abandoned wires. The integrity of the wire and its proper application to the installation are the responsibility of the contractor. The wire shall be properly identified and tested in accordance with this specification. Unused or redundant wiring must be properly identified as such. Interconnecting control wiring shall be removed and shall become the property of the contractor unless specifically noted or shown to be reused.
- B. Local Control Panels. The contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment or replaced with new. Remove and deliver existing control panels to Owner.
- C. Repair. Unless otherwise directed, the contractor is not responsible for repair or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the contractor find existing equipment that requires maintenance, the engineer is to be notified immediately.
- D. Temperature Sensor Wells. The contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors.

- E. Indicator Gauges. Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Maintain the operation of existing pneumatic transmitters and gauges.
- F. Room Thermostats. Room thermostats may be reused. Remove and deliver unnecessary thermostats to Owner unless otherwise noted. Patch and finish holes and marks left by removal to match existing walls. Remove and deliver existing room thermostats to Owner unless otherwise noted. Patch and finish holes and marks left by removal to match existing walls.
- G. Electronic Sensors and Transmitters. Unless specifically noted otherwise, existing sensors and transmitters may be reused. Remove and deliver unnecessary sensors and transmitters to Owner. Remove and deliver existing sensors and transmitters to Owner.
- H. Controllers and Auxiliary Electronic Devices. Existing controllers and auxiliary electronic devices may be reused unless specifically noted otherwise. Recondition as necessary. Remove unnecessary sensors and transmitters. Remove and deliver existing controllers and auxiliary electronic devices to Owner.
- I. Damper Actuators, Linkages, and Appurtenances. Existing damper actuators, linkages, and appurtenances may be reused unless specifically noted otherwise. Recondition as necessary. Remove and deliver unnecessary equipment to Owner. Remove and deliver existing damper actuators, linkages and appurtenances to Owner.
- J. Control Valves. Existing control valves may be reused unless specifically noted otherwise. Recondition as necessary. Replace existing control valves with new. Deliver removed control valves to Owner.
- K. Existing System Operating Schedule. Existing mechanical system may be disabled during this work. The mechanical system must remain in operation and shall maintain space comfort at all times between the hours of 6 a.m. and 6 p.m., Monday through Friday. No modifications to the system shall cause mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort conditions during any such period. Perform cut-over of controls that cannot meet these conditions outside of operational hours.
- L. The scheduling of fans through existing or temporary time clocks or control system shall be maintained throughout the DDC system installation
- M. Install control panels where shown.
- N. Modify existing starter control circuits, if necessary, to provide hand-off-auto control of each controlled starter. If new starters or starter control packages are required, these shall be included as part of this contract.
- O. Patch holes and finish to match existing walls.

3.7 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes, and Division 26 of this specification. Where the requirements of this section differ from Division 26, the requirements of this section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway according to NEC and Division 26 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.

- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for the intended application.
- E. All wiring in mechanical, electrical, or service rooms – or where subject to mechanical damage – shall be installed in raceway at levels below 3 m (10ft).
- F. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- G. Do not install wiring in raceway containing tubing.
- H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.
- I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.
- M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
- O. Size of raceway and size and type of wire shall be the responsibility of the contractor in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
- P. Include one pull string in each raceway 2.5 cm (1 in.) or larger.
- Q. Use color-coded conductors throughout with conductors of different colors.
- R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- S. Conceal all raceways except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g. steam pipes or flues).
- T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
- U. Adhere to this specification's Division 26 requirements where raceway crosses building expansion joints.
- V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of vertical raceways.

- W. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- X. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.
- Y. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.8 COMMUNICATION WIRING

- A. The contractor shall adhere to the items listed in the Wiring” article in Part 3 of the specification.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer’s installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lightning arrestor shall be installed according to manufacturer’s instructions.
- G. All runs of communication wiring shall be unspliced length when that length is commercially available.
- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations article on “Communications Circuits, Cable, and Protector Grounding.”
- J. BACnet Arcnet or MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:
 - 1. Arcnet
 - a. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 nominal. Distributed capacitance between conductors shall be less than 12.5 pF per foot (41 pF per meter.)
 - b. The maximum length of an Arcnet segment is 610 meters (2000 ft) with AWG 22 cable.
 - c. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
 - d. An Arcnet network shall have no T connections.
 - 2. MS/TP

- a. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
- b. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485
- c. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
- d. An MS/TP EIA-485 network shall have no T connections.

3.9 FIBER OPTIC CABLE

- A. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post-installation residual cable tension shall be within cable manufacturer's specifications.
- B. All cabling and associated components shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii, as specified by cable manufacturer, shall be maintained.

3.10 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequately for environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.
- D. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.
- E. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
- F. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m² (1 ft²) of coil area.
- G. Do not install temperature sensors within the vapor plume of a humidifier. If installing a sensor downstream of a humidifier, install it at least 3 m (10 ft) downstream.
- H. All pipe-mounted temperature sensors shall be installed in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.
- I. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
- J. Differential Air Static Pressure.
 1. Supply Duct Static Pressure. Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.

2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
 3. Building Static Pressure. Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
 4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
 5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
 6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.
- K. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.
- L. Install humidity sensors for duct mounted humidifiers at least 3 m (10 ft.) downstream of the humidifier. Do not install filters between the humidifier and the sensor.
- 3.11 FLOW SWITCH INSTALLATION
- A. Use correct paddle for pipe diameter.
 - B. Adjust flow switch according to manufacturer's instructions.
- 3.12 ACTUATORS
- A. General. Mount and link control damper actuators according to manufacturer's instructions.
 1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
 3. Provide all mounting hardware and linkages for actuator installation.
 - B. Electric/ Electronic
 1. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following manufacturer's recommendations.
 2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.13 WARNING LABELS

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the control system.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows.
 - a. **C A U T I O N:** This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to “Off” position before servicing.
- B. Permanent warning labels shall be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows.
 - a. **C A U T I O N:** This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.14 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.
- B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.
- C. Permanently label or code each point of field terminal strips to show the instrument or item served.
- D. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.
- E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- F. Identify room sensors related to terminal boxes or valves with nameplates.
- G. Manufacturers’ nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
- H. Identifiers shall match record documents.

3.15 CONTROLLERS

- A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points listed.

3.16 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging

- B. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given may be used. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, “Zone Temp 1” for Zone 1, “Zone Temp 2” for Zone 2.
- C. Software Programming.
 - 1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:
 - a. Text-based:
 - 1) Must provide actions for all possible situations
 - 2) Must be modular and structured
 - 3) Must be commented
 - b. Graphic-based:
 - 1) Must provide actions for all possible situations
 - 2) Must be documented
 - c. Parameter-based:
 - 1) Must provide actions for all possible situations
 - 2) Must be documented.
- D. Operator Interface.
 - 1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints. As a minimum, show on each equipment graphic the input and output points and relevant calculated points as indicated on the applicable Points List in Section 23 Appendix A.
 - 2. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.17 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Startup Testing. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration
 - 1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.

2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers' recommendations.
4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
7. Alarms and Interlocks:
 - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.18 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration.

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with Part 1, "System Performance."

7. Demonstrate compliance with sequences of operation through all modes of operation.
8. Demonstrate complete operation of operator interface.
9. Additionally, the following items shall be demonstrated:
 - a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
 - b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.
 - c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
 - d. Interface to the building fire alarm system.
 - e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests

B. Acceptance.

1. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

3.19 CLEANING

- A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any

cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.20 TRAINING

- A. Provide training for a designated staff of Owner’s representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.
- B. Training shall enable students to accomplish the following objectives.
 - 1. Day-to-day Operators:
 - a. Proficiently operate the system
 - b. Understand control system architecture and configuration
 - c. Understand DDC system components
 - d. Understand system operation, including DDC system control and optimizing routines (algorithms)
 - e. Operate the workstation and peripherals
 - f. Log on and off the system
 - g. Access graphics, point reports, and logs
 - h. Adjust and change system set points, time schedules, and holiday schedules
 - i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
 - j. Understand system drawings and Operation and Maintenance manual
 - k. Understand the job layout and location of control components
 - l. Access data from DDC controllers and ASCs
 - m. Operate portable operator’s terminals
 - 2. Advanced Operators:
 - a. Make and change graphics on the workstation
 - b. Create, delete, and modify alarms, including annunciation and routing of these
 - c. Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals
 - d. Create, delete, and modify reports
 - e. Add, remove, and modify system’s physical points
 - f. Create, modify, and delete programming
 - g. Add panels when required

- h. Add operator interface stations
 - i. Create, delete, and modify system displays, both graphical and others
 - j. Perform DDC system field checkout procedures
 - k. Perform DDC controller unit operation and maintenance procedures
 - l. Perform workstation and peripheral operation and maintenance procedures
 - m. Perform DDC system diagnostic procedures
 - n. Configure hardware including PC boards, switches, communication, and I/O points
 - o. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
 - p. Adjust, calibrate, and replace system components
3. System Managers/Administrators:
- a. Maintain software and prepare backups
 - b. Interface with job-specific, third-party operator software
 - c. Add new users and understand password security procedures
- C. Organize the training into sessions or modules for the three levels of operators listed above. (Day-to-Day Operators, Advanced Operators, System Managers and Administrators). Students will receive one or more of the training packages, depending on knowledge level required.
- D. Provide course outline and materials according to the “Submittals” article in Part 1 of this specification. Provide one copy of training material per student.
- E. The instructor(s) shall be factory-trained and experienced in presenting this material.
- F. Classroom training shall be done using a network of working controller’s representative of installed hardware.
- 3.21 SEQUENCES OF OPERATION
- A. See Section 23 Sequences of Operation.
- 3.22 CONTROL VALVE INSTALLATION
- A. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.
 - B. Slip-stem control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position. Ball type control valves shall be installed with the stem in the horizontal position.
 - C. Valves shall be installed in accordance with the manufacturer’s recommendations.
 - D. Control valves shall be installed so that they are accessible and serviceable and so that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.
 - E. Isolation valves shall be installed so that the control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screw-type control valves.

- F. Provide tags for all control valves indicating service and number. Tags shall be brass, 1.5 inch in diameter, with ¼ inch high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

3.23 CONTROL DAMPER INSTALLATION

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure ¼ in. larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.
- D. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- E. Install extended shaft or jackshaft according to manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- G. Provide a visible and accessible indication of damper position on the drive shaft end.
- H. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

3.24 SMOKE DAMPER INSTALLATION

- A. The contractor shall coordinate all smoke and smoke/fire damper installation, wiring, and checkout to ensure that these dampers function properly and that they respond to the proper fire alarm system general, zone, and/or detector trips. The contractor shall immediately report any discrepancies to the engineer no less than two weeks prior to inspection by the code authority having jurisdiction.
- B. Provide complete submittal data to controls system subcontractor for coordination of duct smoke detector interface to HVAC systems.

3.25 DUCT SMOKE DETECTION

- A. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1, "Submittals."
- B. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.

3.26 PACKAGED EQUIPMENT CONTROLS

- A. General. The electronic controls packaged with any equipment furnished under this contract shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate

with these controls to read the information and change the control setpoints as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135.

- B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions if the network connection is lost.
- C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.
- D. The Controller shall have a physical connection for a laptop computer or a portable operator’s tool.
- E. Environment. The hardware shall be suitable for the anticipated ambient conditions.
 - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
 - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- F. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.
- G. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 30 days.
- H. Power. Controller shall be able to operate at 90% to 110% of nominal voltage rating.
- I. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

3.27 START-UP AND CHECKOUT PROCEDURES

- A. Start up, check out, and test all hardware and software and verify communication between all components.
 - 1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 - 2. Verify that all analog and binary input/output points read properly.
 - 3. Verify alarms and interlocks.
 - 4. Verify operation of the integrated system.

END OF SECTION 23 09 00

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes piping systems for chilled water cooling, and make-up water for these systems. Piping materials and equipment specified in this Section include pipes, fittings, and specialties, special duty valves, and hydronic specialties.

1.3 DEFINITIONS

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for each hydronic specialty and special duty valve specified. Include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions. Furnish flow and pressure drop curves for diverting fittings and calibrated plug valves, based on manufacturer's testing.
- B. Shop Drawings: Submit manufacturer's drawings detailing dimensions, weight loadings, required clearances, methods of assembly of components, and location and size of each field connection.
- C. Maintenance Data: For hydronic specialties and special duty valves, for inclusion in operating and maintenance manuals.
- D. Quality Control Submittals:
 - 1. Welders' certificates certifying that welders comply with the quality requirements specified in Quality Assurance below.
 - 2. Certification of compliance with ASTM and ANSI manufacturing requirements for pipe, fittings, and specialties.
 - 3. Submit reports specified in Part 3 of this Section.

1.5 QUALITY ASSURANCE

- A. Qualifications for Welding Processes and Operators: ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification."
- B. ASME Compliance: Fabricate and stamp air separators and compression tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

1.6 MAINTENANCE

- A. Maintenance Stock: Furnish a sufficient quantity of chemical for initial system start-up and for preventative maintenance for one year from Substantial Completion.

PART 2 - PRODUCTS

2.1 PIPE AND TUBING MATERIALS

- A. Steel Pipe: ASTM A 120, Schedule 40, with threaded joints and fittings for 2" and smaller, and with welded joints for 2 1/2" and larger. Use flanged joints where noted.
- B. Pre-insulated Pipe: Equal to Thermafab Ferro-Therm as manufactured by Thermacor Process Inc., and consisting of the following components:
 - 1. Carrier pipe is PVC (Class 160 for 8" pipe and larger, Schedule 40 for pipe smaller than 8") gasket joint pipe meeting or exceeding the following specifications: ASTM D2241 and ASTM D1784. Pipe is rated at 160 psi at 73 F.
 - 2. Jacketing material shall be extruded white polyvinylchloride, consisting of clean, virgin NSF approved Class 124 54-B PVC compound, conforming to ASTM D1784, Type I, Grade I, and be of the thickness shown below. No FRP jacket allowed.

CASING DIAMETER	MINIMUM THICKNESS
6" and smaller	60 mils
8"	80 mils
10"	100 mils
12"	120 mils
14"	140 mils
15"	150 mils
16"	160 mils
18"	180 mils
20"	200 mils

- 3. Polyurethane foam insulation shall be injected with one shot into the annular space between carrier pipe and jacket with a minimum thickness of one inch. Insulation shall be rigid, 90-95% closed cell polyurethane with 2.5 to 3.5 pounds per cubic foot density and coefficient of thermal conductivity (K Factor) of .14 and conform to ASTM C-591.
- 4. End seals shall be factory applied, sealed to the jacket and the carrier pipe. End seals shall be certified as having passed a 20-foot head pressure test.
- 5. Approved equals shall be: Energy Task Force and Rovanco Piping Systems.

2.2 FITTINGS

- A. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.
- B. Grooved Mechanical Fittings: ASTM A 106, steel fittings with grooves or shoulders designed to accept grooved end couplings, as manufactured by Victaulic Company of America or Grinnell.
- C. Grooved Mechanical Couplings: Consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings, as manufactured by Victaulic Company of America or Grinnell.
- D. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of material group 1.1, butt welded end connections, and raised facings.

2.3 SPECIAL DUTY VALVES

- A. Triple Duty Valves: 175 psig working pressure, 300oF maximum operating temperature, cast-iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non-slam check valve with spring-loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett and Taco, Inc.
- B. Pressure Reducing Valves: Diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Valve shall be factory-set at operating pressure and have the capability for field adjustment. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett and Taco, Inc.
- C. Safety Relief Valves: 125 psig working pressure and 250oF maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber. Acceptable manufacturers include Amtrol, Inc., Bell & Gossett, Spirax Sarco, and Watts Regulator Co.
- D. Flow Venturi: Steel construction, Venturi body design with ports for connection to flow meter. Bell & Gossett (Xplem, Inc.), Gerand, Preso.

2.4 HYDRONIC SPECIALTIES

- A. Manual Air Vent: Bronze body and nonferrous internal parts; 150 psig working pressure, 225oF operating temperature; manually operated with screwdriver or thumbscrew; and having 1/8" discharge connection and 1/2" inlet connection. Acceptable manufacturers include Armstrong Machine Works, Bell & Gossett, Hoffman Specialty ITT (Fluid Handling Div.), Crane Co., Metraflex Co., and Spirax Sarco.
- B. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240oF operating temperature; and having 1/4" discharge connection and 1/2" inlet connection. Acceptable manufacturers include Armstrong Machine Works, Bell & Gossett, Hoffman Specialty ITT (Fluid Handling Div.), and Spirax Sarco.
- C. Pump Suction Diffusers: Cast-iron body, with threaded connections for 2" and smaller, flanged connections for 2-1/2" and larger; 175 psig working pressure, 300oF maximum operating temperature. Diffusers shall be complete with inlet vanes with minimum length of 2 1/2 times pump suction diameter; cylinder strainer with 3/16" diameter openings with total free area equal to or greater than five times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head; disposable fine mesh strainer to fit over cylinder strainer; permanent magnet, located in flow stream, removable for cleaning; adjustable foot support, designed to carry weight of suction piping; and blowdown tapping in bottom, gauge tapping in side. Provide each pump suction diffuser with a construction strainer for use during the construction phase of the project. Acceptable manufacturers include Amtrol, Inc., Taco, Inc., and Bell & Gossett.
- D. Flexible Pipe Connectors: Pipe size 1-1/2" and smaller shall have flexible metal hose connectors consisting of a corrugated inner metal hose wrapped with a wire protective braid; hose and braid to be stainless steel. Pipe size 2" and larger shall have rubber expansion joints of the single or double arch type, constructed of an EPDM molded rubber cover. Joints shall have flanges integral with the body. Each joint shall be furnished with ANSI 125# drilling and flanges and solid 3/8-inch-thick galvanized steel retaining rings. All units shall be suitable for working pressures up to 150 psig. Connector to be manufactured by Metraflex or approved equal.
- E. Flexible Pipe Connectors: Pipe sizes 2" and larger shall be corrugated hose and braided stainless steel with flanged connections. Maximum working pressure of 150 psig. Pipe connectors shall be manufactured by Metraflex or approved equal.

- F. Circuit Setter: Bronze body/brass ball construction with glass and carbon filled TFE seat rings. Valves to have a differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT inserts and check valves. Valves to have a memory stop feature to allow valve to be closed for service and reopened to set point without disturbing balance position. Approved manufacturers shall be ITT Industries or Armstrong.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

- A. So far as practical, install piping as indicated. Install piping at a uniform grade of 1" in 40' upward in the direction of flow. Make reductions in pipe sizes using eccentric reducer fitting installed with the level side up. Install branch connections to mains using tee fittings in main with take-off out the bottom of the main, except for up-feed risers which shall have take-off out the top of the main line.
- B. Install unions in pipes 2" and smaller, adjacent to each control valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices. Install flanges on valves, apparatus, and equipment having 2-1/2" and larger connections.
- C. Install flexible connectors at inlet and discharge connections to pumps (except inline pumps), chillers and other vibration producing equipment.
- D. Anchor piping to ensure proper direction of expansion and contraction.

3.2 JOINTS

- A. Comply with recommended industry practice for preparation and assembly of soldered, threaded, and flanged joints.
- B. Comply with the procedures contained in the AWS "Brazing Manual" for brazed joints.

3.3 WELDING

- A. Pipe welding shall comply with the provisions of the latest Revision of the Applicable Code, whether ASME Boiler Construction Code, ASA Code for Pressure Piping, or such state or local requirements as may supersede codes mentioned above.
- B. Each individual providing welding services for this project must provide a Proof of Qualifications certificate.

3.4 VALVE APPLICATIONS

- A. General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:
 - 1. Shut-off duty: Use ball, and butterfly valves
 - 2. Throttling duty: Use ball, and butterfly valves
 - 3. Install shut-off duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.
 - 4. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.
- B. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.
- C. Install check valves on each pump discharge and elsewhere as required to control flow direction.

- D. Install pump discharge valves with stem in upward position; allow clearance above stem for check mechanism removal.
- E. Install safety relief valves on all hydronic systems, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 01 for installation requirements.
- F. Install pressure reducing valves on inlet water line, and elsewhere as required to regulate system pressure.

3.5 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at all high points in the system, at heat transfer coils, and elsewhere as required for system air venting.
- B. Install pump suction diffusers on end suction pump suction inlet; adjust foot support to carry weight of suction piping. Install diffusers to maintain minimum service clearance to service strainers. Install nipple and ball valve in blowdown connection.

3.6 FIELD QUALITY CONTROL

- A. Preparation for testing: Prepare hydronic piping in accordance with ASME B 31.9 and as follows:
 - 1. Leave joints including welds uninsulated and exposed for examination during the test.
 - 2. Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
 - 3. Flush system with clean water. Clean strainers.
 - 4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
 - 5. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.
- B. Testing: Test hydronic piping as follows:
 - 1. Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for workers and compatible with the piping system components.
 - 2. Use vents to release trapped air while filling the system.
 - 3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low-pressure filling lines are disconnected.
 - 4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B 31.9, Code For Pressure Piping, and Building Services Piping.
 - 5. After the hydrostatic test pressure has been applied for at least ten minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

3.7 ADJUSTING AND CLEANING

- A. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens. After cleaning and

flushing hydronic piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.

- B. Mark calibrated name plates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.
- C. Chemical Treatment: Provide a water analysis prepared by the chemical treatment supplier to determine the type and level of chemicals required for prevention of scale and corrosion. Perform initial treatment after completion of system testing.
- D. Installer shall remove and clean strainer after 24 hours operation and after 30 days operation.

END OF SECTION 23 21 13

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. Extent of HVAC pumps work required by this Section is indicated on drawings and schedules, and by requirements of this Section. Types of pumps specified in this Section include frame-mounted end suction.
- B. Refer to Division 26 sections power supply wiring from power source to power connection on pumps; not work of this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of general-use centrifugal pumps with characteristics, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".
- C. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters' Laboratories and comply with NEMA standards.
- D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Maintenance Data: Submit maintenance data and parts lists for each type of pump.

PART 2 - PRODUCTS

2.1 PUMPS, GENERAL

- A. Provide factory-tested pumps, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. Provide pumps of same type by same manufacturer.

2.2 BASE MOUNTED PUMPS

- A. Provide base mount pumps, single stage, designed for 175 psi working pressure. Body shall be cast iron, 125 psi ANSI flanges of equal size, tappings for gauge and drain fittings. Pump shaft shall be alloy steel

with replaceable aluminum bronze shaft sleeve. Provide internally flushed mechanical seal with ceramic seal seat and carbon seal ring. Motors shall be non-overloading at any point on pump curve, open, drip-proof, with ball bearings having 15,000 hours bearing life, and with lifting lug on top of motor. Provide enclosed type impeller, hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.

- B. Provide each suction diffusers with a construction strainer during the construction phase of this project.
- C. Acceptable manufacturers include Armstrong Pumps, Inc., Aurora Pump, Taco, Inc. and Bell & Gossett.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which HVAC pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF PUMPS

- A. Install HVAC pumps in accordance with manufacturer's published installation instructions, complying with recognized industry practices. Provide access space around HVAC pumps for service as indicated, but in no case less than that recommended by manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer, and in presence of manufacturer's service representative.
- B. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions. Do not start pumps with mechanical seals until system is under pressure and pumps are protected by strainers.
- C. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 21 23

SECTION 23 25 00 – WATER TREATMENT

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.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

- A. Provide complete chemical water treatment systems for the following systems:
 - 1. Closed loop chilled water.
- B. Provide chemicals as required to control scale, corrosion, biological fouling and biological foaming.
- C. Coordinate tap and sensor locations with Drawings and the water treatment manufacturer's requirements.
- D. Provide supervision of the water treatment program for a period of one year consisting of on-the-spot analysis of all systems treated and a submittal of a written report to Owner and Engineer stating current conditions and recommendations for maintaining optimal controls. This service shall be performed monthly.

1.3 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within all references.

1.4 QUALITY ASSURANCE

- A. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment for the last ten (10) years, whose major business is in the field of water treatment. Supplier shall have regional water analysis laboratories, development facilities and service department, plus full-time service personnel located within the training area of the Project Site.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 SUBMITTALS

A. Product Data:

1. Include rated capacities; water-pressure drops; shipping, installed, and operating weights; and furnished products listed below:
 - a. Chemicals.
 - b. Filters.
 - c. Bypass Chemical pot feeders.

B. Record Documents:

1. Shop Drawings: Detail equipment assemblies indicating dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - a. Wiring Diagrams: Detail power and control wiring and differentiate between manufacturer-installed and field-installed wiring.
2. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project Site.
3. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Chemical Feed System Description:

1. Closed-Loop System: One bypass feeder on each system with isolating and drain valves with inlet piping connecting to discharge of circulating pumps, and outlet side of feeder connected to suction side of pump unless otherwise indicated.
2. Introduce chemical treatment through bypass feeder when required or indicated by test.

C. Performance Requirements:

1. Maintain water quality for HVAC systems that controls corrosion and build-up of scale and biological growth for maximum efficiency of installed equipment without posing a hazard to operating personnel or the environment.
2. Base chemical treatment performance requirements on the quality of water at the Project Site HVAC system equipment material and operating personnel capabilities, and the capability of personnel and guidelines of authorities having jurisdiction at the Project Site.
 - a. Closed System: Maintain system essentially free of scale, corrosion, and fouling to sustain the following water characteristics:

- 1) Conductivity: 1200 to 2500 umhos. (nitrite raises system conductivity)
- 2) Acceptable pH: Not less than 7.5 or greater than 8.5 10.0 (except for piping flush and clean step where the pH level is in the alkaline range of 9.5 to 10.5).
- 3) Hardness: < 5 ppm. (when closed loops have soft water make-up water)

2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:

1. NALCO
2. Aqua-Chem, Inc.; Cleaver-Brooks Division.
3. Barclay Chemical Co., Water Management, Inc.
4. Calgon Corp., ECC International.
5. R2J Chemical Services

2.3 CHEMICAL FEEDING EQUIPMENT

- A. Filtered Bypass Chemical Pot Feeders: Steel or stainless steel, for introducing chemicals into the system; with pressure rated cap, filter bag, drain valve on bottom, and recirculating shutoff valves on sides. Neptune model FTF-5DB.
- B. Chemical Tubing: Schedule 40 PVC with solvent-cement joints; or polypropylene tubing with heat fusion.
- C. Plastic Ball Valves: Rigid PVC or CPVC body, integral union ends, and polytetrafluoroethylene seats and seals.
- D. Plastic-Body Strainer: Rigid PVC or CPVC with cleanable stainless-steel strainer element.

2.4 CHEMICAL TREATMENT TEST EQUIPMENT

- A. Test Kit: Manufacturer recommended equipment and chemicals, in a carrying case, for testing pH, total dissolved solids, dissolved oxygen, biocount, chloride, and total alkalinity and for calcium hardness field tests.
- B. Corrosion Test Coupon Assembly: Constructed of corrosion material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test coupon assembly.
1. Two-station rack for closed-loop systems.
 2. Four-station rack for open condenser water systems.

2.5 CHEMICALS

- A. Furnish chemicals recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment.
- B. System Cleaner: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
- C. Biocide: Chlorine release agents or microbiocides.

- D. Closed-Loop, Water Piping Chemicals: Sequestering agent to reduce deposits and adjust pH, corrosion inhibitors, and conductivity enhancers.

2.6 CHILLED-WATER FILTRATION UNIT

- A. Filtration Unit: Stainless-steel housing and polypropylene filter with polypropylene core.
- B. Replaceable Filter Media: Compatible with antifreeze and water-treatment chemicals.
- C. Filter Media for Sediment Removal Service: Rated at 98 percent efficiency for 20-micrometer particulate.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Water Analysis
 - 1. Perform an analysis of supply water to determine the type and quantities of chemical treatment needed to maintain the water quality as specified in "Performance Requirements" Article.

3.2 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Install treatment equipment level and plumb.
- D. Add cleaning chemicals as recommended by manufacturer.
- E. Connections:
 - 1. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
 - 2. Install piping adjacent to equipment to allow service and maintenance.

3.3 TESTING

- A. Engage a factory-authorized service representative to perform Start-up service.
 - 1. Inspect field-assembled components and equipment installation, including piping. Report results in writing.
 - 2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
 - 3. Place HVAC water-treatment system into operation and calibrate controls during HVAC system Start-up procedures.
- B. Test chemical feed piping as follows:

1. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
2. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose Work that has been covered or concealed before it has been tested and approved.
4. Cap and subject piping to static water pressure of [50 psig (345 kPa)] above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four (4) hours. Leaks and loss in test pressure constitute defects.
5. Repair leaks and defects with new materials and retest piping until satisfactory results are obtained.
6. Prepare test reports, including required corrective action.

END OF SECTION 23 25 00

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 SUMMARY

- A. This Section includes rectangular and round metal ducts and plenums for heating, ventilating and air conditioning systems in pressure classes from minus 3 inches to plus 3 inches water gauge.

1.3 DEFINITIONS

- A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
 - 1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
 - 2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.5 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for duct liner, sealing materials, and fire-stopping materials.
- C. Record Drawings: Include duct systems routing, fittings details and installed accessories and devices.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA-90A, "Standard for the Installation of Air Conditioning and Ventilating Systems".
- B. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.

- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view. Minimum thickness shall be 26-gauge.
- C. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts.
 - 1. For stainless steel ducts, provide stainless steel support materials.
 - 2. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.
- D. Tie Rods: Galvanized steel, 1/4" minimum diameter for 36" length or less; 3/8" minimum diameter for lengths longer than 36".

2.2 FLEXIBLE DUCTS

- A. Low pressure flexible ductwork shall be a factory fabricated assembly consisting of a zinc-coated spring steel helix, non-perforated inner liner and 1" thick fiberglass insulation with metalized vapor barrier jacket. The assembly shall have a minimum working pressure of 6" w.g. The composite assembly including insulation and vapor barrier shall be UL-181, class 1 listed and meet with the requirements of NFPA 90A, with a flamespread rating of 25 or less and a smoke developed rating of 50 or less. Flexible ductwork shall be Flexmaster Type 5m or 9m by Flexmaster, USA, Inc., Flex-Vent KM R-6 by Flexible Technologies, ATCO UPC #036, or approved equal.
- B. At the CONTRACTOR'S discretion spiral wound, corrugated aluminum ductwork with 1" thick fiberglass jacket meeting the requirements listed above in A. may be used. Ductwork to be Flexmaster Type TL-M or T-Fin by Thermofin of Florida.

2.3 SEALING MATERIALS

- A. Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive nature, but also includes tapes and combinations of open weave fabric strips and mastics.
- B. Joint and Seam Sealant: Sealant shall be RCD Corporation #8 Mastic, Foster Vapor-Safe 95-90/91, Design Polymeric DP1010, or approved equal.
- C. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.4 FIRE-STOPPING

- A. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
 - 2. "Pensil 851"; General Electric Co.
 - 3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 - 4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 - 5. "RTV 7403"; General Electric Co.

6. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.5 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners, unless approved in writing by the structural ENGINEER.
- B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod. Straps and rod sizes shall conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, Latest Edition, for sheet width and gauge and steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
 1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
- E. Roof Joist Cross Members: Where ductwork, piping or equipment is suspended between roof joists or trusses by providing cross members supported by the joists or trusses, the cross members shall be fabricated from type B22TH, 12 ga. channel as manufactured by B-Line Systems, Inc or 1"x1"x1/4" galvanized angle iron.

2.6 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards", Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
 1. Supply Ducts: 3 inches water gauge.
 2. Return Ducts: 3 inches water gauge, negative pressure.
 3. Exhaust Ducts: 3 inches water gauge, negative pressure.
- C. Cross-breaking or Cross Beading: Cross-break or bead duct sides that are 19 inches and larger and are 20-gauge or less, with more than 10 square feet of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard", Figure 1-4,

2.7 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard", Latest Edition, Figures 2-1 through 2-10.

2.8 ROUND DUCT FABRICATION

- A. General: Except where interrupted by fittings, provide round ducts in lengths not less than 12 feet.
- B. Round Ducts: Fabricate round supply ducts with spiral lock-seam construction. Comply with SMACNA "HVAC Duct Construction Standards", Table 3-2 for galvanized steel gauges. Fabricate with minimum sheetmetal thickness of 26-gauge. Longitudinal seam duct is not acceptable.

2.9 ROUND DUCT FITTINGS FABRICATION

- A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards", Latest Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
 - 1. Mitered Elbows: Fabricate mitered elbows with welded construction in gauges specified below.
 - a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards", Table 3-1.
 - b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 3 inches to plus 3 inches:
 - (1) 3 to 14 inches: 24 gauge.
 - (2) 15 to 26 inches: 22 gauge.
 - (3) 27 to 50 inches: 20 gauge.
 - (4) 52 to 60 inches: 18 gauge.
 - (5) 62 to 84 inches: 16 gauge.
 - 2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2" diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.
 - 3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60 and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2" diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.
 - 4. Round Elbows - Larger Than 14 Inches: Gored elbows, except where space restrictions require a mitered elbow.
 - 5. Die-Formed Elbows for Sizes Through 8 Inches and All Pressures: 20 gauge with 2-piece welded construction.
 - 6. Round Gored Elbows Gauges: Same as for non-elbow fittings specified above.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Install ducts with the fewest possible joints. Use fabricated fittings for all changes in directions, changes in size and shape, and connections. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- B. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct usable space of block access for servicing building and its equipment. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any. Install insulated ducts with 1-inch clearance outside of insulation. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal

runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

- C. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.
- D. Non-Fire Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2 inches. Where duct pass through interior partitions and are shielded from view by ceilings, seal space between duct and construction opening with compound compatible with wall construction to minimize noise transmission between spaces.
- E. At all connections, remove any sharp corners or projections which may damage the vapor barrier of the insulation.

3.2 INSTALLATION OF FLEXIBLE DUCTS

- A. For any duct run using flexible ductwork, do not exceed 8'-0" extended length. Unless noted, install in accordance with Section III of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".
- B. Flexible duct shall be installed in no more than the length required to make the connection between the duct fitting and the air device.
- C. Horizontal supports for flexible ducts shall be suspended on 36" center with a minimum 3/4" wide flat sheetmetal banding material. Provide a hanger within 6" of all "flexible elbows".
- D. All connections shall be made with a wide positive locking strap.

3.3 SEAM AND JOINT SEALING

- A. All transverse joints, longitudinal seams, and duct penetrations. Seal externally insulated ducts prior to insulation installation.

3.4 HANGING AND SUPPORTING

- A. Install rigid round and rectangular metal ducts with support systems indicated in SMACNA "HVAC Duct Construction Standards", tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts within 2'-0" of each elbow and within 4'-0" of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16'-0" and at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.
- E. Verify method of attachment to precast concrete panel with structural ENGINEER.

3.5 CONNECTIONS

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section "Ductwork Accessories".

- B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards", Figures 2-7 and 2-8.
- C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards", Figures 2-16 through 2-18.
- D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards", Figure 2-19.

3.6 DUCT LEAKAGE TESTING

- A. Duct leakage Testing shall be required to be performed as part of the GENERAL CONTRACTOR'S scope of work. CONTRACTOR is required to provide written notice to OWNER prior to testing. All ductwork is to be leak tested at the completion of installation. The ductwork is to be tested from the connection point of the air handler/fan to the fitting outlet for diffuser run-outs or connection points for hard ducted air devices. Do not test through the spin-in fittings. For constant volume systems, test the entire duct system at 3-inch w.g. Test with all accessories installed, including dampers, fire dampers and access doors. Total allowable leakage is 3.5% of the connected fan's design cfm. No additional fitting allowance is provided.
- B. Reseal leaking joints as required and apply sealants to achieve specified maximum allowable leakage.
- C. Additional testing of the duct systems, other than required by the CONTRACTOR'S scope of work, may be done by OWNER'S Test and Balance agency. One additional test for each duct system may be provided at the OWNER'S expense. If test fails, correction and retest will be at the CONTRACTOR'S expense. All subsequent tests due to failure will be done at the CONTRACTOR'S expense. If at any point the CONTRACTOR schedules testing on a duct system which proves to be incomplete upon inspection by the test and balance agency, the scheduled test will constitute a failure of the system and the CONTRACTOR will be responsible for all costs associated with subsequent testing.

3.7 ADJUSTING AND CLEANING

- A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.
- C. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 23 31 13

SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this Section. Types of ductwork accessories required for project include the following:

- 1. Dampers.
 - a. Low pressure manual dampers.
 - b. Conical fitting with damper.
- 2. Turning vanes.
- 3. Duct access doors.
- 4. Flexible connections.
- 5. Fire Dampers.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three years.
- B. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
- C. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
- D. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
- E. NFPA Compliance: Comply with applicable provisions of NFPA-90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.
- F. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.

PART 2 - PRODUCTS

2.1 DAMPERS

- A. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards" for 3" Wg.
- B. Ring Seal Collar with Manual Volume Damper: Provide flange fittings with locking type dampers for all duct run-outs to diffusers as indicated. Damper blade to be minimum 28 ga. on continuous rod. Provide with locking quadrant lock extended for external insulation. Fitting with damper to be Crown Products Model 654 or approved equal.
- C. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-gauge aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" by 1/2" by 1/8" steel channel for face areas 25 square feet and under; 4" by one and 1-1/4" by 16-gauge channel for face areas over 25 square feet. Provide galvanized steel finish on frame with aluminum touch-up.
- D. Acceptable manufacturers include Airguide Corp., Greenheck, Flexmaster National Control Air, Crown Products, Louvers & Dampers, Inc., and Ruskin Mfg. Co.

2.2 TURNING VANES

- A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards" or provide manufactured turning vanes constructed of 1" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c. and set into side strips suitable for mounting in ductwork.
- B. Acceptable manufacturers include Aero Dyne Co., Airsan Corp., Barb-Aire Co., Duct-Mate Duro Dyne Corp., and Register & Grille Mfg. Co., Inc.

2.3 DUCT ACCESS DOORS

- A. Construct access doors of the same or greater gauge as ductwork served, provide 1" thick insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type cam latch for all doors. If space is limited for a hinged door swing, then provide a two handle-type cam latch door. Installation of door shall be accessible, and the size opening shall be large enough to permit maintenance and resetting of device the door serves.
- B. Minimum Access Door Sizes *

Largest Duct Dimension	Access Door Nom. Dimension
Up to 10"	6" x 6"
10" to 16"	8" x 8"
17" to 24"	12" x 12"
25" to 36"	16" x 16"
37" and larger	24" x 16"

* CONTRACTOR is to provide access doors large enough that fire dampers and other devices can be repaired/reset as required. If in the opinion of the ENGINEER inadequate access to these devices has been provided, the CONTRACTOR shall install additional/or larger access doors at no additional cost to the OWNER.

- C. Acceptable manufacturers include Air Balance Inc., Louver & Dampers, Inc. and Ruskin Mfg. Co.

2.4 FLEXIBLE CONNECTIONS

- A. Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct airtight flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Where ends of material meet, it shall be sewn tightly, staples not allowed. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement and also capable of absorbing vibrations of connected equipment. Flexible connections to be VentFab or approved equal.
- B. Acceptable manufacturers include American/Elgen Co. (Energy Div.), Duct-Mate Duro Dyne Corp., Flexaust (The) Co., and Ventfabrics, Inc.

2.5 FIRE DAMPERS

- A. Fire Dampers: Construct casings of 20-gauge galvanized steel. Provide fusible link rated at 160°F to 165°F unless otherwise indicated. Provide damper with positive lock in closed position, and with curtain type damper blade assembly, with curtain 100% out of airstream and 24-gauge galvanized steel blades.
- B. Ceiling fire dampers: Only all steel constructed air devices to be installed with this type of damper. Construct frame of 20-gauge galvanized steel. Provide fusible link rated at 160°F to 165°F unless otherwise indicated. Provide damper with positive lock in the closed position, and with single or butterfly damper blade assembly with UL Classified insulating mineral board and 22-gauge galvanized steel blades. Provide minimum 1/4" thick ceramic insulating blanket as required by air device, and manufacturer's tested assembly. Ceiling damper based on Ruskin model CFD and CFDR with UL test assembly and sizes based on air device served. Damper may be used as a volume damper for air devices with an approved UL tested assembly.
- C. Acceptable Manufacturers: Ruskin, Greenheck and Nailor.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards and in accordance with recognized industry practices to ensure that products serve intended function. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.
- B. Install turning vanes in all square or rectangular 90° elbows and elsewhere as indicated.
- C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- D. Fire Dampers:
 - 1. Each fire damper shall be installed in accordance with the conditions of their listing and the manufacturer's installation instructions.
 - 2. Provide wall sleeves. Thickness of sleeves shall not be less than the conditions of rating under UL

555S, standard for fire dampers and ceiling dampers. Provide an expansion gap between the fire rated wall opening and the fire damper sleeve. The gap shall be sized at 1/8" per linear foot in both dimensions.

3.3 FIELD QUALITY CONTROL

- A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak-proof performance.

3.4 ADJUSTING AND CLEANING

- A. Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
- B. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 EXTRA STOCK

- A. Furnish extra fusible links to OWNER, one link for every 10 installed of each temperature range.

END OF SECTION 23 33 00

SECTION 23 64 23 – SCROLL WATER CHILLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Chiller package.
- B. Charge of refrigerant and oil.
- C. Controls and control connections.
- D. Chilled water connections.
- E. Starters.

1.2 RELATED SECTIONS (NOT USED)

1.3 REFERENCES

- A. ARI 550/590
- B. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- C. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.
- D. ASME SEC 8 - Boiler and Pressure Vessel Code.
- E. NEMA MG 1 - Motors and Generators.
- F. UL 465 - Central Cooling Air Conditioners.
- G. ARI 370
- H. NFPA 70 – National Electric Code (NEC)

1.4 SUBMITTALS FOR REVIEW

- A. Submittals for equipment (provided under separate contract) shall be reviewed by engineer prior to awarding of that bid.
- B. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate valves, strainers, and thermostatic valves required for complete system.
- C. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

1.5 SUBMITTALS FOR INFORMATION

- A. Submit manufacturer's installation instructions.

- B. Manufacturer's Certificate: Certify that components of package not furnished by manufacturer have been selected in accordance with manufacturer's requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

- A. Operation and Maintenance Data: Submit maintenance data and parts list for each air-cooled chiller, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include three (3) copies of this data and product data in maintenance manual or in CD-ROM/DVD format; in accordance with requirements of Division 01.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

1.8 REGULATORY REQUIREMENTS

- A. Provide certification of inspection for conforming authority having jurisdiction approval.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

- A. Store units at factory until mechanical contractor coordinates installation. Manufacturer shall be responsible for equipment until contractor offloads at site.
- B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- C. Protect units from physical damage.

1.10 WARRANTY

- A. Provide full five years manufacturer's standard warranty on entire machine. Include all parts and labor including refrigerant.

1.11 MANUFACTURER'S AND MAINTENANCE SERVICE WARRANTY

- A. In addition to the five (5) year warranty, manufacturer shall provide manufacturer's parts and labor and an OEM full maintenance service warranty in accordance with annual OEM service agreement. Agreement shall include years 1-5 and shall include but not be limited to the following:
 - 1. Three (3) operating inspections per year and one (1) annual shutdown inspection for each of 5 years.
 - 2. Report of work performed.
 - 3. Oil analysis every 4 months.
 - 4. Oil analysis report.
 - 5. Repair work including parts and labor.
 - 6. Emergency service 24 hours a day 365 days per year. Response time shall be no more than 2 hours for emergency calls.
 - 7. Semi-annual for each of 5 years oil cleaning of condenser coil.
 - 8. Preventative maintenance as recommended by factory.
 - 9. Lubricate as necessary.

10. All parts and labor including refrigerant necessary for full warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Carrier
- B. Trane
- C. York
- D. Daiken

2.2 MANUFACTURED UNITS

- A. Provide factory assembled and tested outdoor air cooled liquid chillers consisting of compressors, - condenser, evaporator, thermal expansion valve, refrigeration charge (R410a) and accessories, and control panel. Construction, testing, and ratings shall be in accordance with ARI 590. Provide a minimum of two (2) independent refrigeration circuits.
- B. Conform to ASHRAE 15 code for construction and operation of water chillers.

2.3 (NOT USED)

2.4 HERMETIC COMPRESSORS

A. Scroll Compressors:

1. Unit: Direct drive, hermetic scroll type, compliant design for axial and radial sealing.
2. Features: Differential refrigerant pressure oil pump, oil heater, oil separator and filter, oil charging valve.
3. Motor: Suction gas cooled, hermetically sealed, 2 pole squirrel cage induction.
4. Controls:
 - a. Non-fused molded case disconnect switch.
 - b. Single point power connection and grounding lug. Provide with (2) 115 volt power connections for controls and heat strip.
 - c. Anti-recycle timer.
 - d. Solid state overload relay for each compressor.
 - e. Phase loss/reversal/imbalance monitor.
 - f. Cycle counter and hour meter per compressor.
 - g. Low and high pressure control.
 - h. Automatic shutdown compressor overload and low and high refrigerant pressure.
 - i. Across the line starter.
5. Automatic Capacity Reduction: Continuously variable slide valve with infinitely variable control to 25 percent of full load.

2.5 SOUND ATTENUATION

- A. Provide chiller unit with compressor sound attenuation kit and low sound fan kit. Manufacturer shall provide complete sound data in accordance with ARI Standard 370 for chiller unit with compressor sound

attenuation kit and low sound fan assembly installed. Minimum sound power requirements as scheduled.

2.6 EVAPORATOR

- A. Provide shell and tube type or plate frame evaporator. Shell and tube type evaporator shall include seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Plate frame evaporators shall be brazed plate stainless steel construction. Provide dual refrigerant circuits on dual compressor units.
- B. Design, test, and stamp refrigerant side for 200 psig working pressure and water side for 150 psig working pressure, in accordance with ASME.
- C. Insulate with 2.0 inch minimum thick flexible polyurethane foam insulation with maximum K value of 0.26. Provide heat tape to protect evaporator to -20 degrees F.
- D. Provide water drain connection and thermometer wells for temperature controller and low temperature cutout.

2.7 CONDENSERS

- A. Construct condenser coils of aluminum fins mechanically bonded to seamless aluminum or copper tubing. Provide sub-cooling circuits with liquid accumulators. Factory Air test under water to 450 psig.
- B. Low sound fans: Provide vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with ball bearings with grease fittings extended to outside of casing. Provide factory mounted coil guard panels.
- C. Provide fan motors with permanently lubricated ball bearings and built-in current and overload protection.

2.8 ENCLOSURES

- A. House components in welded steel frame with galvanized steel panels with weather resistant, powdercoat finish.
- B. Mount starters and disconnects in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.
- C. Provide condenser coils with wire coil guards.

2.9 HEAT RECOVERY CONDENSERS (NOT USED)

2.10 REFRIGERANT CIRCUIT

- A. Provide refrigerant circuits, factory supplied and piped. 1 circuit per scroll compressor.
- B. Provide for each refrigerant circuit:
 - 1. Liquid line solenoid valve.
 - 2. Filter dryer (replaceable core type).
 - 3. Liquid line sight glass and moisture indicator.
 - 4. Thermal expansion valve sized for maximum operating pressure and variable capacity modulation over entire operating range.
 - 5. Charging valve.

6. Insulated suction line.
7. Discharge line check valve.
8. Compressor discharge service valve.
9. Condenser pressure relief valve.
10. Suction line accumulator.

2.11 CONTROLS

- A. On chiller, mount weatherproof steel control panel, containing starters, power and control wiring, molded - case disconnect switch, factory wired with single point power connection. Chiller controls shall be compatible with the Site's DDC Control System installed under this Contract. Provide a Bacnet interface either native with the chiller controls or an additional BacNet card. As a minimum, the following points/features shall be accessible remotely through the Energy Management System:
 - a) Chiller status
 - b) Chiller temperature setpoints with the ability to remotely adjust the setpoints.
 - c) Chiller flow rate in GPM, both set point and real time flow.
 - d) Real time water temperatures both entering and leaving.
 - e) Chillers percentage of capacity.
 - f) Chiller alarms, not only alarm status but provide the ability to remotely read the specific alarm and reset as required.
- B. For each compressor, provide across the line starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection.
- C. Provide safety controls with indicating lights, with terminations for connection to controls system, arranged so any one will shut down machine and require manual reset:
 1. Low chilled water temperature switch.
 2. High discharge pressure switch for each compressor.
 3. Low suction pressure switch for each compressor.
 4. Oil pressure switch.
 5. Factory provided flow switch in chilled water line. Paddle type will not be accepted.
 6. Relay for remote mounted emergency shut-down switch.
- D. Provide operating controls:
 1. Microcomputer controls multi-step chilled water temperature controller which cycles compressors and activates compressor unloading, all control functions, electronic expansion valve modulation, fan sequencing, and auto lead/lag compressor starting.
 2. Chilled water reset control logic and factory installed sensors to reset leaving chilled water temperature based on ambient temperature or return water temperature.
- E. Provide pre-piped gage board with pressure gages for suction and discharge refrigerant pressures, and oil pressures for each compressor.

2.12 PERFORMANCE

- A. Refer to attached schedule.

2.13 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics:

1. Refer to schedule.
 2. Manufacturer exceeding existing electrical characteristics shall be responsible for increased power requirements for wire, conduit, and breaker size.
- B. Motor: NEMA rated.
- C. Disconnect Switch: Factory mount disconnect switch or circuit breaker on equipment.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Installer must examine areas and conditions under which chillers are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF CHILLERS:

- A. General: Install chillers in accordance with manufacturer's written instructions. Install units plumb and level, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- B. Support: Install floor-mounted units on reinforced concrete pad. Furnish with 4" spring vibration isolations.
- C. Chilled Water Piping: See detail on drawings for requirements.
- D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to manufacturer and equipment installer.
- E. Control: Furnish field-installed automatic temperature control requirements to Control Installer. Field-installed automatic temperature controls are not work of this Section.
- F. Start-up chillers, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's technical representative. Test controls and demonstrate compliance with requirements. Replace damaged, or malfunctioning, controls and equipment and retest. Do not place chillers in sustained operation prior to initial balancing of mechanical systems which interface with the reciprocating chillers.

3.3 TRAINING OF OWNER'S PERSONNEL:

- A. Training
1. Provide services of manufacturer's technical representative for (2) eight hour days. Train the Owner's maintenance personnel on start-up and shutdown procedures, troubleshooting procedures, and servicing and preventative maintenance schedules and procedures. Review with the Owner's personnel, the date contained in the Operating and Maintenance Manuals.
 2. Schedule training with Owner through the Engineer with at least (7) day prior notice.

END OF SECTION 23 64 23

SECTION 23 73 13 – MODULAR INDOOR CENTRAL STATION AIR HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conform to Division 01 and other sections of this division.

1.2 DESCRIPTION OF WORK

- A. Extent of air handling unit work is indicated on drawings and schedules and by requirements of this Section. Types of air handling units specified in this Section include indoor draw-through.
- B. Provide control wiring as work of this Section, complying with requirements of Division 26; power wiring shall be by Division 26.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of packaged air handling units with characteristics, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than five years.
- B. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
- C. ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central-Station Air Handling Units", display certification symbol on units of certified models.
- D. ASHRAE Compliance: Construct and install refrigerant coils in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
- E. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A-1989 "Standard for the Installation of Air Conditioning and Ventilating Systems".
- F. UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA Standards.
- G. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

1.4 SUBMITTALS

- A. Submit in accordance with General, Supplementary and Special Conditions.
- B. As-built drawings shall show total unit configuration in direction of airflow, unit dimensions and field duct connection details.
- C. Product data shall indicate dimensions, weights, coil performance, fan performance, motor electrical characteristics, finishes of materials, filter media, filter sizes and filter quantities.
- D. Submit manufacturer's installation instructions.
- E. Provide fan curves with specified operating point clearly plotted. Fan curves shall indicate air volume, static pressure, fan speed and brake horsepower.

- F. Submit sound power levels by octave band for air handling units at scheduled design conditions. Provide sound power levels for "discharge" and "inlet plus cabinet" sound paths in accordance with AMCA 300 (or ASHRAE 68) and AMCA 301. If unit sound power levels exceed values scheduled on drawings, CONTRACTOR shall submit detailed plan outlining steps to meet design noise levels.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include instructions for lubrication, filter replacement, motor and drive replacement, belt tension adjustments and wiring diagrams.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. Units shall ship fully assembled on factory-installed mounting legs. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section.
- B. Deliver units to site with fan motors, sheaves, and belts completely assembled and mounted in units.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.8 EXTRA STOCK

- A. Provide one extra set filters.
- B. Provide one extra set of belts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A.
 - 1. Trane
 - 2. Carrier
 - 3. York/JCI
 - 4. Daiken

2.2 GENERAL

- A. Manufacturer must clearly define any and all deviations from the Plans and Specifications and submit at time of bid. Provide a custom generated list which lists each deviation to the plans and specs. Generic cut sheets are not acceptable.
- B. Fabricate draw-thru type air handling units with fan sections, coil sections, access sections, mixing boxes and filter sections.

- C. Factory fabricate air handling units of sizes, capacities, and configurations as scheduled on drawings.

2.3 AIR HANDLERS

A. Casing:

1. Construct casings of minimum 16-gauge G90-u galvanized steel structural frames and minimum 2-inch-thick double wall panels. Construct double wall panels of minimum 18-gauge G90-u galvanized steel exterior panels and minimum 20-gauge G90-U galvanized steel interior panels. In order to properly clean the interior of the air handler of microbial growth and other debris, the casings shall be constructed such that structural frames are free standing and double wall panels are non-load bearing. Manufacturer shall be responsible to provide connection flanges and all other framework that is needed on unit to ensure that removal of double wall panels shall not affect structural integrity of unit.
2. Construct casing sections located upstream of supply fan for operation at 4 inches water gage negative static pressure and casing sections located downstream of supply fan for operation at 6 inches water gage positive static pressure. Seal joints between casing sections with closed-cell foam gasketing for leak seal and thermal and acoustical break.
3. Casings not constructed of G90-U galvanized steel, casings with welds on exterior surfaces, or casings with welds on interior surfaces that have burned through to exterior surfaces shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel in order to prevent premature corrosion and microbial growth.
4. Casing shall have removable access panels and doors. Construct access doors of minimum 18-gauge G90-U galvanized steel exterior panels and minimum 22-gauge G90-U galvanized steel interior panels. Provide automotive style neoprene gasketing around full perimeter of access doors to prevent air leakage. Provide "ventlock" style non-corrosive alloy latches operable from the inside or outside of unit. If access doors do not open against unit operating pressure, provide safety latches that allow access doors to partially open after first handle movement and fully open after second handle movement. Insulate access doors with 2-inch-thick 1-1/2 pound per cubic foot density matt faced fiber glass insulation.
5. Insulate casing sections with 2-inch-thick 1-1/2 pound per cubic foot density matt faced fiber glass insulation. Provide double wall casing construction and encase insulation between exterior and interior casing panels such that no insulation is exposed to airstream. Foil facing on insulation is not acceptable as alternate to double wall construction. Insulate all structural channels connected to casing panels and cover openings in structural channels with galvanized steel. Insulation shall comply with NFPA 90A.
6. Provide sealed double wall drain pans constructed of minimum 18-gauge G90-U galvanized steel exterior pans 304 stainless steel interior pans. Encase manufacturer's standard insulation between exterior and interior walls. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to insure complete condensate drainage. Drain pan shall be coated with an anti-microbial agent that prevents microbes from growing on the drain pan. Units with cooling coils shall have drain pans under complete cooling coil. All drain pan connections will be to the side of the unit to enable proper trapping. Also provide secondary drain pan with a 1" drain.

B. Fans:

1. Provide supply fan section with FC double width, double inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Key fan wheels to fan shaft to prevent slipping.
2. Provide self-aligning, grease lubricated pillow-block ball bearings selected for L-50 200,000-hour

average life per ANSI/AFBMA 9. Extend grease lubrication fittings to drive side of unit with plastic tubes and zerkl fittings rigidly attached to casing.

3. Mount fans on minimum 16-gauge steel isolation bases. Internally mount motors on same isolation bases and internally isolate fans with 2-inch housed spring isolators. Install flexible canvas ducts between fan and casings to insure proper isolation and prevent vibration and noise from being transmitted through the unit and ductwork. Flexible canvas ducts shall comply with NFPA 90A. If no flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply duct work and piping by CONTRACTOR.
4. Fan sections shall have full height, double wall, hinged, removable access doors on drive side for inspection and maintenance of internal components.
5. Statically and dynamically balance fan section assemblies. Fan section assemblies include fan wheels, shafts, bearings, drives, belts, isolation bases and isolators. Allow isolators to free float when performing fan balance. Measure vibration at each fan shaft bearing in horizontal, vertical and axial directions. Balance at design RPM's as scheduled on drawings.

C. Motors and Drives:

1. Factory install all motors on slide base to permit adjustment of belt tension.
2. Fan Motors shall be heavy duty, high efficiency open drip-proof with an efficiency rating of at least 88.5.
3. V-Belt Drive shall be variable pitch rated 1.5 times the motor nameplate.

D. Cooling Coils:

1. Coils shall be manufactured by the same company as the supplier of the air handling unit. Install coils such that headers and return bends are enclosed by unit casings.
2. Construct coils of configuration plate fins and seamless tubes. Fins shall have collars drawn, belled and firmly bonded to tubes by means of mechanical expansion of tubes. Do not use soldering or tinning in bonding process.
3. Construct coil casings of minimum 16-gauge stainless steel with formed end supports and top and bottom channels. If two or more coils are stacked in unit, install intermediate drain channels between coils to drain condensate to main drain pans without flooding lower coils or passing condensate through airstream.
4. Clearly label suction and liquid connections on outside of units.
5. Proof test coils to 450 psig air under water and leak test coils to 300 psig air pressure under water. Dry insides of coils after testing and seal all connections.
6. Construct suction headers of copper tubing. Suction connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.
7. Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

E. Filters:

1. Provide factory fabricated filter section of the same construction and finish as unit casings. Filter sections shall have 2-inch, 1.5 lb. density complete double wall construction. Filter sections shall have filter guides and full height, double wall, hinged, removable access doors for filter removal. Filter sections shall flange to other unit components. Provide filter block-offs as required to prevent air bypass around filters.
2. Provide 2 inch angled or flat filter sections (as scheduled) with maximum face velocity of 250 feet per minute with merv 8 pleated media filters. Filters shall be coated with an anti-microbial coating to prevent microbes from growing in the filters. Filters shall be removable from both side(s) of filter sections.

F. Access Sections:

1. Provide access sections as scheduled on drawings. Access sections shall have double wall, hinged, removable access doors on both sides of sections.
2. Construct access sections such that access may be obtained to internal components through any access panel. Construct panels of minimum 18-gauge galvanized steel. In order to properly clean the interior of the air handler of microbial growth and other debris, the casings shall be constructed such that structural frames are free standing and double wall panels are non-load bearing. Vendor shall be responsible to provide connection flanges and all other framework that is needed on unit to ensure that removal of double wall panels shall not affect structural integrity of unit.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which air handling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF AIR HANDLING UNITS

- A. Install air handling units where indicated, in accordance with equipment manufacturer's published installation instructions and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes. Coordinate with other work, including ductwork, floor construction, roof decking and piping, as necessary to interface installation of air handling units with other work. Provide access space around air handling units for service as indicated, but in no case less than that recommended by manufacturer.
- B. Install floor-mounted air handling units on 4" high reinforced concrete pad, 4" larger on each side than unit base. If fan motors are not internally isolated mount air handling units on spring vibration isolators, in accordance with manufacturer's instructions.

3.3 STARTUP AND CLOSEOUT PROCEDURES

- A. Upon completion of installation of air handling units, start-up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.
- B. Provide one complete extra set of filters for each air handling unit. Install new filters at completion of air handling system work, and prior to testing, adjusting and balancing work. Obtain receipt from OWNER that new filters have been installed, and the extra set has been received.
- C. Provide one set of extra belts for each belt-driven air handling unit. Obtain receipt from OWNER that belts have been received.

END OF SECTION 23 73 13

SECTION 23 91 00 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Variable Frequency Drives (VFDs).
- B. Fuses.
- C. Enclosures.
- D. Mechanical Bypass.

1.2 SCOPE OF WORK

- A. It is the intent of this specification for the Division 23 Contractor to provide UL approved and labeled, VFD equipment and control interface.
- B. Any changes to this specification shall have prior approval of the Project Architect/Engineer (PA/E).
- C. Scope of work related to this specification section shall be distributed as follows:
 - 1. Division 23 Mechanical Subcontractor to supply the VFD.
 - 2. Division 26 Electrical Subcontractor to provide power and TVSS to the VFD and, if not pre-wired to packaged equipment, provide power from the drive to the equipment.
 - 3. Division 23 Controls Subcontractor to provide controls interface to include conduit, cable, terminations, and interface software.
 - 4. VFD Manufacturer to provide startup, training, and validate proper operation of the VFD.

1.3 RELATED SECTION

- A. Section 230510 General Mechanical Requirements.
- B. Section 230900 Instrumentation & Control for HVAC.

1.4 REFERENCES

- A. Underwriters Laboratory—UL 508C.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01 or Division 230510 – General Mechanical Requirements, or this Section, whichever is more stringent.
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

1.6 WARRANTY

- A. Manufacturer shall warrant (in writing) the equipment to be free from defects in materials and workmanship. This warranty shall extend for a period of two years or per the Manufacturer's published standard warranty, whichever is longer, starting from Substantial Completion.

- B. Manufacturer agrees to provide parts, labor, travel, and shipping for a minimum period of two years to replace defective parts or repair defects in workmanship. For the remainder of the warranty period, if any, replacement materials shall be provided at no charge but labor shall be at the Owner's expense. Provided the standard manufacturer's published warranty exceeds two years, the manufacturer shall provide replacement parts to the authorized service dealer under contract to the District.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS—VARIABLE FREQUENCY DRIVE

- A. ABB.
- B. Danfoss Graham.
- C. Toshiba.
- D. Square 'D'
- E. Eaton / Cutler Hammer
- F. Re-labeled products manufactured by the listed acceptable Manufacturer's as an OEM product shall not be accepted.

2.2 PRODUCTS

- A. Variable Frequency Drive (VFD) Motor Speed Controller (Refer to Drawings for Voltage, Size, and Location.)
 - 1. Variable frequency drive and motor shall provide full motor nameplate rated horsepower as scheduled with no derating and shall be UL 508C listed.
 - 2. The controller shall be furnished in an enclosure which shall be a NEMA-1 enclosure and be configured as a motor starter. NEMA-4x stainless steel with gasketing shall be provided for highly corrosive exterior applications such as cooling tower yards. NEMA 3R is acceptable for other exterior applications. Refer to drawings for exact rating. The enclosure shall contain the following VFD components:
 - 3. Output thermal motor overloads
 - 4. 3 phase input line reactor (3%)
 - 5. VFD shall contain circuitry to automatically restart after input power outage. This circuitry shall be contained in the same cabinet as the VFD components.
 - 6. The controller shall be of the pulse width modulated (PWM) type.
 - 7. The variable frequency controller shall convert 60 hertz utility power to variable voltage/frequency, A-C power pulse width modulation for motor speed control. The drive shall have one minute rating of 110% of rated current.
 - 8. The variable frequency controller shall have two sections as follows:
 - a) Converter/Rectifier:
 - 1) Filter Capacitor Assembly
 - b) Inverter:
 - 1) Three identical output power modules. (if applicable)

9. The variable frequency controller shall have the following basic functions:
 - a) Start/stop and speed selection.
 - b) VFD Auto/Off/Bypass.
 - c) Auto operation via 4 to 20 mA and 0 to 10 VDC control systems.
 - d) Adjustable timed acceleration and deceleration.
 - e) Minimum and maximum adjustable speed set limits.
 - f) Manual operation: Turn POT or UP/DOWN arrows to adjust output.
 - g) Digital display of output frequency, voltage, current (percentage readings are acceptable for speed only).
 - h) Ability to lock out specific frequencies.
 - i) Contacts for alarm notification to energy management system.
 - j) Local display.

 10. The variable frequency controller shall have the following protective devices and/or features:
 - a) Lockable means of disconnect (or manual disconnect).
 - b) Input magnetic circuit breaker.
 - c) Protection for Overcurrent, Ground Fault, Input Phase Loss, Over-Temperature (heatsink), Auxiliary Voltage Short Circuit, Motor Overload (I_{2t}), Overvoltage (+30% of rated), Undervoltage (-35% of rated), Microprocessor Fault, Motor Stall, and Serial Communication Fault.
 - d) A-C overload function which continuously monitors output current and shuts down D-C module gate signals if motor current exceeds 115% of rated current for one minute.
 - e) NEMA-1 Construction.
 - f) Drive/Bypass hardware selector switch.
 - g) Provide low voltage protection on the 110 VAC contactor control circuit (NCC-VNC series or equal).

 11. The variable frequency controller shall have the following adjustable controls:
 - a) Volts/Hertz
 - b) Acceleration Rate
 - c) Deceleration Rate

 12. The three phase, 3%, impedance input line reactor shall be provided to minimize drive harmonics on the A-C line and protect the drive from damaging electrical system transients.
- B. BYPASS: Each drive shall be equipped with either a 3 contactor manual bypass or a two contactor electronic bypass. (Drives for redundant pumps and for relief and exhaust fans do not require a bypass. See plans for drives that do not require a bypass) The bypass shall be by the drive manufacturer. Bypass shall carry the same manufacturer's warranty as the drive.
1. Manual Bypass: VFD with a manual bypass shall contain a three-contactor, manual bypass to line circuitry. Bypass shall be installed in a separate rated cabinet adjacent to the VFD. Provide a 110 VAC control transformer and contactors for the manual bypass. Provide low voltage protection on the 110 VAC contactor control circuit (NCC-VNC series or equal).
 2. Bypass shall be by the drive manufacturer.
 3. Electronic Bypass: Two contactor electronic shall be equipped with the following:
 - a) Bypass shall be completely factory wired, UL 508 labeled, and tested electronic bypass.
 - b) Bypass shall be 2 contactor (output and bypass contactors) with a manual service

isolation switch to line voltage only. Manual disconnect for entire VFD and Bypass is not acceptable as service disconnect.

- c) 3-phase control power capable of +30% to -35% nominal voltage fluctuations.
- d) Bypass controls shall be independent of drive controls. Common circuit board for VFD and bypass are not acceptable.
- e) 100,000 AIC rating.
- f) Bypass shall be by the drive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install variable frequency controllers where indicated on drawings.
- B. Drives for redundant pumps and for relief and exhaust fans do not require a bypass. See plans for drives that do not require a bypass
- C. Install per Manufacturer's written instructions.
- D. Provide adequate space around the VFD for ventilation.
- E. Start-up Contractor shall set motor nameplate values.
- F. Comply with all setback requirements per NEC.
- G. Do not install near outside air ventilation louvers.
- H. All maintainable parts and wiring shall be accessible from floor level.
- I. If a disconnect is provided on the output of the drive, provide an electrical interlock to disable the VFD when the local disconnect is pulled.
- J. Separate conduits for line, load, and control.
- K. Permanently set wall anchor nuts with no bolts sticking out of the wall. Stud mounts or lag bolts shall not be accepted.
- L. If a local disconnect is provided for the VFD, then a permanently affixed warning label shall be provided on the local disconnect. The label shall read "Do not energize this disconnect without verifying the VFD is powered OFF to prevent damage to the drive".

3.2 DOCUMENTATION

- A. Contractor shall provide one copy of Operation and Maintenance Manual and the same information on CD-ROM/DVD per Division 230510 or General Conditions, whichever is more stringent.

END OF SECTION 23 91 00

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency and testing agency's field supervisor.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Subject to compliance with requirements, provide product by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. Dossert; AFL Telecommunications LLC.
 - 3. ERICO International Corporation.
 - 4. Fushi Copperweld Inc.
 - 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 6. Harger Lightning and Grounding.
 - 7. ILSCO.
 - 8. O-Z/Gedney; A Brand of the EGS Electrical Group.
 - 9. Robbins Lightning, Inc.
 - 10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches x 12 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor.
 - 1. Bury at least 24 inches below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. (as noted) AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to

- building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor.
1. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall contract a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and

include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
 - 1. Service ground: 5 ohm(s).
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance. Contractor is responsible for materials and labor to install a service ground connection that is 5 ohms or less.

END OF SECTION 260526

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
 - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 4. Fitting and Accessory Materials: Same as channels and angles.
 5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
3. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney.
 - 6. Picoma Industries.
 - 7. Republic Conduit.
 - 8. Robroy Industries.
 - 9. Southwire Company.
 - 10. Thomas & Betts Corporation.
 - 11. Western Tube and Conduit Corporation.
 - 12. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.

- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.
 - 3. Arco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corporation.
 - 6. Condux International, Inc.
 - 7. Electri-Flex Company.
 - 8. Kraloy.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Niedax-Kleinhuis USA, Inc.
 - 11. RACO; Hubbell.
 - 12. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. LFNC: Comply with UL 1660.
- E. Rigid HDPE: Comply with UL 651A.
- F. Continuous HDPE: Comply with UL 651B.
- G. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- H. RTRC: Comply with UL 1684A and NEMA TC 14.

- I. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- J. Fittings for LFNC: Comply with UL 514B.
- K. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- L. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Mono-Systems, Inc.
 - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Prime coated, ready for field painting.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Mono-Systems, Inc.
 - b. Panduit Corp.
 - c. Wiremold / Legrand.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Adalet.
 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 3. EGS/Appleton Electric.
 4. Erickson Electrical Equipment Company.
 5. FSR Inc.
 6. Hoffman.
 7. Hubbell Incorporated.
 8. Kraloy.
 9. Milbank Manufacturing Co.
 10. Mono-Systems, Inc.
 11. O-Z/Gedney.
 12. RACO; Hubbell.
 13. Robroy Industries.
 14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal.
 2. Shape: Rectangular.
 3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- L. Gangable boxes are allowed.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: EMT and Type EPC-40-PVC.
 3. Underground Conduit: Type EPC-40-PVC.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
- C. Minimum Raceway Size: **3/4-inch** trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use compression fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.5 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 2. Subject to compliance with requirements, provide or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 - 3. Sealing Elements: EPDM or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 4. Pressure Plates: Carbon steel.
 - 5. Connecting Bolts and Nuts: Carbon steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 - 2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. 120/208: black; 277/480: orange.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
 - 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.4 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
 - 5. Color: Black.

- B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi .
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.

- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

- C. Apply identification devices to surfaces that require finish after completing finish work.

- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.

- 2) Phase B: Orange.
 - 3) Phase C: Yellow.
- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- E. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: [Engraved, laminated acrylic or melamine label] [Stenciled legend 4 inches high].
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be [self-adhesive, engraved] [engraved], laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchgear.
 - e. Switchboards.
 - f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - g. Substations.
 - h. Emergency system boxes and enclosures.
 - i. Motor-control centers.
 - j. Enclosed switches.
 - k. Enclosed circuit breakers.
 - l. Enclosed controllers.
 - m. Variable-speed controllers.

- n. Push-button stations.
- o. Power transfer equipment.
- p. Contactors.
- q. Remote-controlled switches, dimmer modules, and control devices.
- r. Battery-inverter units.
- s. Battery racks.
- t. Power-generating units.
- u. Monitoring and control equipment.
- v. UPS equipment.
- w. <Insert equipment>.

END OF SECTION 260553

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Weather-resistant receptacles.
 - 3. Snap switches and wall-box dimmers.
 - 4. Solid-state fan speed controls.
 - 5. Wall-switch and exterior occupancy sensors.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 3. Leviton Mfg. Company Inc. (Leviton).
 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.
 - d. Leviton; 7590.
2. Description:
 - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide the following:

- 1) Cooper; AH1221.
- 2) Hubbell; HBL1221.
- 3) Leviton; 1221-2.
- 4) Pass & Seymour; CSB20AC1.

2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.035-inch. Color selected by Architect.
 3. Material for Unfinished Spaces: Galvanized steel.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Blank cover with bushed cable opening, Four modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.11 FINISHES

- A. Device Color:
 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
 2. Verify that dimmers used for fan speed control are listed for that application.
 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- 3.2 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.3 IDENTIFICATION
- A. See plans.
- 3.4 FIELD QUALITY CONTROL
- A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.

- D. Prepare test and inspection reports.

END OF SECTION 262726

APPENDIX A - SPECIFIC PURPOSE SURVEY

DESCRIPTION:
A Specific Purpose Survey to locate the existing conditions and constructed improvements in close proximity to the HVAC Cooler System at the Government Center located at 540 S. Commerce Avenue, Sebring, Highlands County, Florida.

SURVEYOR'S NOTES:
1) THIS IS NOT A BOUNDARY SURVEY.
2) Underground improvements, if any, were not located unless shown hereon.
3) Attention is directed to the fact that this survey drawing may have been reduced or enlarged in size during reproduction.
4) Irrigation system not located.

VERTICAL CONTROL DATA:
ORIGINAL BENCHMARK:
NGS Identification: DJS282, Designation: F 656
Found unstamped FDOT Survey Disc in the southwest end of the concrete bridge guardrail roughly 3.0' above pavement level of U.S. Highway 27, bridge between Lake Jackson & Little Lake Jackson, in Section 31, Township 34 South, Range 29 East, Highlands County. Disc elevation = 114.12, referenced to the North American Vertical Datum of 1988.

HORIZONTAL CONTROL DATA:
Coordinates shown hereon were derived from GPS observations of the following local geodetic horizontal control points, referenced to the Florida State Plane Coordinate System, East Zone, North American Datum of 1983 (2007 Adjustment):
POINT IDENTIFICATION: AF7411 POINT IDENTIFICATION: AF6100
DESIGNATION: AVONPORT DESIGNATION: S - 115
NORTHING: 1,184,550.92 NORTHING: 1,191,876.57
EASTING: 485,608.89 EASTING: 513,795.34
(Steel rod & cap stamped "Avonport 1989") (Bronze disc in endwall stamped "S115 1945")

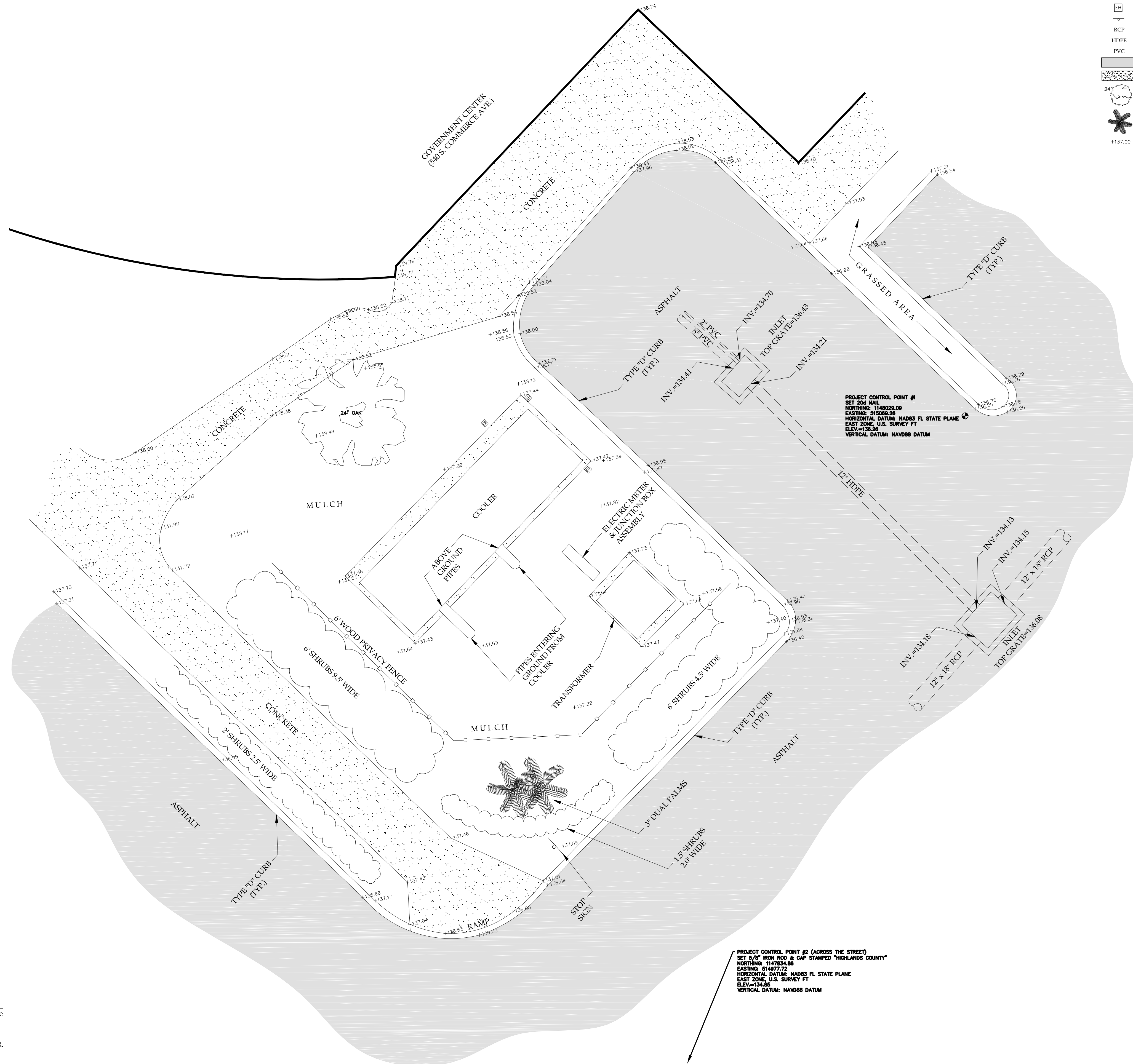
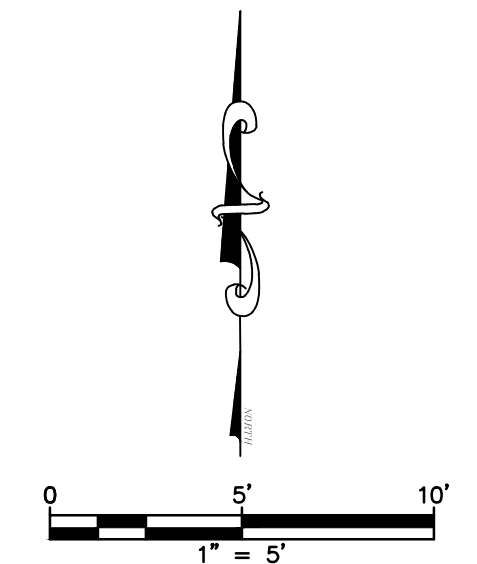
PROJECT CONTROL DATA:
PROJECT CONTROL POINT #1
SET 20d NAIL
NORTHING: 1148029.09
EASTING: 515069.26
ELEVATION: 136.26

PROJECT CONTROL POINT #2
SET 5/8" IRON ROD & CAP STAMPED "HIGHLANDS COUNTY"
NORTHING: 1147834.86
EASTING: 514977.72
ELEVATION: 134.85

I hereby certify that I am a Florida Registered Professional Land Surveyor and that the map or plat shown hereon is a graphic representation of the described lands recently surveyed under my direction and meets or exceeds the "Standards of Practice" as set forth by the Board of Professional Surveyors and Mappers, Chapter 5J-17.050 through .052 of the Florida Administrative Code, pursuant to Section 472.027 of the Florida Statutes.

EMBOSSSED
SEAL
Ralph H. Whisler III, P.L.S. Signature Date
Florida Registration # LS 5248
Highlands County Surveyor
NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.

- LEGEND:**
- = Electrical Junction Box
 - = Stop Sign
 - = Reinforced Concrete Pipe
 - = High-Density Polyethylene
 - = Polyvinyl Chloride
 - = Asphalt Area
 - = Concrete Area
 - = Oak Tree (Trunk Diameter in inches)
 - = Cabbage Palm Tree
 - = Typical Spot Elevation



PROJECT CONTROL POINT #2 (ACROSS THE STREET)
SET 5/8" IRON ROD & CAP STAMPED "HIGHLANDS COUNTY"
NORTHING: 1147834.86
EASTING: 514977.72
HORIZONTAL DATUM: NAD83 FL STATE PLANE
EAST ZONE, U.S. SURVEY FT
ELEV=134.85
VERTICAL DATUM: NAVD83 DATUM

REVISIONS						DESIGNED BY:	HIGHLANDS COUNTY ENGINEERING DEPARTMENT		COUNTY OF HIGHLANDS STATE OF FLORIDA	GOVERNMENT CENTER HVAC COOLER SPECIFIC PURPOSE SURVEY		SCALE: 1"=5'
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	—	505 S. COMMERCE AVENUE SEBRING, FLORIDA 33870			DRAWING NO. 15068	REV. 0	SHEET 1 OF 1
						DRAWN BY: BWD	APPROVED BY: RALPH H. WHISLER III, P.L.S.		DATE:			
						CHECKED BY: R. Whisler	FLORIDA REGISTRATION NO.: LS #5248					
						IN CHARGE: R. WHISLER III, P.L.S.						
						FIELD SURVEY: AUGUST 23, 2017						

HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS GOVERNMENT CENTER - HVAC RENOVATION

SWEET SPARKMAN
ARCHITECTS

600 S. COMMERCE AVE.
SEBRING, FL. 33870



VICINITY MAP
N.T.S

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COVER

ARCHITECTURAL

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M1.1 MECHANICAL SCHEDULES
M2.0 CHILLER YARD FLOOR PLAN - MECHANICAL - PHASE I
M2.1 CHILLER YARD FLOOR PLAN - MECHANICAL - PHASE II
M2.2 MECHANICAL FIRST FLOOR PLAN
M2.3 MECHANICAL FIRST FLOOR PLAN
M2.4 MECHANICAL FIRST FLOOR PLAN
M2.5 MECHANICAL SECOND FLOOR PLAN
M2.6 MECHANICAL SECOND FLOOR PLAN
M3.0 MECHANICAL DETAILS
M3.1 MECHANICAL DETAILS

ELECTRICAL

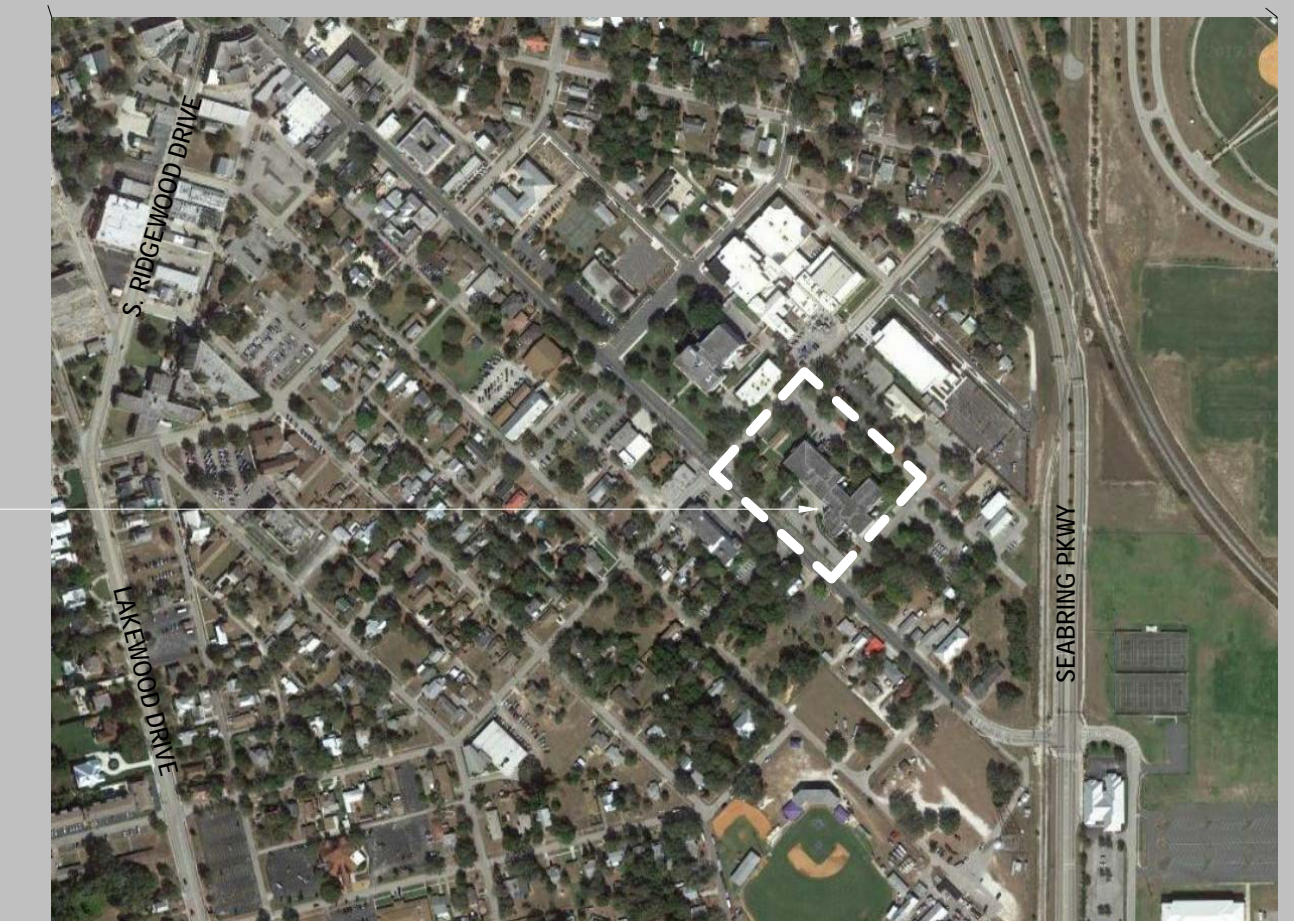
E1.0 GENERAL NOTES
E2.0 ELECTRICAL PLAN

SYMBOLS

- DETAIL SECTION
- EXTERIOR ELEVATION
- LEVEL LINE
- DRAWING NOTE
- DIRECTION OF SLOPED SURFACE
- STANDARD SYMBOLS
12" = 1'-0"

SITE LOCATION MAP

600 S. COMMERCE AVE.
SEBRING, FL. 33870



SITE

OWNER

HIGHLANDS COUNTY BOARD OF
COUNTY COMMISSIONERS
600 S. COMMERCE AVENUE
SEBRING, FL 33870
MS. SUZANNE HUNNICUTT
CAPITAL PROJECTS MANAGER
PHONE: 863.402.6932

ARCHITECT

SWEET SPARKMAN ARCHITECTS
2168 MAIN STREET
SARASOTA, FLORIDA 34237
CONTACT: TODD M. SWEET, AIA LEED AP
PRINCIPAL
PHONE: 941.952.0084
FAX: 941.952.0201

STRUCTURAL ENGINEER

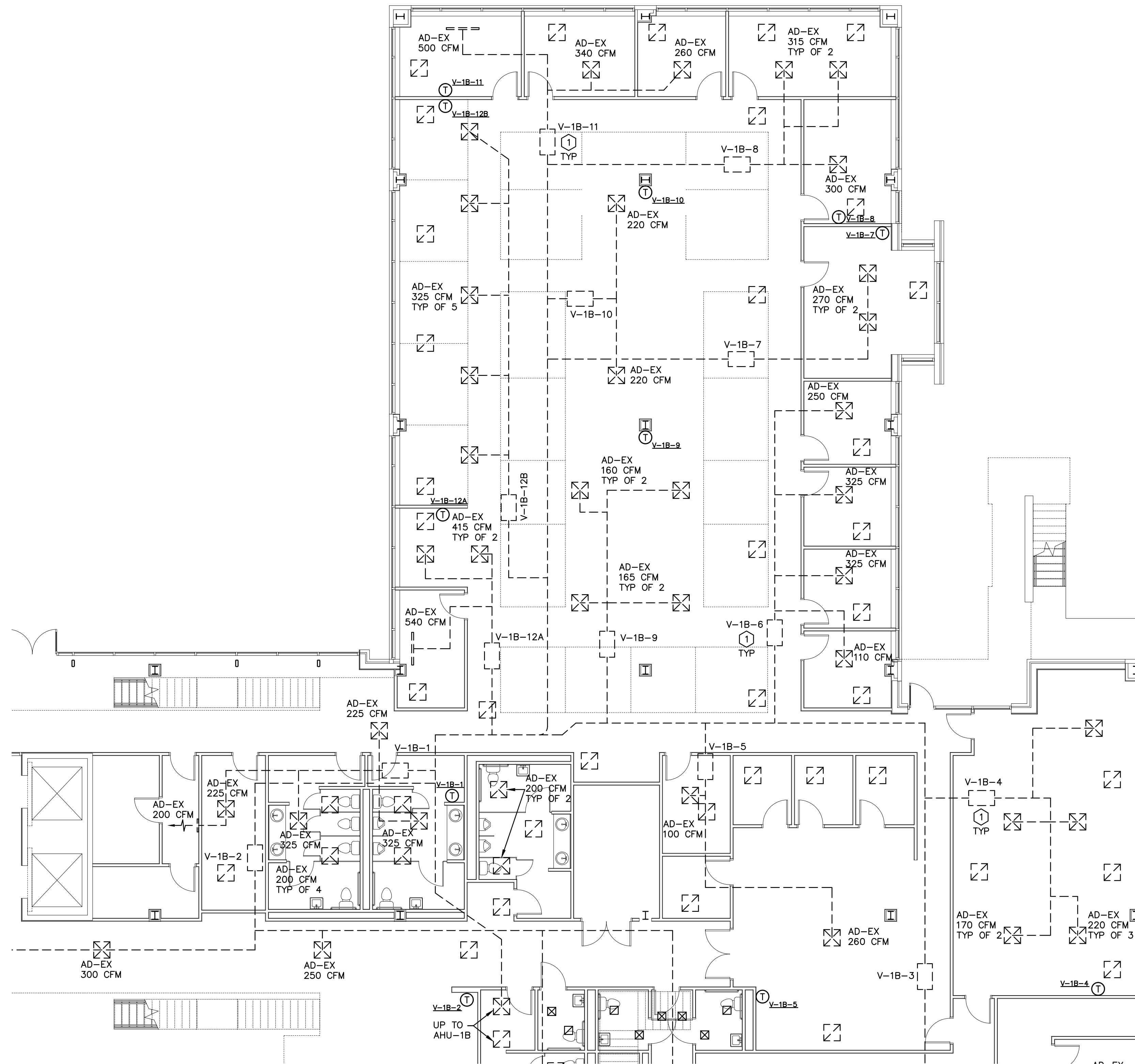
COLLINS STRUCTURAL ENGINEERING
149 GRAND OAK CIRCLE
VENICE, FL 34292
CONTACT: STEPHEN K. COLLINS, P.E.
PHONE: 941.223.1584
FAX: 941.451.8553

MEP ENGINEER

PYRAMID ENGINEERING
5596 RIO VISTA DRIVE
CLEARWATER, FLORIDA 33760
CONTACT: MICHAEL J. CURKAN, PE
PRESIDENT
PHONE: 727.531.2989

NOTE: THE SCALE OF THESE PLANS MAY HAVE
CHANGED DUE TO REPRODUCTION

HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS -
GOVERNMENT CENTER - HVAC RENOVATION
17471 - 100% CONSTRUCTION DOCUMENTS - 11/20/2017

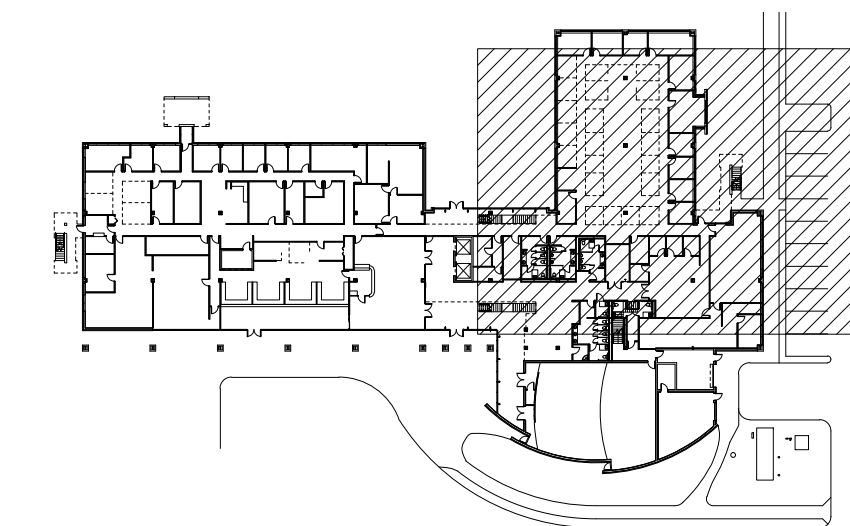


FIRST FLOOR PLAN - MECHANICAL

SCALE: 1/8"=1'-0" /4023-M2.3

MECHANICAL NOTES:

- ① EXISTING VAV TERMINAL TO BE REUSED. REMOVE AND REPLACE CONTROLS WITH NEW. INSTALLATION SHALL INCLUDE NEW WALL MOUNTED TEMPERATURE SENSOR/THERMOSTAT. REBALANCE TO AIR FLOWS INDICATED ON SCHEDULE.
- ② EXISTING COMPUTER ROOM UNIT TO BE REUSED. PROVIDE NEW TEMPERATURE SENSOR TO MONITOR TEMPERATURE.



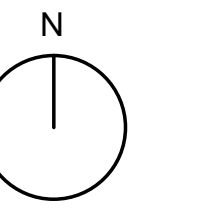
KEY PLAN
N.T.S.

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NOT FOR CONSTRUCTION
HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
GOVERNMENT CENTER - HVAC RENOVATION
600 S. COMMERCE AVE.
SEBRING, FL 33870

PROJECT TITLE:
ISSUED FOR: 100% CONSTRUCTION DOCUMENTS

11/13/2017

REV DESCRIPTION DATE

GRAPHIC SCALE:
0' 1'

SCALE: 1/8" = 1'-0"

PROJECT MANAGER:

DRAWN BY: RC

A/E OF RECORD:

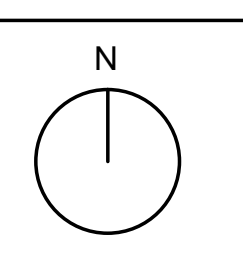
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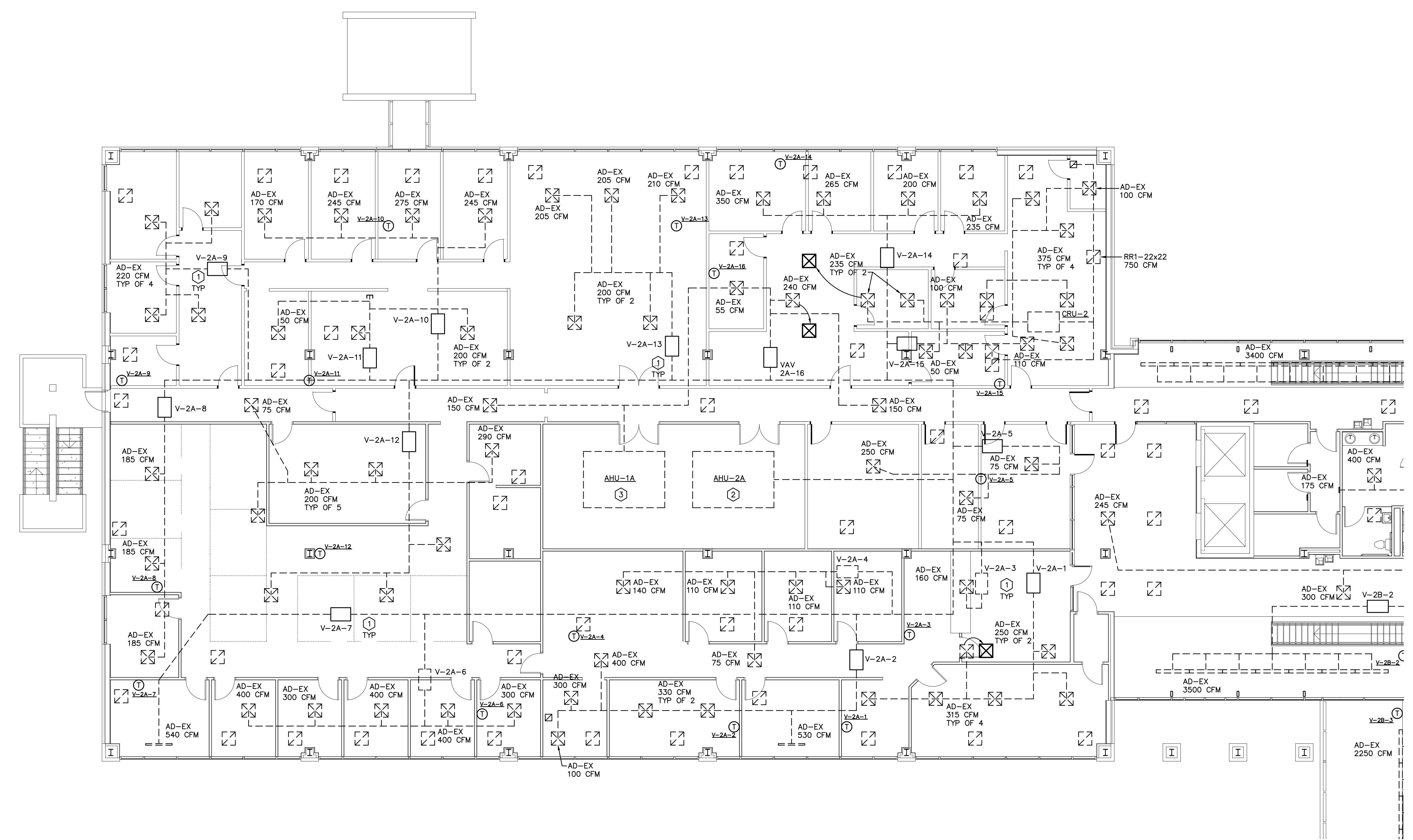
MECHANICAL FIRST FLOOR PLAN

SHEET No.: **M2.3**

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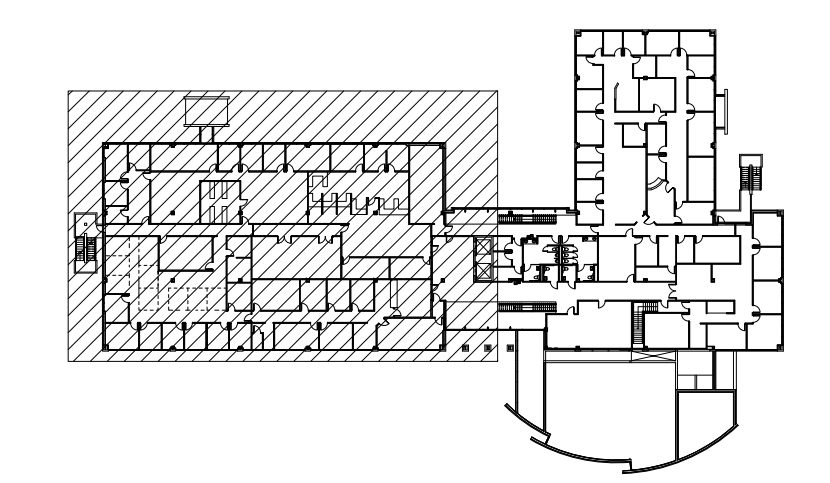


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SEBRING, FL 33870
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11/13/2017



SECOND FLOOR PLAN - MECHANICAL
SCALE: 1/8"=1'-0" /4023-M2.5

- MECHANICAL NOTES:**
- ① EXISTING VAV TERMINAL TO BE REUSED. REMOVE AND REPLACE CONTROLS WITH NEW. INSTALLATION SHALL INCLUDE NEW WALL MOUNTED TEMPERATURE SENSOR/THERMOSTAT. REBALANCE TO AIR FLOWS INDICATED ON SCHEDULE.
 - ② EXISTING AIR HANDLER, AHU-2A, TO BE REUSED. CLEAN AND SERVICE UNIT PRIOR TO REUSE. REMOVE EXISTING INLET GUIDE VANES AND ASSOCIATED CONTROL ELEMENTS AND REPLACE WITH NEW 20HP VFD. PROVIDE NEW SENSORS, ACTUATORS AND CONTROL ELEMENTS FOR A COMPLETE INSTALLATION. REBALANCE UNIT TO:
13,120 CFM SUPPLY AIR
1,475 CFM OUTSIDE AIR
89.4 GPM CHILLED WATER
 - ③ EXISTING AIR HANDLER, AHU-1A, TO BE REUSED. CLEAN AND SERVICE UNIT PRIOR TO REUSE. REMOVE EXISTING INLET GUIDE VANES AND ASSOCIATED CONTROL ELEMENTS AND REPLACE WITH NEW 20HP VFD. PROVIDE NEW SENSORS, ACTUATORS AND CONTROL ELEMENTS FOR A COMPLETE INSTALLATION. REBALANCE UNIT TO:
11,700 CFM SUPPLY AIR
1,950 CFM OUTSIDE AIR
81.0 GPM CHILLED WATER



KEY PLAN
N.T.S.

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MECHANICAL
SECOND
FLOOR PLAN
SHEET No.: **M2.5**

SCOPE OF DEMAND CONTROLLED VENTILATION WORK

1. INSTALLATION

A. PROVIDE AND INSTALL ALL SENSORS, WIRING, AIR FLOW MONITORS, MOTORIZED DAMPERS, ETC... REQUIRED TO PROVIDE A "TURN KEY" DEMAND CONTROLLED VENTILATION SYSTEM AS DESCRIBED IN THE "SEQUENCE OF OPERATION" OUTLINED BELOW. THE EXISTING AIRFLOW MONITORING STATIONS, MOTORIZED DAMPERS AND AIR HANDLER CAN BE REUSED IF SUITABLE FOR REUSE. THIS WORK SHALL INCLUDE ANY INTERFACES AND PROGRAMMING REQUIRED TO COMPLETELY INTEGRATE THIS NEW FEATURE INTO THE SITE'S NEW EMS.

B. INSTALLATION SHALL INCLUDE COORDINATION ASSISTANCE WITH THE TEST AND BALANCE CONTRACTOR AND A TWO (2) HOUR TRAINING SESSION WITH THE OWNER.

2. SEQUENCE OF OPERATION

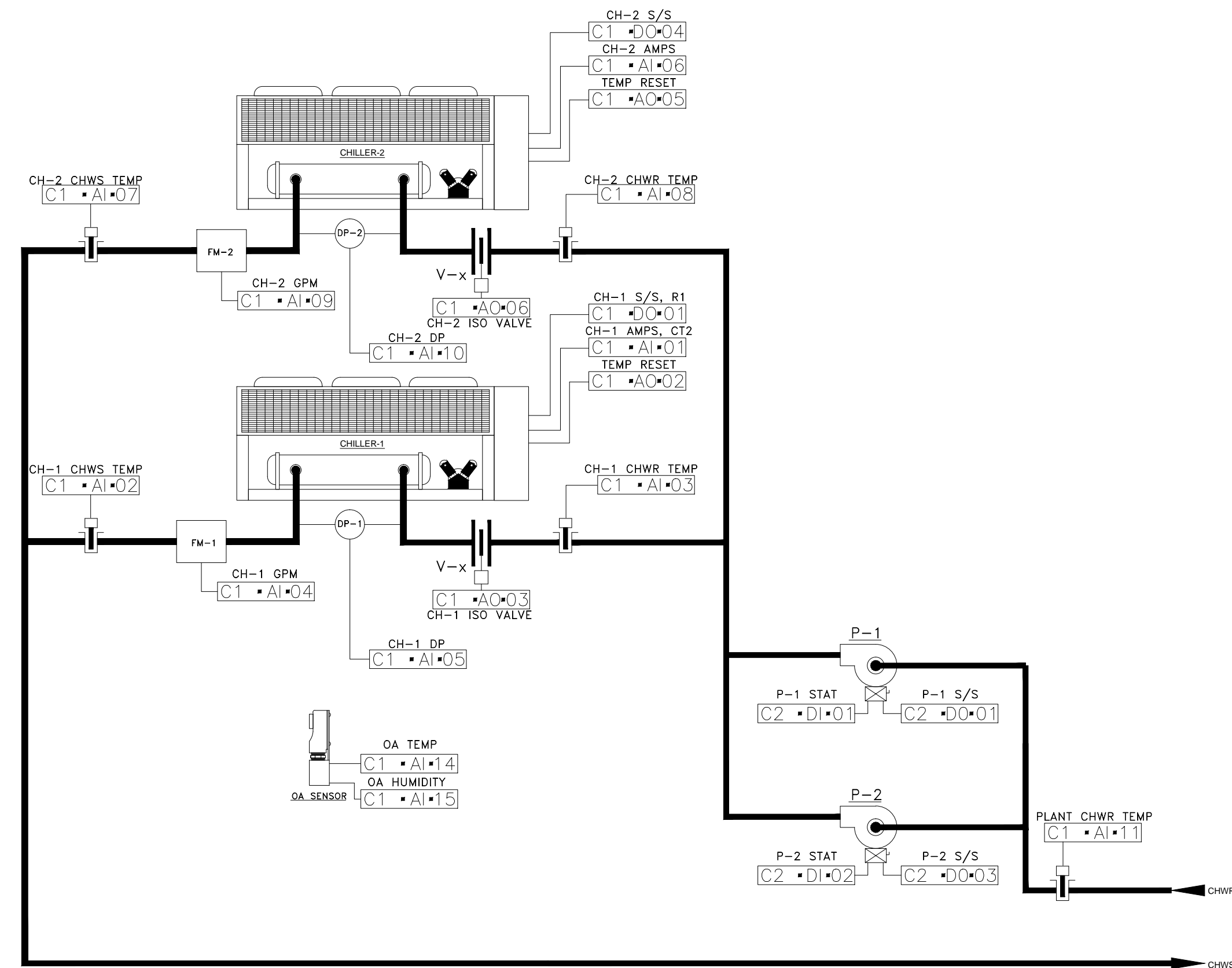
A. DEMAND CONTROLLED VENTILATION:

A DEMAND CONTROLLED VENTILATION FEATURE SHALL BE ADDED TO THE SYSTEM. ON A DROP IN CO2 LEVELS BELOW THE SET POINT (500 PPM, ADJUSTABLE) THE CONTROLLER SHALL REDUCE AIRFLOW BY 10% OF CURRENT CAPACITY BY MODULATING THE MOTORIZED CONTROL DAMPER CLOSED. THE SYSTEM SHALL MONITOR CO2 LEVELS EVERY 10 MINUTES AND CONTINUE TO REDUCE OUTSIDE AIRFLOW IN 10% INCREMENTS UNTIL THE SYSTEM REACHES ITS MINIMUM AIRFLOW SET POINT. ON A RISE IN CO2 LEVELS, THE OPPOSITE SHALL OCCUR.

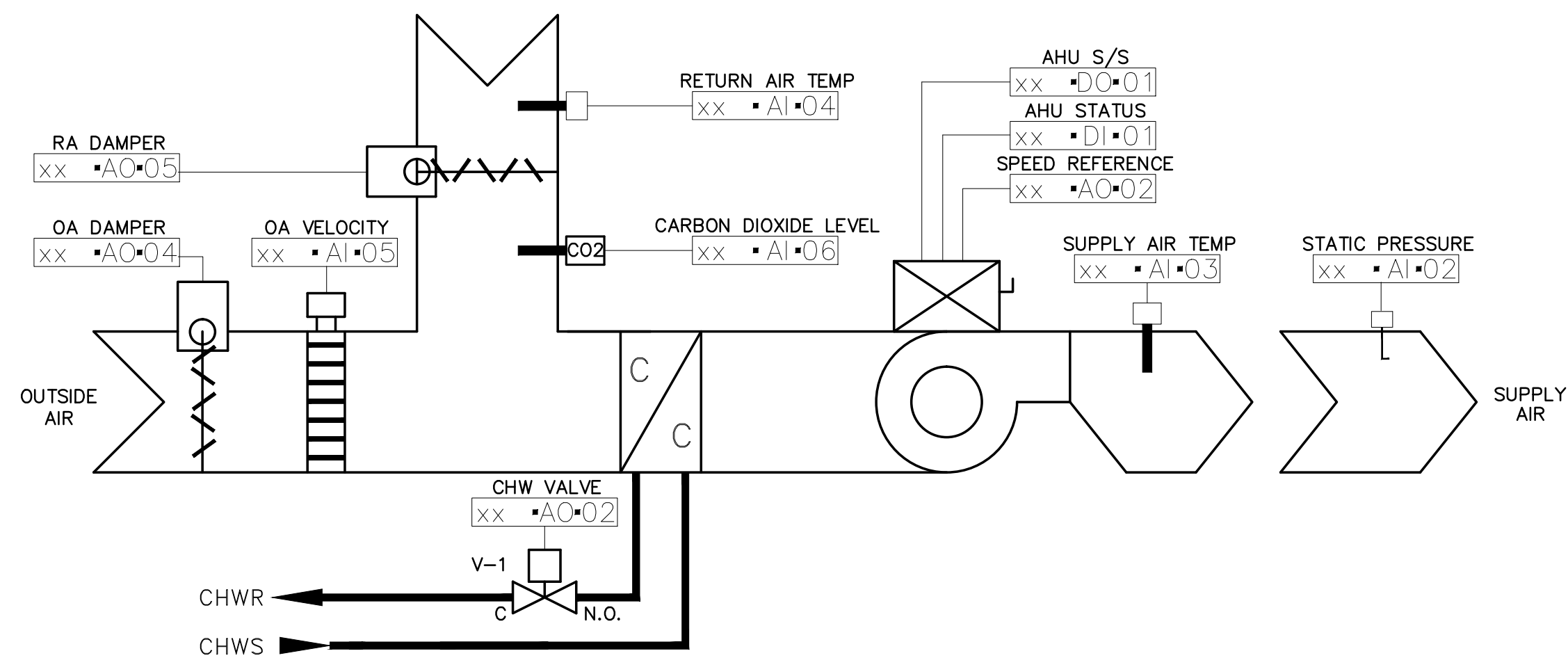
ON UNITS PROVIDED WITH AN OUTSIDE AIR FAN, IF CO2 LEVEL REMAINS ABOVE THE SET POINT WHEN THE DAMPERS ARE FULLY OPEN, THE OUTSIDE AIR FAN SHALL START.

IN THE UNOCCUPIED MODE, THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED; OUTSIDE AIR FANS SHALL REMAIN OFF.

3. REBALANCE OUTSIDE AIR AND EXHAUST SYSTEMS AS NOTED ON DRAWINGS AND SCHEDULES.



CHILLER PLANT CONTROLS
N.T.S.

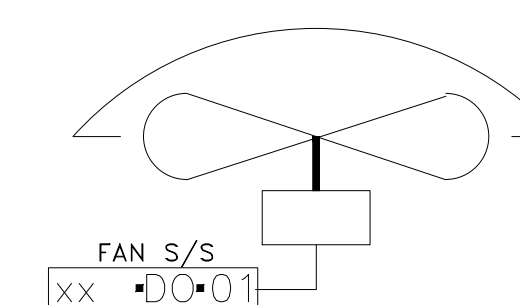


AHU POINT SUMMARY				
INPUTS		OUTPUTS		
DESCRIPTIONS	SGNL.	NO	SGNL.	DESCRIPTIONS
AHU STATUS	DI	1	DO	AHU START/STOP
STATIC PRESSURE	AI	2	AO	VFD SPEED REFERENCE
SUPPLY AIR TEMP	AI	3	DO	CHW VALVE
RETURN AIR TEMP	AI	4	DO	OUTSIDE AIR DAMPER
OA VELOCITY	AI	5	DO	RETURN AIR DAMPER
CARBON DIOXIDE LEVELS	AI	6		
		7		
		8		

VARIABLE AIR VOLUME AIR HANDLER WITH DEMAND CONTROLLED VENTILATION CONTROLS
N.T.S.

CHILLER PLANT PLC1 POINT SUMMARY				
INPUTS		OUTPUTS		
DESCRIPTIONS	SGNL.	NO	SGNL.	DESCRIPTIONS
CH-1 AMPS	AI	1	DO	CH-1 S/S
CH-1 CHWS TEMP	AI	2	AO	CH-1 TEMP RESET
CH-1 CHWR TEMP	AI	3	AO	CH-1 ISO VALVE
CH-1 CHWS GPM	AI	4	DO	CH-2 S/S
CH-1 DP	AI	5	AO	CH-2 TEMP RESET
CH-2 AMPS	AI	6	AO	CH-2 ISO VALVE
CH-2 CHWS TEMP	AI	7		
CH-2 CHWR TEMP	AI	8		
CH-2 CHWS GPM	AI	9		
CH-2 DP	AI	10		
PLANT CHWR TEMP	AI	11		
OA TEMP	AI	12		
OA HUM	AI	13		
	AI	14		
	AI	15		

CHILLER PLANT PLC2 POINT SUMMARY				
INPUTS		OUTPUTS		
DESCRIPTIONS	SGNL.	NO	SGNL.	DESCRIPTIONS
P-1 STAT	DI	1	DO	P-1 S/S
P-2 STAT	DI	2	DO	P-2 S/S



NOTE: FIVE EXISTING FANS

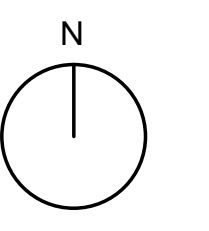
EXHAUST FANS
N.T.S. TYPICAL

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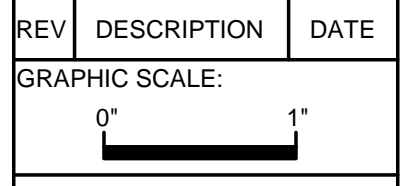
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NOT FOR CONSTRUCTION

HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
GOVERNMENT CENTER - HVAC RENOVATION
600 S. COMMERCE AVE.
SEBRING, FL 33870

PROJECT TITLE:
ISSUED FOR: 100% CONSTRUCTION DOCUMENTS
11/13/2017



SCALE: 1/16" = 1'-0"

PROJECT MANAGER:
DRAWN BY: RC
A/E OF RECORD:
PROJECT NO: 4023
SHEET TITLE:

MECHANICAL DETAILS

SHEET No.: **M3.1**

DEMOLITION:

- REMOVE EXISTING WIRING AND EQUIPMENT/DEVICES WHICH ARE NOT NECESSARY FOR THE FUNCTION OF NEW EQUIPMENT/DEVICES AND THE FUNCTIONS OF EXISTING EQUIPMENT/DEVICES REMAINING.
- REMOVE ABANDONED WIRING ENTIRELY UNLESS NOTED AND REMOVE ACCESSIBLE RACEWAYS.
- CUT, CAP AND PATCH OVER CONCEALED CONDUITS AT POINT OF EMERGENCE.
- EXISTING EQUIPMENT AND MATERIALS THAT ARE REMOVED SHALL NOT BE REUSED EXCEPT WHERE SPECIFICALLY NOTED.
- DISPOSE OF SCRAP AND DEBRIS. MAINTAIN ELECTRICAL CONTINUITY TO EQUIPMENT/DEVICES WHICH SHALL REMAIN.
- CONTRACTORS SHALL BE GUIDED BY OWNER'S REPRESENTATIVE, THE ARCHITECT AND THE ENGINEER AS TO THE REQUIREMENT FOR THE REMOVAL OF EQUIPMENT/ DEVICES WHICH MAY NOT BE INDICATED.
- REMOVE EXISTING WIRING DEVICES AS REQUIRED FOR THE REMOVAL OF WALLS AND/OR THE INSTALLATION OF NEW WALL FINISHES.
- WHERE DEVICES ARE REMOVED, CONTRACTOR SHALL ALSO REMOVE OUTLET BOX, CONDUCTORS, CONDUIT AND MOUNTING HARDWARE. EXCEPTION TO THIS REQUIREMENT MAY BE WHERE CONTRACTOR PROPOSES TO RE-USE CONDUIT CONCEALED OR OUTLET BOX RECESSED IN EXISTING WALL OR FLOOR SLAB FOR NEW WORK IF APPROVED IN ADVANCE BY THE ARCHITECT/ENGINEER

GENERAL NOTES:

- ALL WORK SHALL BE IN ACCORDANCE WITH THE 2014 FLORIDA BUILDING CODE AND THE 2011 NATIONAL ELECTRICAL CODE. WORK SHALL ALSO COMPLY WITH ALL APPLICABLE RULES AND REGULATIONS OF LOCAL LAWS AND ORDINANCES.
- CONTRACTOR SHALL MAKE A THOROUGH EXAMINATION OF THE SITE AND THE CONTRACT DOCUMENTS. NO CLAIM FOR EXTRA COMPENSATION WILL BE RECOGNIZED IF DIFFICULTIES ARE ENCOUNTERED WHICH AN EXAMINATION OF SITE CONDITIONS AND CONTRACT DOCUMENTS PRIOR TO EXECUTING CONTRACT WOULD HAVE REVEALED.
- ELECTRICAL CONTRACTOR SHALL ARRANGE FOR ALL NECESSARY PERMITS, LICENSES, UTILITY COORDINATION, AND INSPECTIONS AS REQUIRED BY THE CITY OR UTILITY COMPANY. CONTRACTOR IS RESPONSIBLE FOR ALL EQUIPMENT REQUIRED BY UTILITY COMPANY AND SHOULD INCLUDE NECESSARY COSTS IN BID.
- CONTRACTOR SHALL LEGIBLY MARK-UP A SET OF 24"x36" DRAWINGS TO REFLECT AS-BUILT CONDITIONS, AND TURN OVER TO ARCHITECT.

WIRE/RACEWAY:

- ALL CONDUCTORS SHALL BE COPPER. CONDUCTOR INSULATION SHALL BE DUAL TYPE THIN/THIN 75°C (167°F) FOR DRY, DAMP, AND WET LOCATIONS. CONDUCTOR INSULATION WITH SINGLE TYPE MARKING THHN 90°C (194°F) MAY BE USED FOR DRY LOCATIONS ONLY. ALL CONDUCTORS SHALL BE COLOR CODED AS REQUIRED BY NEC AND FURTHER IDENTIFIED AND CODED AS SPECIFIED HEREINAFTER. COLOR CODING SHALL BE BY MEANS OF COLORED INSULATING MATERIAL, COLORED BRAID OR JACKET OVER THE INSULATION OR BY MEANS OF SUITABLE COLORED, PERMANENT, NON-AGING, INSULATING TAPE APPLIED TO CONDUCTORS AT EACH CABINET OR JUNCTION POINT. THE COLOR CODING SHALL BE ACCOMPLISHED AS THE CONDUCTORS ARE INSTALLED. THE FOLLOWING SYSTEMS OF COLOR CODING SHALL BE STRICTLY ADHERED TO:
 - A) GROUND LEADS: GREEN
 - B) 120/208 VOLT UNGROUNDED PHASE WIRES:
 - PHASE A: BLACK
 - PHASE B: RED
 - PHASE C: BLUE
 - NEUTRAL: WHITE
 - C) 277/480 VOLT UNGROUNDED PHASE WIRES:
 - PHASE A: BROWN
 - PHASE B: ORANGE
 - PHASE C: YELLOW
 - NEUTRAL: GRAY

- THE COLOR CODE ASSIGNED TO EACH PHASE WIRE SHALL BE CONSISTENTLY FOLLOWED THROUGHOUT.
- BRANCH CIRCUIT CONDUCTORS ARE SIZED FOR A MAXIMUM VOLTAGE DROP OF 3% AT DESIGN LOAD PER FBC C405.7.3.2. FEEDER & SERVICE CONDUCTORS ARE SIZED FOR A MAXIMUM VOLTAGE DROP OF 2% AT DESIGN LOAD PER FBC C405.7.3.1.
 - ALL INTERIOR BUILDING CONDUCTORS SHALL BE RUN IN THIN WALL CONDUIT AND THIN WALL CONDUIT SHALL BE UNDERWRITERS' APPROVED GALVANIZED ELECTRICAL METALLIC TUBING. COUPLINGS AND CONNECTORS SHALL BE STEEL COMPRESSION TYPE, ZINC OR CADMIUM PLATED. BELOW GRADE CONDUITS SHALL BE SCHEDULE 40 PVC WITH RIGID METAL ELBOWS AND RISERS. RIGID METAL CONDUIT BELOW GRADE OR IN CONCRETE SHALL BE COATED WITH BITUMASTIC OR OR SLEEVED WITH 10 MIL POLYETHYLENE. SITE CONDUITS SHALL BE ROUTED AT 24" BELOW GRADE AND CONDUITS ROUTED BELOW BUILDINGS SHALL BE AT 36". EXTERIOR CONDUITS SHALL BE RIGID GALVANIZED STEEL.
 - RACEWAY PENETRATIONS OF FIRE RATED WALLS AND/OR FLOORS SHALL BE SEALED TO MAINTAIN INTEGRITY OF CONSTRUCTION. ALL PRODUCTS, MATERIALS AND METHODS OF INSTALLATION SHALL BE UL APPROVED AND MEET NFPA.

GROUNDING:

- THE ENTIRE ELECTRICAL SYSTEM SHALL BE COMPLETELY AND EFFECTIVELY GROUNDED AS REQUIRED BY NATIONAL ELECTRICAL CODE. ALL METALLIC RACEWAYS SHALL BE MECHANICALLY AND ELECTRICALLY SECURE AT ALL JOINTS AND AT ALL BOXES, CABINETS, FITTINGS AND EQUIPMENT.
- THE GROUNDING SYSTEM SHALL BE TESTED BY THE CONTRACTOR. THE RESISTANCE TO GROUND SHALL BE NO MORE THAN FIVE (5) OHMS. SUBMIT TEST RESULTS TO ENGINEER. CONTRACTOR SHALL MAKE UPGRADES AND ADDITIONS TO GROUNDING SYSTEM AS REQUIRED TO ACHIEVE THE (5) OHM REQUIREMENT.

OUTLET BOXES/DEVICES:

- COORDINATE DEVICE AND COVER PLATE COLORS WITH ARCHITECT.
- ALL OUTLET BOXES SHALL BE RIGIDLY MOUNTED AND SHALL BE EQUIPPED WITH SUITABLE SCREW FASTENED COVERS. OPEN KNOCKOUTS OR HOLES IN BOXES SHALL BE PLUGGED WITH SUITABLE BLANKING DEVICE.
- OUTLET BOXES SHALL BE 4 INCH SQUARE x 2-1/8" DEEP. OUTLET BOXES LOCATED ABOVE THE CEILING SHALL BE LEGIBLY IDENTIFIED WITH BRANCH CIRCUIT NUMBER OF CIRCUIT TERMINATED WITHIN BY MEANS OF BLACK PERMANENT MARKER.
- RECEPTACLES WITHIN (6) FEET OF A SINK SHALL HAVE GFCI PROTECTION.

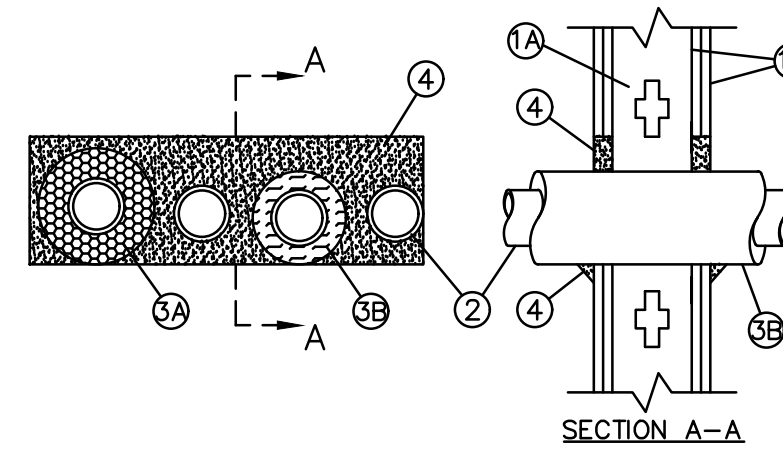
SWITCHGEAR:

- DISCONNECT SWITCHES SHALL BE HEAVY-DUTY TYPE AND MANUFACTURED MANUFACTURED BY SQUARE 'D' COMPANY OR APPROVED EQUAL: EATON OR SIEMENS. FUSES SHALL BE DUAL ELEMENT, CARTRIDGE TYPE. FUSES SHALL BE BY ONE MANUFACTURER: BUSSMAN "FUSETRON" OR CHASE-SHAMMUT "TRONIC."
- INSTALL ENGRAVED PLASTIC-LAMINATE LABELS ON EACH MAJOR UNIT OF ELECTRICAL EQUIPMENT IDENTIFYING PANELBOARD NAME OR EQUIPMENT SERVING. EXAMPLES ARE: PANELBOARDS, DISCONNECT SWITCHES, AND MOTOR STARTERS, I.E. LABELS SHALL BE 1/16" THICK BLACK PLASTIC LAMINATE WITH 3/8" WHITE CORE PLIE LETTERS.
- PANELBOARD DIRECTORY CARDS SHALL BE TYPED WITH ACCURATE AND CURRENT INFORMATION BY THE CONTRACTOR AT THE END OF CONSTRUCTION.
- MAGNETIC FULL VOLTAGE STARTERS SHALL BE SQUARE D CLASS 8536, MAGNETICALLY OPERATED WITH THREE THERMAL OVERLOAD UNITS AND FOUR AUXILIARY CONTACTS. CONTROL VOLTAGE SHALL BE 24 VOLTS SUPPLIED FROM AN INTERNAL CONTROL POWER TRANSFORMER WHERE NO OTHER SUPPLY OF CONTROL POWER IS INDICATED. HOA SWITCH SHOULD BE MOUNTED IN FRONT COVER. COMBINATION UNITS SHALL BE SQUARE D CLASS 8538 WITH THREE POLE HORSEPOWER RATED, NON-FUSIBLE DISCONNECT SWITCH INCLUDED IN THE ENCLOSURE OR APPROVED EQUAL: EATON OR SIEMENS.
- ALL MULTI-WIRE BRANCH CIRCUIT BREAKERS ARE TO BE TIED TOGETHER BY AN IDENTIFIED HANDLE-TIE OR BY A COMMON TRIP CIRCUIT BREAKER PER 2011 NEC SECTION 210.4(B).

RATED THRU WALL PIPE PENETRATION

NTS

System No. W-L-8010
May 19, 2005
F Ratings - 1 & 2 Hr (See Item 1)
T Ratings - 1/4, 3/4, 1, 1-1/2 and 1-3/4 Hr (See Items 2 & 3)



1. Wall Assembly - The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

- A. Studs - Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 in. by 4 in. (51 mm to max 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.
 - B. Gypsum Board* - Nom 5/8 in. (16 mm) thick gypsum wallboard, as specified in the individual Wall and Partition Design. Max area of opening is 65-1/4 sq in. (421 cm2) with max dimension of 14-1/2 in. (368 mm).
- The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly.

2. Through Penetrants - A max of four pipes, conduits or tubing to be installed within the opening. The space between pipes, conduits or tubing shall be min 1/2 in. to max 1-5/16 in. (13 mm to max 33 mm). The space between pipes, conduits or tubing and periphery of opening shall be min 1-3/16 in. (30 mm) for uninsulated copper tubes and copper pipes (Items 2C and 2D) and 0 in. (point contact) for insulated copper tubes and copper pipes and uninsulated steel pipes and conduit (Item 2B). The space between pipes, conduits or tubing and periphery of opening shall be max 1-5/16 in. (33 mm). Pipes, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

- A. Steel Pipe - Nom 2 in. (51 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
- B. Conduit - Nom 2 in. (51 mm) diam (or smaller) steel electrical metallic tubing or steel conduit.
- C. Copper Tubing - Nom 2 in. (51 mm) diam (or smaller) Type L (or heavier) copper tubing.
- D. Copper Pipe - Nom 2 in. (51 mm) diam (or smaller) Regular (or heavier) copper pipe.

When uninsulated steel pipe or conduit is used, T Rating is 3/4 hr and 1-1/2 hr for 1 and 2 hr rated assemblies, respectively. When uninsulated copper tubing or pipe is used, T Rating is 1/4 hr for both 1 and 2 hr rated assemblies.

3A. Pipe Covering* (Optional) - Nom 1 in. (25 mm) hollow cylindrical heavy density glass fiber units jacketed on the outside with an oil service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing top tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product.

See Pipe and Equipment Covering - Materials* (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

When pipe covering is used on all through penetrants, T Rating is 1 hr and 1-3/4 hr for 1 and 2 hr rated assemblies, respectively.

3B. Tube Insulation - Plastics* (Optional) - Nom 3/4 in. (19 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing.

See Plastics (DMFZ) category in the Recognized Component Directory for names of manufacturers. Any Recognized component tube insulation material meeting the above specifications and having a UL94 Flammability Classification of 94-5VA may be used.

When tube insulation is used on all through penetrants, T Rating is 3/4 hr and 1-1/2 hr for 1 and 2 hr rated assemblies, respectively.

4. Fill/Void or Cavity Material* - Caulk or Sealant - Min 5/8 in. or 1-1/4 in. (16 mm or 32 mm) thickness of fill material, for 1 or 2 hr walls, respectively, applied within the annulus, flush with both surfaces of wall. At point contact locations, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the wall/pipe and wall/pipe insulation interface on both surfaces of wall.

3M COMPANY- CP 25WB+, IC 15WB+ caulk or FB-3000 WT sealant

5. Fill/Void or Cavity Materials* - Wrap Strip (Not Shown) - Min one layer of 2 in. (51 mm) wide, nom 1/4 in. (6 mm) thick intumescent elastomeric material faced on one side with aluminum foil, required only when tube insulation (Item 3B) is used in 2 hr rated assemblies. Wrap strip tightly wrapped around tube insulation (foil side exposed) within the opening on both sides of the wall, flush with both surfaces of the wall assembly.

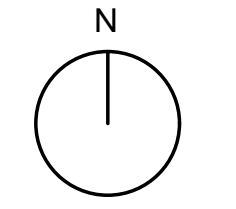
3M COMPANY - FS-195+
#Bearing the UL Recognized Component Mark
*Bearing the UL Classification Marking

ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION	MOUNTING
	DUPLEX RECEPTACLE (20A., 125V.)	M.H. 18" TO CENTERLINE
	DENOTES GROUND FAULT INTERRUPTER TYPE RECEPTACLE	
	DENOTES WEATHER-RESISTANT RECEPTACLE	
	DENOTES RECEPTACLE WITH DIECAST ALUMINUM 'IN-USE' COVER.	
	DENOTES DEVICE EXISTING TO REMAIN.	
	JUNCTION BOX OR OUTLET BOX, 4" SQUARE BOX UNLESS OTHERWISE NOTED	ABOVE CEILING
	DISCONNECT SWITCH	
	FUSED DISCONNECT SWITCH	
	COMBINATION STARTER/DISCONNECT SWITCH	
	120/208V. POWER PANELBOARD	
	RACEWAY CONCEALED IN WALL OR CEILING	SEE GENERAL NOTES
	RACEWAY CONCEALED UNDER FLOOR OR BENEATH GRADE	SEE GENERAL NOTES
	HOMERUN TO PANEL, LETTERS INDICATE PANEL, NUMBERS INDICATE CIRCUIT. NOTE: ANY CIRCUIT WITHOUT FURTHER DESIGNATION INDICATES A TWO WIRE & EQUIP. GROUND CIRCUIT. A GREATER NUMBER OF WIRES IS INDICATED AS SHOWN: (3 WIRES & EQUIPMENT GROUND), (4 WIRES & EQUIPMENT GROUND), ETC.	AS NOTED

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NOT FOR CONSTRUCTION

PROJECT TITLE: Highlands County Board of County Commissioners
Government Center - HVAC Renovation
600 S. Commerce Ave.
Sebring, FL 33870-3889

ISSUED FOR: 100% CONSTRUCTION DOCUMENTS
11/13/2017

REV DESCRIPTION DATE

GRAPHIC SCALE:
0' 1'

SCALE: 1/8" = 1'-0"

PROJECT MANAGER:

DRAWN BY: DN

A/E OF RECORD: DN

PROJECT NO: 4023

SHEET TITLE:

GENERAL NOTES

SHEET No.: **E1.0**

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