INVITATION FOR BID
IFB # 14-2841CD
MANATEE COUNTY ADMINISTRATION BUILDING 7TH FLOOR
DATA CENTER RENOVATION

Manatee County, a political subdivision of the State of Florida, (hereinafter "County") will receive sealed bids from individuals, corporations, partnerships, and other legal entities organized under the laws of the State of Florida or authorized to conduct business in the State of Florida.

NON-MANDATORY INFORMATION CONFERENCE

In order to ensure all prospective bidders have sufficient information and understanding of County's needs, an Information Conference will be held at: **2:00 PM on November 3, 2014** at the **Manatee County Administration Center, Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205. A site inspection shall take place immediately following the information conference.** Attendance is not mandatory, but is highly encouraged.

DEADLINE FOR CLARIFICATION REQUESTS: **5:00 PM on November 13, 2014**
Reference Bid Article A.06

BID OPENING TIME AND DATE DUE: **3:30 PM on November 26, 2014**

FOR INFORMATION CONTACT:
Chris Daley,CPPO, CPPB, Contract Specialist
(941) 749-3048
chris.daley@mymanatee.org
Manatee County Financial Management Department
Purchasing Division

AUTHORIZED FOR RELEASE: _____

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SECTION A
INFORMATION TO BIDDERS

A.01 OPENING LOCATION

Sealed bids will be **publicly opened** at the **Manatee County Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, Florida 34205** in the presence of County officials at the time and date stated, or soon thereafter. All bidders or their representatives are invited to attend the sealed bid opening.

Any bids received after the stated time and date will not be considered. It shall be the sole responsibility of the bidder to have their bid delivered to the Manatee County Purchasing Division for receipt on or before the stated time and date. Bidder shall be solely and strictly responsible for its timely delivery to the Purchasing Division. Bids delayed by mail, courier, or bids delayed for any other reason, shall not be considered, shall not be opened at the public opening, and arrangements shall be made for their return at the bidder's request and expense.

A.02 SEALED & MARKED

Bids shall be submitted in **duplicate, one original (marked Original) and one copy (marked Copy)** of your **signed bid** shall be submitted in one **sealed** package, clearly marked on the outside **"Sealed Bid #14-2841CD- Manatee County Administration Building 7th Floor Data Center Renovation"** along with your company name.

For your convenience, a mailing label is provided with this Invitation for Bid package. Or, you may address the package as follows:

Manatee County Purchasing Division
1112 Manatee Avenue West, Suite 803
Bradenton, Florida 34205
Sealed Bid # _____, Title _____

All blank spaces on the bid form must be filled in as noted with amounts extended and totaled and no changes shall be made in the wording of the forms or in the items thereupon. In the event a change is made in your submittal, the bidder shall write its initials by the change. Any bid may be rejected which contains any omissions, alterations, irregularities of any kind, or which shall in any manner fail to conform to the requirements of this Invitation for Bid (IFB).

A bid made by an individual, either in his/her own or proper person or under a trade or firm name, shall be executed under the individual's signature. If made by a partnership, the bid shall be executed by two or more of the general partners. If made by a corporation, the bid shall be executed by its President or other legally authorized corporate officer or agent.

A.03 SECURING BID DOCUMENTS

IFB's and related documents are available on http://www.mymanatee.org/purchasing for download in a portable document format (.PDF) file by clicking on "Bids and Proposals" from the Purchasing Division's web page. You may view and print these files using Adobe Reader software. If necessary, you may download a free copy of Adobe Reader from the link provided on the "Bids and Proposals" page.

Additionally, Manatee County collaborates with the Manatee Chamber of Commerce by announcing solicitation opportunities to the Chamber which are then passed to its members.

Manatee County may also use DemandStar to distribute bids. On the DemandStar website, http://www.DemandStar.com, click on the tab titled "My DemandStar" for more information regarding this service. Participation in the DemandStar system is not a requirement for doing business with Manatee County.

Complete copies of the IFB and all related documents are available for public inspection at the Manatee County Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205, or by calling (941) 749-3014. Appointments are encouraged. Documents are available between the hours of 9:00 AM and 4:00 PM Monday through Friday, with the exception of holidays. A complete set of the IFB documents must be used in preparing bids. County assumes no responsibility for errors and misinterpretations resulting from the use of incomplete sets of bid documents.

A.04 EXAMINATION OF BID DOCUMENTS AND SITE(S)

It is the responsibility of each bidder before submitting a bid, to (a) examine the IFB documents thoroughly; (b) visit the site(s) to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the Work; (c) consider federal, state, and local codes, laws, and regulations that may affect costs, progress, performance, or furnishing of the Work; (d) study and carefully correlate bidder's observations with the IFB documents; and (e) notify County of all conflicts, errors, or discrepancies in the IFB documents.

Each bidder may, at bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions at or contiguous to the site(s) or otherwise which may affect cost, progress, performance or furnishing of the Work and which bidder deems necessary to determine his bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the IFB documents. County will provide each bidder access to the site(s) to conduct such explorations and tests.

Bidder shall fill all holes, clean up and restore the site(s) to its former condition upon completion of such explorations. The lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by successful bidder in performing the Work are identified in the IFB documents.

All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by successful bidder. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by County unless otherwise provided in the IFB documents.

Inspection of the site(s) is **a requirement** to be considered for award of this bid. Prior to submitting a bid, each bidder shall examine the site(s) and all conditions thereon fully familiarizing themselves with the full scope of the Work. Failure to become familiar with site conditions will in no way relieve the successful bidder from the necessity of furnishing any materials or performing any work that is required to complete the project in accordance with the plans and specifications. Bidder shall acknowledge inspection of the project site(s) on his/her signed, submitted Bid Form.

A.05 MODIFICATION OF BID DOCUMENTS

If a bidder wishes to recommend changes to the IFB documents, the bidder shall furnish, in writing, data and information necessary to aid County in evaluating the request to modify the IFB documents. County is not obligated to make any changes to the IFB documents. Unless an Addendum is issued, the IFB documents shall remain unaltered. **Bidders must fully comply with the IFB documents in their entirety.**

A.06 CLARIFICATION & ADDENDA

Each bidder shall examine all IFB documents and shall judge all matters relating to their adequacy and accuracy. Any inquiries, suggestions or requests concerning interpretation, clarification or additional information pertaining to this IFB shall be made through the Manatee County Purchasing Division. County shall not be responsible for oral interpretations given by any County employee, representative, or others.

5:00 PM on November 13, 2014 shall be the deadline to submit to the Purchasing Division, in writing, all inquiries, suggestions, or requests concerning interpretation, clarification or additional information pertaining to this IFB.

This deadline has been established to maintain fair treatment of all potential bidders, while maintaining progression of the Work.

If any addenda are issued to this IFB, County will post the documents on the Purchasing Division's web page at http://www.mymanatee.org/purchasing, and then by clicking on "Bids and Proposals". If the original solicitation was broadcast via DemandStar, the addenda will also be broadcast on the DemandStar distribution system to "Planholders" on this web service.

The issuance of a written addendum is the only official method whereby interpretation, clarification or additional information can be given.

It shall be the **responsibility of each bidder, prior to submitting a bid**, to contact the Purchasing Division (see contact information on the cover page) to **determine if any addenda were issued** and to make such addenda a part of their bid.

A.07 LOBBYING

After the issuance of any IFB, prospective bidders or any agent, representative or person acting at the request of such bidder shall not contact, communicate with or discuss any matter relating in any way to the IFB with any officer, agent or employee of Manatee County other than the Purchasing Official or the contact identified in this IFB, pursuant to the Manatee County Code of Laws. This prohibition includes the act of carbon copying officers, agents or employees of Manatee County on all correspondence, including email correspondence. This requirement begins with the issuance of an IFB and ends upon execution of Agreement or when the IFB has been cancelled. Violators of this prohibition shall be subject to sanctions as provided in the Manatee County Code of Laws.

A.08 UNBALANCED BIDDING PROHIBITED

County recognizes that large and/or complex projects will often result in a variety of methods, sources, and prices. However, where in the opinion of County such variation does not appear to be justified, given bid requirements and industry and market conditions, the bid will be presumed to be unbalanced. Examples of unbalanced bids will include:

a. Bids showing omissions, alterations of form, additions not specified, or required conditional or unauthorized alternate bids.

b. Bids quoting prices that substantially deviate, either higher or lower, from those included in the bids of competitive bidders for the same line item unit costs.

c. Bids where the unit costs offered are in excess of or below reasonable cost analysis values.

In the event County determines that a bid is presumed unbalanced, it will request the opportunity to and reserves the right to, review all source quotes, bids, price lists, letters of intent, etc., which the bidder obtained and upon which the bidder relied upon to develop its bid. County reserves the right to reject as nonresponsive any presumptive unbalanced bids where the bidder is unable to demonstrate the validity and/or necessity of the unbalanced unit costs.

A.09 FRONT LOADING OF BID PRICING PROHIBITED

Prices offered for performance and/or acquisition activities which occur early in the project schedule, such as mobilization; clearing and grubbing; or maintenance of traffic; that are substantially higher than pricing of competitive bidders within the same portion of the project schedule, will be presumed to be front loaded. Front loaded bids could reasonably appear to be an attempt to obtain unjustified early payments creating a risk of insufficient incentive for the bidder to complete the Work or otherwise creating an appearance of an undercapitalized bidder.

In the event County determines that a bid is presumed to be front loaded, it will request the opportunity to, and reserves the right to, review all source quotes, bids, price lists, letters of intent, etc., which the bidder obtained and upon which the bidder relied upon to develop the pricing or acquisition timing for these bid items. County reserves the right to reject as nonresponsive any presumptive front loaded bids where the bidder is unable to demonstrate the validity and/or necessity of the front loaded costs.

A.10 WITHDRAWAL OF BIDS

Bidders may withdraw bids as follows:

a. Mistakes discovered before the public bid opening may be withdrawn by written notice from the bidder submitting the bid. This request must be received in the Purchasing Division prior to the time set for delivery and opening of the bids. A copy of the request shall be retained and the unopened bid returned to the bidder; or

b. After the bids are opened or a selection has been determined, but before an Agreement is signed, a bidder alleging a material mistake of fact may be permitted to withdraw their bid if:

   1. the mistake is clearly evident in the solicitation document; or

   2. bidder submits evidence which clearly and convincingly demonstrates that a mistake was made. Request to withdraw a bid must be in writing and approved by the Purchasing Official.

A.11 IRREVOCABLE OFFER

Any bid may be withdrawn up until the time and date set for opening of the bid. Any bid not so withdrawn shall, upon opening, constitute an irrevocable offer for a period of ninety (90) days to sell to Manatee County the goods or services set forth in the attached IFB until one or more of the bids have been duly accepted by County.

A.12 BID EXPENSES

All expenses for making bids to County are to be borne by the bidder.

A.13 RESERVED RIGHTS

County reserves the right to accept or reject any and/or all bids, to waive irregularities and technicalities, and to request resubmission. Also, County reserves the right to accept all or any part of the bid and to increase or decrease quantities to meet additional or reduced requirements of County. Any sole response received by the first submission date may or may not be rejected by County depending on available competition and current needs of County. For all items combined, the bid of the lowest, responsive, responsible bidder will be accepted, unless all bids are rejected.

The lowest, responsible bidder shall mean that bidder who makes the lowest bid to sell goods and/or services of a quality which meets or exceeds the quality of goods and/or services set forth in the IFB documents or otherwise required by County.

To be responsive, a bidder shall submit a bid which conforms in all material respects to the requirements set forth in the IFB.

To be a responsible bidder, the bidder shall have the capability in all respects to perform fully the bid requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance.

Also, County reserves the right to make such investigation as it deems necessary to determine the ability of any bidder to furnish the service requested. Information County deems necessary to make this determination shall be provided by the bidder. Such information may include, but shall not be limited to current financial statements, verification of availability of equipment and personnel, and past performance records.

A.14 APPLICABLE LAWS

Bidder must be authorized to transact business in the State of Florida. All applicable laws and regulations of the State of Florida and ordinances and regulations of Manatee County will apply to any resulting Agreement. Any involvement with the Manatee County Purchasing Division shall be in accordance with the Manatee County Purchasing Ordinance as amended.

A.15 COLLUSION

By submitting a bid to this IFB, bidder certifies that it has not divulged, discussed or compared its bid with any other bidder, and has not colluded with any other bidder or parties to this bid whatsoever. Also, bidder certifies, and in the case of a joint bid each party thereto certifies as to their own organization, that in connection with this bid:

a. any prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices and/or cost data, with any other bidder or with any competitor;

b. any prices and/or cost data quoted for this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder, prior to the scheduled opening, directly or indirectly to any other bidder or to any competitor;

c. no attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition;

d. the only person or persons interested in this bid, principal or principals is/are named therein and that no person other than therein mentioned has any interest in this bid or in the resulting Agreement to be entered into; and

e. no person or agency has been employed or retained to solicit or secure the resulting Agreement upon an agreement or understanding or a commission, percentage, brokerage, or contingent fee except bona fide employees or established commercial agencies maintained by bidder for purpose of doing business.

A.16 CODE OF ETHICS

With respect to this bid, if any bidder violates, directly or indirectly, the ethics provisions of the Manatee County Purchasing Ordinance and/or Florida criminal or civil laws related to public procurement, including but not limited to Florida Statutes, Chapter 112, Part III, Code of Ethics for Public Officers and Employees, such bidder will be disqualified from eligibility to perform the Work described in this IFB, and may also be disqualified from furnishing future goods or services to, and from submitting any future bids to supply goods or services to, Manatee County.

By submitting a bid, the bidder represents to County that all statements made and materials submitted are truthful, with no relevant facts withheld. If a bidder is determined to have been untruthful in their bid or any related presentation, such bidder will be disqualified from eligibility to perform the Work described in this IFB, and may also be disqualified from furnishing future goods or services to, and from submitting any future bids to supply goods or services to, Manatee County.

A.17 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime, as that term is defined in Florida Statute § 287.133, may not submit a bid to provide any goods or services to a public entity; may not submit a bid with a public entity for the construction or repair of a public building or public work; may not submit bids on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under an agreement with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Florida Statutes § 287.017 for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted list.

In addition, the Manatee County Code of Laws prohibits the award of any bid to any person or entity who/which has, within the past five (5) years, been convicted of, or admitted to in court or sworn to under oath, a public entity crime or of any environmental law that, in the reasonable opinion of the Purchasing Official, establishes reasonable grounds to believe the person or business entity will not conduct business in a responsible matter.

To ensure compliance with the foregoing, the Code requires all persons or entities desiring to do business with County to execute and file with the Purchasing Official an affidavit, executed under the pain and penalties of perjury, confirming that person, entity and any person(s) affiliated with the entity, does not have such a record and is therefore eligible to seek and be awarded business with County. In the case of a business entity other than a partnership or a corporation, such affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, such affidavit shall be executed by the general partner(s). A Public Contracting and Environmental Crimes Certification form is attached herein for this purpose.

A.18 BID FORMS

Bids must be submitted on the provided forms, although additional pages may be attached. **Bidders must fully complete all pages of the Bid Forms. Bid Forms must be executed by an authorized signatory who has the legal authority to make the bid and bind the company. Bidders must fully comply with all requirements of this IFB in its entirety.** Failure to comply shall result in bidder being deemed nonresponsive.

A.19 LEGAL NAME

Bids shall clearly indicate the legal name, address and telephone number of the bidder on the Bid Form. Bid Forms shall be signed above the typed or printed name and title of the signer. The signer must have the authority to bind the bidder to the submitted bid.

When bidder is a partnership, the Bid Form shall be signed in the name of the firm and by all partners required under the terms of the partnership agreement. When a corporation is a bidder, the authorized corporate officers shall sign.

Bidders who are corporations or limited partnerships shall provide a certified copy of their permit to transact business in the State of Florida, preferably along with the Bid Form, or within forty-eight (48) hours after request by County.

When submitting a bid as a joint venture, it must have filed paper documents with the Division of Profession's Construction Industry Licensing Board prior to submitting a bid.

A.20 DISCOUNTS

Any and all discounts must be incorporated in the prices contained in the bid and not shown separately. The prices indicated on the Bid Form shall be the prices used in determining award.

A.21 TAXES

Manatee County is exempt from Federal Excise and State Sales Taxes. (F.E.T. Cert. No. 59-78-0089K; Florida Sales Tax Exempt Cert. No. 85-8012622206C-6); therefore, the bidder is prohibited from delineating a separate line item in his bid for any sales or service taxes. Nothing herein shall affect the bidder's normal tax liability.

A.22 DESCRIPTIVE INFORMATION

Unless otherwise specifically provided in the IFB documents, all equipment, materials and articles provided shall be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in the IFB documents, reference to any equipment, material, article or patented process, by trade name, brand name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.

A.23 AMERICANS WITH DISABILITIES ACT

County does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of County's functions including one's access to, participation, employment, or treatment in its programs or activities. Anyone requiring **reasonable accommodation** for an Information Conference or Bid Opening should contact the person named on the cover page of this IFB document at least twenty-four (24) hours in advance of either activity.

A.24 EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

In accordance with the provisions of Title VI of the Civil Rights Act of 1964 and Title 15, Part 8 of the Code of Federal Regulations, County hereby notifies all bidders that they will affirmatively ensure minority business enterprises will be afforded full opportunity to participate in response to this advertisement and will not be discriminated against on the grounds of race, color or national origin in consideration for bid award.

A.25 MBE/DBE

The State of Florida Office of Supplier Diversity provides the certification process and the database for identifying certified MBE/DBE firms. This service may be directly accessed at: http://www.osd.dms.state.fl.us/iframe.htm. If you have any questions regarding this State service, please contact their office at (850) 487-0915.

A.26 MATHEMATICAL ERRORS

In the event of multiplication/extension error(s), the unit price shall prevail. In the event of addition error(s) the extension totals will prevail. All bids shall be reviewed mathematically and corrected, if necessary, using these standards, prior to additional evaluation.

A.27 DISCLOSURE

Upon receipt, all inquiries and responses to inquiries related to this IFB become "Public Records", and shall be subject to public disclosure consistent with Florida Statues, Chapter 119.

Bids become subject to disclosure thirty (30) days after the opening or if a notice of intent to award decision is made earlier than this time as provided by Florida Statutes § 119.071(1)(b). No announcement or review of the bid shall be conducted at the public bid opening.

Based on the above, County will receive bids at the time and date stated and will make public at the opening the names of the business entities of all that submitted a bid and any amount presented as a total offer without any verification of the mathematics or the completeness of the bid.

If County rejects all bids and concurrently notices its intent to reissue the solicitation, the rejected bids are exempt from public disclosure until such time as County provides notice of an intended decision concerning the reissued solicitation or until County withdraws the reissued solicitation. A bid is not exempt for longer than twelve (12) months after the initial notice rejecting all bids.

Pursuant to Florida Statutes 119.0701, to the extent successful bidder is performing services on behalf of County, successful bidder must:

a. keep and maintain public records that ordinarily and necessarily would be required by County in order to perform the service;

b. provide the public with access to public records on the same terms and conditions that County would provide and at a cost that does not exceed the cost provided in Florida Statutes, Chapter 119, or as otherwise provided by law;

c. ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law; and

d. meet all requirements for retaining public records and transfer, at no cost, to County all public records in possession of successful bidder upon termination of the awarded Agreement and/or PO and destroy any duplicate public records that are exempt or confidential from public records disclosure requirements. All records stored electronically must be provided to County in a format that is compatible with County's information technology systems.

A.28 LOCAL PREFERENCE

Local business is defined as a business legally authorized to engage in the sale of the goods and/or services to be procured, and which certifies within its bid that for at least six (6) months prior to the announcement of the solicitation of bids it has maintained a physical place of business in Manatee, Desoto, Hardee, Hillsborough, Pinellas or Sarasota County with at least one full-time employee at that location.

Local preference shall not apply to the following categories of Agreements:

1. Purchases or Agreements which are funded, in whole or in part, by a governmental or other funding entity, where the terms and conditions of receipt of the funds prohibit the preference.

2. Any bid announcement which specifically provides that the general local preference policies set forth in this section are suspended due to the unique nature of the goods or services sought, the existence of an emergency as found by either the County Commission or County Administrator, or where such suspension is, in the opinion of the County Attorney, required by law.

To qualify for local preference under this section, **a local business must certify to County** by completing an "**Affidavit as to Local Business Form"**, which is available for download at www.mymanatee.org/vendor. Click on "Affidavit for Local Business" to access and print the form. Complete, notarize, and mail the notarized original to the following address: Manatee County Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205.

It is the responsibility of the bidder to ensure accuracy of the Affidavit as to Local Business and notify County of any changes affecting same.

A.29 VENDOR REGISTRATION

Registering your business with Manatee County will enhance our opportunities to identify sources for goods and services, plus identify local businesses. This information is used for soliciting quotations up to $250,000.00 and for competitive solicitations of larger purchases.

Our staff can assist you with your registration as needed. Our office hours are 8:00 A.M. to 5:00 P.M., Monday through Friday on regular business days. Please call (941) 749-3014 if you wish to have a Purchasing staff member assist you.

Quick steps to registration: **www.mymanatee.org/purchasing**

A link to Vendor Registration is listed on the Purchasing Division's web page under "Register as a Vendor". Click on "Vendor Registration Form" for on-line input.

Registration is not mandatory; however, by taking the time to register, you are helping County to provide timely notification of quotation, bid and proposal opportunities to your business.

A.30 ePAYABLES

Manatee County and Clerk of the Circuit Court have partnered to offer the ePayables program, which allows payments to be made to vendors via credit cards. The Clerk will issue a unique credit card number to each vendor; the card has a zero balance until payments have been authorized.

After goods are delivered or services rendered, vendors submit invoices to the remit to address on the purchase order according to the current process. When payments are authorized, an email notification is sent to the vendor. The email notification includes the invoice number(s), invoice date(s), and amount of payment. There is no cost for vendors to participate in this program; however, there may be a charge by the company that processes your credit card transactions.

If you are interested in participating in this program, please complete the ePayables Application attached herein and return the completed form via email to Ms. Lori Bryan, Supervisor at lori.bryan@manateeclerk.com.

NOTE: ANY OR ALL STATEMENTS CONTAINED IN THE FOLLOWING SECTIONS: SCOPE OF WORK, BID SUMMARY, GENERAL TERMS AND CONDITIONS, GENERAL CONDITIONS, OR FORM OF CONTRACT, WHICH VARY FROM THE INFORMATION TO BIDDERS, SHALL HAVE PRECEDENCE.

END OF SECTION A

SECTION B

SCOPE OF WORK

B.01 BACKGROUND

The Manatee County Administration Building 7th Floor Data Center Renovation project includes portions that will be self-performed by the County using the County's own services, employees, and equipment; while the remainder of the project will be procured under this Invitation for Bids.

The successful Bidder shall be responsible for the master construction schedule and coordination with the work as provided by Manatee County Property Management.

B.02 SCOPE OF WORK

The Work included in this Invitation for Bids consists of furnishing all labor, materials, equipment and incidentals required for the removal of the existing data center, conference room, lab, offices and storage areas and a renovation of the area into a new, smaller data center with open offices at the perimeter, a new computer lab facility, and a new customer service center. The Contractor shall be advised that to complete this project, work areas will include (but not be limited to):

- Several floors of the Manatee County Administration Building;
- Vertical chases on every floor, both the central chase from floor 1 to the roof and the eastern chase from floor 7 to the roof;
- The main electrical room on the first floor;
- The Generator room in the parking garage;
- The alleyway behind the Administration Building and through the Parking Garage.

Contractor Responsibilities

The Contractor shall be responsible for visiting the site and familiarizing themselves with the existing conditions prior to submitting a bid for Work.

The electrical, mechanical and fire work shall be under one Contractor and Manatee County Property Management acting as the General Contractor for the remainder of Work to be done under this project. The successful Bidder shall be responsible for the master construction schedule and coordination with the work as provided by Manatee County Property Management.

The alley work and installation of additional conduits between the main building and the generator room shall be completed by Florida Power and Light Services under separate contract. The Contractor is responsible for completing the pathway from the conduit termination to all points as detailed in the construction documents.

Roofing work shall be limited to the installation of the CRAC unit DX backup units and the subsequent connection of all refrigerant lines, control cabling, and electrical as required.

Electrical work as detailed on the drawings includes demolition of the existing electrical infrastructure within the work area and safe off of any live leads. Existing data center power equipment not being reused shall be removed and disposed of by the contractor per the demolition notes on sheet A3.0. Work shall also include the complete rework of the power supply from the Generator room and the Main Bus to create a completely separate A/B power setup including the kirk-key as detailed in the electrical drawings. The electrical contractor shall also provide and install all data wiring, structured wiring, power supplies, PDU systems, and terminations per the documents and the specifications.

Mechanical scope shall be to remove the existing CRAC units as detailed on Sheet A3.0 and all associated chilled water piping. Contractor shall install valves as required for the new data center loop per the Mechanical Drawings. This scope includes a new air handler unit to be connected to the existing chilled water loop to supply the new open office area as well as three new dual coil CRAC units, see plans.

Additional work shall be the coordination and installation of the ADA required signage as provided by Manatee County and coordination and installation of all access controls.

Work performed by Manatee County

1. Limited Demolition (not including electrical, mechanical, or fire related work);
2. Data floor rework and restructuring;
3. ADA ramp;
4. Metal railings;
5. Metal framing, gypsum wall board, texture and paint;
6. Acoustical Ceilings;
7. Casework and cabinetry;
8. Furniture, Fixtures, and Equipment.

General Construction Notes

1. There shall be no smoking, use of e-cigarettes, smokeless tobacco or any tobacco products of any kind in any of the project areas.
2. During construction, air conditioning will not be available.
3. Contractor is hereby notified that any work on Tuesdays can and will be interrupted due to Public Meetings occurring on the first floor. Any noisy work including (but not limited to) drilling, hammering, or sawing should be avoided on Tuesdays.
4. Power shut-downs require 72 hours written notice to the Manatee County Property Management Department.

The successful Bidder shall furnish all Shop Drawings, working drawings, labor, materials, equipment, tools, services and incidentals necessary to complete all Work required by these Specifications.

The successful Bidder shall perform the Work complete, in place and ready for continuous service and shall include any repairs, replacements, and/or restoration required as a result of damages caused prior to acceptance by County.

The successful Bidder shall furnish and install all materials, equipment and labor which is reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Bid Documents or not.

Inspection of the site(s) is **a requirement** to be considered for Award of this Bid. Prior to submitting a Bid, each Bidder shall examine the site(s) and all conditions thereon fully familiarizing themselves with the full scope of the Project. Failure to become familiar with site conditions will in no way relieve the Successful Bidder from the necessity of furnishing any materials or performing any Work that is required to complete the Project in accordance with the plans and Specifications. Bidder shall acknowledge inspection of the Project site(s) on his/her signed, submitted Bid Form.

A site inspection will be conducted immediately following the informational conference.

An additional site inspection will be conducted on **November 7, 2014** for all interested Bidders or Subcontractors. All interested parties who are unable to inspect the site following the informational conference shall contact Angela Honts at (941) 742-5844 or Debra Leavenworth at (941) 748-4501 ext. 3831, between the hours of 8:00 AM and 2:00 PM Monday thru Thursday, for coordination of the scheduled site visit.

Due to limited access to the job site, the above date is the only additional date after the informational conference that site inspections will be conducted.

END OF SECTION B

SECTION C
BID SUMMARY

C.01 MINIMUM QUALIFICATIONS OF BIDDERS

No person who is not certified or registered as a General Contractor or Mechanical Contractor pursuant to Florida Statutes, Chapter 489 on the day the bid is submitted, and who has continuously held that certification or registration for a period of at least three (3) consecutive years immediately prior to the day the bid is submitted, may be qualified to bid on this Work. In the event that a bidder is a business organization, including a partnership, corporation, business trust or other legal entity as set forth in Florida Statutes § 489.119(2), then the bidder shall only be qualified to bid on this Work if: 1) the bidder (the business organization) is on the day the bid is submitted, and for at least three (3) consecutive years immediately prior to the day the bid is submitted has been, in continuous existence, properly licensed and registered as required by Florida law; and 2) the bidder, on the day the bid is submitted, has a certified or registered Qualifying Agent, as required by Florida Statutes § 489.119, and that Qualifying Agent has been the same Qualifying Agent of the bidder for a period of at least three (3) consecutive years immediately prior to the day the bid is submitted.

C.02 ENGINEER'S ESTIMATE

The construction cost estimate for this Work is **$1,160,000.00**, which is based on the original scope of work and drawings issued. Changes to the scope of work by addenda to this bid subsequent to the original documents may not be accounted for in this construction cost estimate.

C.03 BASIS OF AWARD

Award shall be to the lowest, responsive, responsible Bidder meeting Specifications and having the lowest total offer for the requirements listed on the Bid Form for the Work as set forth in this Invitation for Bid. Bid prices shall include costs for furnishing all labor, equipment and/or materials for the completion of the Work in accordance with and in the manner set forth and described in the Bid Documents to County's satisfaction within the prescribed time.

Only one schedule for Completion of the Work shall be considered. Only one Award shall be made.

NOTE: Inspection of the site is a pre-requisite to be considered for Award of this Bid.

In evaluating bids, County shall consider the qualifications of the bidders; and if required, may also consider the qualifications of the subcontractors, suppliers, and other persons and organizations proposed. County may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work.

Whenever two or more bids are equal with respect to price, the bid received from a local business shall be given preference in award.

Whenever two or more bids are equal with respect to price, and all other evaluative factors are otherwise equal, including local preference policies, if the company provides documented environmentally preferable “green” products, materials, or supplies, they shall be given preference in award.

Whenever two or more bids which are equal with respect to price are received, and neither of these bids are from a local business, and neither of these bids provides documented “green” products, the award shall be determined by a chance drawing, coin toss, or similar tie-breaking method conducted by the Purchasing Division and open to the public.

END OF SECTION C

SECTION D

GENERAL TERMS & CONDITIONS

D.01 AGREEMENT FORMS

The Agreement resulting from the acceptance of a bid shall be in the form of the Agreement stated in this IFB, which is attached herein.

A written notice confirming award or recommendation thereof will be forwarded to the successful bidder accompanied by the required number of unsigned counterparts of the Agreement. Within ten (10) days thereafter, successful bidder shall sign and deliver the required number of counterparts of the Agreement with any other required documents to County. (Note: Agreement must be approved in accordance with Chapter 2-26 of the Manatee County Code of Laws and the Administrative Standards and Procedures Manual approved by the County Administrator).

D.02 ASSIGNMENT OF AGREEMENT

Successful bidder shall not assign, transfer, convey, sublet or otherwise dispose of the resulting Agreement or of his right, title, or interest therein, or his power to execute such Agreement, or to assign any monies due or to become due there under to any other person, firm or corporation unless first obtaining the written consent of County. The giving of such consent to a particular subcontractor assignment shall not dispense with the necessity of such consent to any further or other assignment.

D.03 COMPLETION OF WORK

The Work will be completed and ready for final inspection within the specified calendar days from the date the Contract time commences to run. Only one Bid shall be considered based on **120 calendar days**. **Only one Award shall be made**.

D.04 LIQUIDATED DAMAGES

If the successful bidder refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will hinder its completion within the time specified, County may seek damages. The actual damages for delay will be impossible to determine and in lieu thereof, the successful bidder shall pay to County the sum of **$1,742** as fixed, agreed, and liquidated damages for each calendar day of the delay until the Work is finally accepted by County and the successful bidder.

D.05 PAYMENT

Successful bidder may apply for partial payment on monthly estimates, based on the amount of the Work done or completed in compliance with the provisions of the resulting Agreement. Successful bidder shall submit an application, on a standard pay application form provided or approved by County, of an approximate estimate of the proportionate value of the Work done, items and locations of the Work performed up to and including the last day of the period then ending.

County will then review said estimate and make any necessary revisions so that the estimate can receive approval for payment. If the successful bidder and County do not agree on the approximate estimate of the proportionate value of the Work done for any pay period, the determination of County will be binding. The amount of said estimate after deducting any required retainage and all previous payments shall be due and payable to the successful bidder, twenty (20) business days if County is its own Engineer of Record (EOR) or twenty-five (25) business days if outside agent approval is required after the pay estimate has been approved by the agent for County.

In accordance with the Prompt Payment Act, Florida Statutes § 218.735(7), a punch list shall be formulated. Time allowed for development of punch list:

a. Awarded agreements with an estimated cost of less than $10 million will be within thirty (30) calendar days after reaching substantial completion.

b. Awarded agreements with a cost of $10 million dollars or more will be within thirty (30) calendar days OR if extended by Agreement, up to sixty (60) calendar days after reaching substantial completion.

The final completion date of the resulting Agreement must be at least thirty (30) days after delivery of the list of items. If the list is not provided to the successful bidder by the agreed upon date, the contract completion time must be extended by the number of days County exceeds the delivery date.

It is the successful bidder's responsibility for the care of the materials. Any damage to or loss of said materials is the full responsibility of the successful bidder. Any periodical pay estimate signed by the successful bidder shall be final as to the successful bidder for any or all Work covered by the periodical pay estimate.

Any requests for payment of materials stored on site must be accompanied with a paid receipt. Successful bidder warrants and guarantees that title to all Work, materials and equipment covered by any application for payment, whether incorporated in the Work or not, will pass to County at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter referred to as "Liens").

Successful bidder agrees to furnish an affidavit stating that all laborers, material men, and subcontractors have been paid for Work covered by the application for payment and that a partial or complete release of lien, as may be necessary, be properly executed by the material men, laborers, subcontractors for Work covered by the application for payment, sufficient to secure County from any claim whatsoever arising out of the aforesaid Work. When the successful bidder has completed the Work in compliance with the terms of the Agreement, he shall notify County in writing that the Work is ready for final inspection.

County will then advise successful bidder as to the arrangements for final inspection and what Work, if any, is required to prepare the Work or a portion thereof for final inspection. When County determines the Work or portion thereof is ready for final inspection, County shall perform same. Upon completion of final inspection, County will notify successful bidder of all particulars in which this inspection reveals that the Work is incomplete or defective. Successful bidder shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies. When all such errors have been corrected, a final re-inspection will be made.

The process will be repeated until, in the opinion of County, the Work has been completed in compliance with the terms of the IFB Documents.

When final acceptance has been made by County, County will make final payment of the resulting Agreement amount, plus all approved additions, less approved deductions and previous payments made. The resulting Agreement will be considered complete when all Work has been finished, the final inspection made, approved as-builts received, and the Work finally accepted in writing by County. Successful bidder's responsibility shall then terminate except as otherwise stated.

D.06 CONTRACT CONTINGENCY WORK

Contract contingency is a monetary allowance used solely at County's discretion to handle unexpected conditions as required to satisfactorily complete the Work in accordance with the IFB documents. A field directive must be issued by an authorized County representative to authorize use of contract contingency funds.

The percentage for contract contingency is listed on the Bid Form. Bidder shall enter the dollar amount for contract contingency based on the percentage of the total base bid. The total contract award will include contract contingency.

Appropriate uses of contract contingency include increases to existing bid item quantities that do not change the initial scope of work, which may be directed by staff; modification items not originally bid which were unforeseen yet necessary during the Work to provide a safe, complete project and that do not change the initial scope of work; and unanticipated conflicts and/or design changes required during construction which are necessary to provide a safe, complete project and that do not change the initial scope of work.

Inappropriate uses of contract contingency include anything that changes the initial scope of work, including the contract price and contract time, and adding bid items not previously contemplated that change the initial scope of work.

D.07 RETAINAGE

Retainage of 10% of the total Work in place shall be withheld until 50% complete. After 50% completion, the retainage shall be reduced to 5% of the total Work in place until final completion and acceptance of the Work by County. Upon final acceptance, the remaining retainage shall be included in the final payment.

D.08 PROGRESS REQUIREMENTS

All Work done under the resulting Agreement shall be done with a minimum of inconvenience to the private property owners in the area. Successful bidder shall coordinate his Work with private property owners such that existing utility services are maintained and they have access to their property at all times.

D.09 WARRANTY AND GUARANTEE PROVISIONS

All Work, materials, and equipment furnished as defined herein shall be guaranteed and warranted by the successful bidder for a minimum period of three (3) years, unless otherwise specified, from final acceptance by County to be free from defects due either to faulty materials or equipment or faulty workmanship.

All materials, equipment, and workmanship furnished and installed by the successful bidder is warranted and guaranteed by the successful bidder to meet the required standards and to accomplish the purposes and functions of the Work as defined, detailed, and specified herein.

County shall, following discovery thereof, promptly give written notice to the successful bidder of faulty materials, equipment, or workmanship within the period of the guarantee and the successful bidder shall promptly replace any part of the faulty equipment, material, or workmanship at his own cost. These warranty and guarantee provisions create no limitations on County as to any claims or actions for breach of guaranty or breach of warranty that County might have against parties other than the successful bidder, and do not constitute exclusive remedies of County against the successful bidder.

D.10 MATERIALS AND WORKMANSHIP

All materials and apparatus required for this Work, except as specified otherwise, shall be new, of first class quality, and shall be furnished, delivered, connected and finished in every detail. Construction shall be prescribed by good industry practice and in accordance with manufacturer's recommendations for the type being installed.

Use skilled workman trained and experienced in the necessary trades and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this section.

D.11 PROJECT CLOSE-OUT

Clean construction site and remove any and all excess materials. Correct any damages to property that may have occurred as a result of installation and/or delivery. Repair and patch all surfaces cut for installation. The successful bidder shall remedy any deficiencies promptly should County determine any Work is incomplete or defective.

When County determines the Work is acceptable in accordance with the IFB documents, successful bidder shall provide the close out submittals, including but not necessarily limited to the following:

1 set	Certificate of Warranties	
1 set	Manufacturer's Product Literature	(when applicable)
1 set	Project Record Drawings	
1 set	Subcontractor Information	(when applicable)

All manuals, schematics and handbooks shall be provided which are applicable to the equipment delivered. An operators manual, parts manual and technician manual must also be provided. Parts lists (manuals) must include OEM part numbers for items not manufactured by the successful bidder. Successful bidder shall furnish two (2) copies of each.

D.12 ROYALTIES AND PATENTS

The successful bidder shall pay all royalties and license fees for equipment or processes in conjunction with the equipment and/or services being furnished. Successful bidder shall defend all suits or claims for infringement of any patent, trademark or copyright, and shall save County harmless from loss on account thereof, including costs and attorney's fees.

D.13 AUTHORIZED PRODUCT REPRESENTATION

The bidder, by virtue of submitting the name and specifications of a manufacturer's product, will be required to furnish the named manufacturer's product. Failure to perform accordingly may, in County's sole discretion, be deemed a material breach of the resulting Agreement, and shall constitute grounds for County's immediate termination of the resulting Agreement.

D.14 REGULATIONS

It shall be the responsibility of the successful bidder to assure compliance with any OSHA, EPA and/or other federal or State of Florida rules, regulations or other requirements, as each may apply.

D.15 CANCELLATION

Any failure of the successful bidder to furnish or perform the Work (including, but not limited to, commencement of the Work, failure to supply sufficient skilled workers or suitable materials or equipment) in accordance with the resulting Agreement, County may order the stop of the Work, or any portion thereof, until the cause for such order has been eliminated. If the successful bidder persistently fails to perform the Work in accordance with the resulting Agreement, County reserves the right to terminate the resulting Agreement and select the next qualified bidder or re-advertise this procurement in part or in whole. County reserves the right to cancel all or any undelivered or unexecuted portion of the resulting Agreement with or without cause.

D.16 INDEMNIFICATION

The successful bidder covenants and agrees to indemnify and save harmless County, its agents and employees, from and against all claims, suits, actions, damages, causes of action, or judgments arising out of the terms of the resulting Agreement for any personal injury, loss of life, or damage to the property sustained as a result of the performance or non-performance of services or delivery of goods; from and against any orders, judgments, or decrees, which may be entered against County, its agents or employees; and from and against all costs, attorney's fees, expenses and other liabilities incurred in the defense of any such claim, suit or action, and the investigation thereof. Nothing in the resulting Agreement shall be deemed to affect the rights, privileges and immunities of County as set forth in Florida Statutes § 768.28.

D.17 SUBCONTRACTORS, SUPPLIERS AND OTHERS

The identity of subcontractors, suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) may be requested by County for each bid item from any of the bidders; and the bidder shall respond within five (5) days after the date of such request. Such list shall be accompanied by an experience statement with pertinent information regarding similar Work and other evidence of qualification for each such subcontractor, supplier, persons or organization if requested by County. If County, after due investigation, has reasonable objection to any proposed subcontractor, supplier, other person or organization, County may, before the notice of intent to award is given, request the successful bidder to submit an acceptable substitute without an increase in contract price or contract time.

If successful bidder declines to make any such substitution, County may award the resulting Agreement to the next lowest qualified bidder that proposes to use acceptable subcontractors, suppliers, and other persons who County does not make written objection to. Successful bidder shall not be required to employ any subcontractor, supplier, other person or organization who successful bidder has reasonable objection to.

Subcontractors shall be bound by the terms and conditions of the resulting Agreement insofar as it applies to their work, but this shall not relieve the successful bidder from the full responsibility to County for the proper completion of all Work to be executed under the resulting Agreement.

D.18 E-VERIFY

The employment of unauthorized aliens by any successful bidder is considered a violation of Section 274(e) of the Immigration and Employment Act. If successful bidder knowingly employs unauthorized aliens, such violation shall be cause for unilateral cancellation of the resulting Agreement.

A complete list of all subcontractors proposed for any portion of the Work may be requested of any bidder deemed necessary by County. Subcontracts shall be awarded only to those subcontractors considered satisfactory by County.

The successful bidder shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the successful bidder during the term of the Agreement; and

The successful bidder shall expressly require any subcontractors performing work or providing services pursuant to the state contract to utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the term of the Agreement.

D.19 NO DAMAGES FOR DELAY

No claim for damages or any claim other than for an extension of time shall be made or asserted against County by reason of any delays. The successful bidder shall not be entitled to an increase in the total contract price or payment or compensation of any kind from County or direct, indirect, consequential impact or other costs, expenses for damages, including but not limited to costs of acceleration or inefficiency arising because of delay, disruption, interference or hindrance from any cause whatsoever; provided, however, that this provision shall not preclude recovery or damages by the successful bidder for hindrance or delays due solely to fraud, bad faith, or active interference on part of County or its agents. Otherwise, the successful bidder shall only be entitled to extensions of the contract time as the sole and exclusive remedy for such resulting delay, in accordance with and to the extent specifically provided above.

D.20 NO INTEREST

Any monies not paid by County when claimed to be due to the successful bidder under this Agreement shall not be subject to interest including prejudgment interest. Any monies not paid by County when claimed to be due to the successful bidder for damages awarded in the case of construction delays shall not be subject to prejudgment interest.

D.21 BE GREEN

All bidders are encouraged to use as many **environmentally preferable** "green" products, materials, supplies, etc. as possible in order to promote a safe and healthy environment. **Environmentally preferable are products or services that have a reduced adverse effect on the environment**. Where all other evaluative factors, including local preference policies, are otherwise equal, such policies and practices will be a determinative factor in the award decision.

Provide detail of your organization's initiative and its ability to meet the goal of environmental sustainability.

END OF SECTION D

SECTION E

GENERAL CONDITIONS

ARTICLE 1. DEFINITIONS

Whenever used in the Contract Documents, the following terms have the meaning indicated which are applicable to both the singular and plural thereof:

Addendum - Written or graphic instruments issued prior to the opening of Bids which clarify or change the Bid Documents.

Administrative Contract Adjustment (ACA) – A minor change to a Contract, which is less than 10% of the Contract Price or less than 20% of the Contract Time, and does not require Board approval. (Reference Resolution R-07-189)

Application for Payment - The form accepted by the Project Representative which is to be used by Contractor in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

Award - Acceptance of the Bid from the person, firm, or corporation which in the County's sole and absolute judgment will under all circumstances best serve the public interest. Award shall be made in accordance with Chapter 2-26 of the Manatee County Code.

Bid - The Offer of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bid Bond – An insurance agreement, accompanied by a monetary commitment, by which a third party (the Surety) accepts liability and guarantees that the Bidder will not withdraw the Bid.

Bidder - One who submits a Bid directly to the County, as distinct from a Sub-bidder, who submits a Bid to a Bidder.

Bid Documents - Consists of the Invitation for Bid, which includes but is not limited to the Bid Form, drawings, technical Specifications, terms and conditions, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids); and becomes a part of the resulting Contract.

Bid Summary – Specifications or scope of Work that specifically describes the Work to be done for this Project.

Bond Rider – A Bond Rider increases the Performance Bond coverage to ensure responsibility of the Contractor in executing the Work for the County in consideration of the increased value resulting from an approved change in the Contract amount.

Change Order - A document recommended by the Project Representative which is signed by Contractor and County and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Contract.

Compensable Delay - Any delay beyond the control and without the fault or negligence of the Contractor resulting from County-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by County.

Contract - The written Contract between County and Contractor covering the Work to be performed; other Contract Documents are attached to the Contract and made a part thereof as provided therein.

Contract Contingency - A monetary allowance used at the County's discretion, which is part of the total sum of the Contract that allows for minor changes in the Contract that do not change the initial Scope of Work, including Contract Price and Contract Time.

Contract Documents - The Contract, Invitation for Bid in its entirety, Public Construction Bond Form and Insurance Certificate(s), Drawings/Plans, Addenda (which pertain to the Bid Documents), Contractor's Bid Form (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award), and Reports, together with all written Change Orders and other documents amending, modifying or supplementing the Contract Documents issued on or after the Effective Date of the Contract.

Contract Price - The monies payable by County to Contractor under the Contract Documents as stated in the Contract.

Contract Time - The number of days or the date stated in the Notice to Proceed for the completion of the Work.

Contractor - The person, firm or corporation with whom County has entered into a Contract.

Days - All references to days are to be considered calendar days except as specified differently.

Defective - An adjective which when modifying the Work refers to work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to Project Representative's recommendation of final payment (unless responsibility for the protection thereof has been assumed by County).

Drawings - The drawings which show the character and Scope of Work to be performed and which have been prepared or approved by Engineer and are referred to in the Bid and Contract Documents.

Effective Date of the Contract - The date indicated in the Contract on which it becomes effective (date of execution).

Engineer – Licensed professional who is responsible for the preparation, signing, dating, sealing and issuing of any engineering document(s) for any engineering service or Work.

Excusable Delay - Any delay beyond the control and without the negligence of the Contractor, the County, or any other Contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, fires, floods, freight embargoes, acts of government other than County or epidemics. Labor disputes and above average rainfall shall give rise only to Excusable Delays.

Field Directive - A written order issued by an authorized County Representative which approves changes in the Work, but does not involve a change in the initial Scope of Work, including the Contract Price and the Contract Time. A Field Directive must be issued by an authorized County Representative to authorize use of Contract Contingency funds.

Final Completion – The Work (including items defined on the Punch List) has been completed, accepted in writing by the County, approved as-builts have been received, and is ready for final payment.

Float or Slack Time - The time available in the progress schedule during which an unexpected activity can be completed without delaying Substantial Completion of the Work.

Inexcusable Delay - Any delay caused by events or circumstances within the control of the Contractor, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the Contractor.

Information (Pre-Bid) Conference – A meeting held by the Purchasing Division with potential Bidders, prior to the opening of the solicitation, for the purpose of answering questions, clarifying ambiguities, and responding to general issues in order to establish a common basis for understanding all of the requirements of the solicitation; may result in the issuance of an Addendum.

Material Breach – A substantial failure in the performance of the Contract, as to give the affected party the right to remedies available in the Contract.

Non-prejudicial Delay - Any delay impacting a portion of the Work within the available total Float or Slack Time and not necessarily preventing completion of the Work within the Contract Time.

Notice of Award - The written notice to the Successful Bidder stating Award has been approved by the Board of County Commissioners; or by the Purchasing Official in accordance with Chapter 2-26 of the Manatee County Code.

Notice of Intent to Award - The written notice to the apparent Successful Bidder stating Award has been recommended with final Award to be authorized by the Purchasing Official or Board of County Commissioners, as appropriate.

Notice to Proceed - Written notice by County (after execution of Contract) to Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform (ten (10) days from date of such notice) Contractor's obligations under the Contract Documents.

Payment Bond – An instrument, issued by a Surety that guarantees that Subcontractors will be paid for labor expended on the Contract.

Performance Bond – An instrument executed subsequent to Award by the successful Contractor that protects the County from loss due to Contractor’s inability to complete the Contract as agreed.

Preconstruction Conference - Prior to starting the Work, a meeting scheduled by County with Contractor to review the Work schedules, to establish procedures for handling Shop Drawings and other submissions, for processing periodical pay estimates, and such other matters as may be pertinent to the project.

Prejudicial Delay - Any excusable or Compensable Delay impacting the Work and exceeding the total float time available in the progress schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.

Pre-operation Testing - All field inspections, installation checks, water tests, performance tests and necessary corrections required of Contractor to demonstrate that individual components of the Work have been properly constructed and do operate in accordance with the Contract Documents for their intended purposes.

Project - The total construction of which the Work to be provided under the Contract Documents (may be the whole or a part as indicated elsewhere in the Contract Documents).

Project Representative - The authorized representative of Manatee County who is assigned to the project or any part thereof.

Punch List – A list of minor deficiencies or additional Work that does not prohibit achieving Substantial Completion yet must be completed before Final Completion of the Contract can be achieved.

Retainage – A certain percentage, identified in the solicitation document, is withheld from payment due to the Contractor until the Work is fully completed and accepted by County.

Schedule of Values – In the case of a total, lump sum Bid, unit prices shall be established for this Contract by the submission of a Schedule of Values. In the case of an itemized Bid, unit prices are the prices bid. The Contractor shall submit a Schedule of Values within ten (10) days of Notice to Proceed date. The schedule shall include quantities and prices of items equaling the Total Offer and will subdivide the Work into components in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by Contractor to illustrate material or equipment for some portion of the Work.

Special Provisions: As required to define Work or procedures not covered in the standard Specifications, and as necessary to supplement or modify items in the standard Specifications.

Subcontractor - An individual or corporation having a direct contact with Contractor or with any other Subcontractor for the performance of a part of the Work at the site. Such person or firm has contractual relations with the Contractor, not with the County.

Substantial Completion - The stage in the progress of the Work (or a specified portion thereof) is sufficiently complete in accordance with the Contract Documents so the Work (or a specified portion thereof) can be utilized for the intended purpose.

Successful Bidder - The lowest, responsible and responsive Bidder to whom an Award is made.

Supplier - A manufacturer, fabricator, Supplier, distributor, material man or vendor.

Surety – A pledge or guarantee by an insurance company, bank, individual or corporation on behalf of the Bidder which protects against default or failure of the principal to satisfy the contractual obligations.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments and any encasement containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Unit Price Work - Work to be paid for on the basis of unit prices.

Work - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

Work Directive Change - A written directive to Contractor, issued on or after the Effective Date of the Contract and signed by County and recommended by Project Representative ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed or to emergencies. A Work Directive Change itself may not change the Contract Price or Contract Time; but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time.

Written Amendment - A Written Amendment of the Contract Documents, signed by County and Contractor on or after the Effective Date of the Contract and normally dealing with the non-engineering or non-technical rather than strictly Work related aspects of the Contract Documents.

ARTICLE 2. PRELIMINARY MATTERS

Computation of Time: When time is referred to in the Contract Documents 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 legal holiday, such day will be omitted from the computation.

2.1 The Contractor must submit a proposed schedule of the Work at the Preconstruction Conference. The purpose of this schedule is to enable the County to govern the Work, to protect the functions of the local government and its citizens and to aid in providing appropriate surveillance. The County shall have the right to reschedule Work provided such rescheduling is in accordance with the remainder of the terms of the Contract. The schedule shall show, as a minimum, the approximate dates on which each segment of the Work is expected to be started and finished, the proposed traffic flows during each month, the anticipated earnings by the Contractor for each month and the approximate number of crews and equipment to be used. The County, after necessary rescheduling and obtaining additional information for specific

purposes, shall review and approve the schedule. The Contractor shall also forward to the County, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the Work under the Contract, in fabrication and in the field, stating the existing status, estimated time of completion and cause of delay, if any. Together with the summary report, the Contractor shall submit any necessary revisions to the original schedule for the County's review and approval. In addition, more detailed schedules may be required by the County for daily traffic control.

2.2 A Notice to Proceed may be given at any time within thirty (30) days after the Effective Date of the Contract. The Contract Time will commence at the time specified in such notice. Contractor shall start to perform the Work on the date specified in the Notice to Proceed, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.

2.3 If at any time the materials and appliances to be used appear to the County as insufficient or improper for securing the quality of Work required or the required rate of progress, the County may order the Contractor to increase his efficiency or to improve the character of his Work and the Contractor shall conform to such an order. The failure of the County to demand any increase of such efficiency of any improvement shall not release the County from its obligation to secure the quality of Work or the rate of progress necessary to complete the Work within the limits imposed by the Contract. The County may require the Contractor to remove from the Work such employees as the County deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Work is deemed to be contrary to the County's interest.

2.4 The County reserves the right to let other Contracts in connection with this Work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and execution of their Work, and promptly connect and coordinate the Work with theirs.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, RE-USE

3.1 The Contract Documents comprise the entire Contract between County and Contractor concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the laws and ordinances of the State of Florida and Manatee County.

Should a conflict exist within the Contract Documents, the precedence in order of authority is as follows: 1) Bid Summary, 2) Special Conditions, 3) General Conditions, and 4) Drawings.

Note: Computed dimensions shall govern over scaled dimensions.

3.2 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. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for in the Contract Documents. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard Specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of County, Contractor or Engineer, or any of their agents or employees from those set forth in the Contract Documents.

3.3 The Contract Documents may 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:

3.3.1 A Written Amendment

3.3.2 A Change Order

3.3.3 An Administrative Contract Adjustment (ACA)

3.3.4 A Work Directive Change

3.4 In addition, the requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized in one or more of the following ways:

3.4.1 Contract Contingency Work – Field Directive

3.4.2 Engineer's approval of a Shop Drawing or sample

ARTICLE 4. CONTRACTOR'S RESPONSIBILITIES

4.1 Contractor shall keep on the Work at all times during its progress a competent resident superintendent; who shall be the Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.

4.2 Contractor shall provide competent, suitable 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. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours and Contractor will not permit overtime Work or the performance of Work on Saturday, Sunday or legal holiday without County's written consent given after prior notice to Engineer (at least seventy-two (72) hours in advance).

4.2.1 Contractor shall pay for all additional engineering charges to the County for any overtime Work which may be authorized. Such additional engineering charges shall be a subsidiary obligation of Contractor and no extra payment shall be made by County on account of such overtime Work. At County's option, overtime costs may be deducted from Contractor's monthly payment request or Contractor's Retainage prior to release of final payment.

4.3 Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, 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 furnishing, performance, testing, start-up and completion of the Work.

4.4 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable Supplier except as otherwise provided in the Contract Documents.

4.5 Contractor shall be fully responsible to County for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect Contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between County or Engineer and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of County to pay or to see to the payment of any monies due any such Subcontractor, Supplier or other person or organization.

4.6 Permits: Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. County 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.

4.7 During the progress of the Work, Contractor shall keep the premises free from accumulation of waste materials rubbish and other debris resulting from the Work. At the completion of the Work, Contractor shall remove all waste materials, rubbish, and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials and shall leave the site clean and ready for occupancy by County. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents.

4.8 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 property to stresses or pressures that will endanger it.

4.9 Safety and Protection: Contractor shall comply with the Florida Department of Commerce Safety Regulations and any local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

4.9.1 all employees on the Work and other persons and organizations who may be affected thereby;

4.9.2 all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

4.9.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

4.9.4 Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for the protection required by public authority or local conditions. Contractor shall provide reasonable maintenance of traffic way for the public and preservation of the County’s business, taking into full consideration all local conditions. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed.

4.10 Emergencies: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from Engineer or County, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give County prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If County determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a Work Directive Change or Change Order will be issued to document the consequences of the changes or variation.

4.11 For substitutes not included with the Bid, but submitted after the Effective Date of the Contract, Contractor shall make written application to Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provisions of such substitute, including costs of redesign and claims of other Contractors affected by the resulting change, all of which will be considered by the Engineer in evaluating the proposed substitute. Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed substitute. In rendering a decision, County/Engineer and Contractor shall have access to any available Float or Slack Time in the construction schedule. In the event that substitute materials or equipment not included as part of the Bid, but proposed after the Effective Date of the Contract, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the County and an appropriate Change Order executed.

4.11.1 If a specific means, method, sequence, technique or procedure of construction is indicated in or required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to Engineer if Contractor submits sufficient information to allow Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents.

4.11.2 Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Engineer will be the sole judge of acceptability and no substitute will be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved shop drawing. County may require Contractor to furnish at Contractor's expense a special performance guarantee or other Surety with respect to any substitute.

4.11.3 Contractor shall reimburse County for the charges of Engineer and Engineer's consultants for evaluating each proposed substitute submitted after the Effective Date of the Contract and all costs resulting from any delays in the Work while the substitute was undergoing review.

4.12 The Contractor shall furnish, free of charge, all labor, stakes, surveys, batter boards for structures, grade lines and other materials and supplies and shall set construction stakes and batter boards for establishing lines, position of structures, slopes and other controlling points necessary for the proper prosecution of the construction Work. Where rights-of-way, easements, property lines or any other conditions which make the lay-out of the project or parts of the project critical are involved, the Contractor will employ a competent surveyor who is registered in the State of Florida for lay-out and staking. These stakes and marks shall constitute the field control by and in accord with which the Contractor shall govern and execute the Work. The Contractor will be held responsible for the preservation of all stakes, marks and if for any reason any of the stakes or marks or batter boards become destroyed or disturbed, they will be immediately and accurately replaced by the Contractor.

4.13 The Contractor has, by careful examination, satisfied himself as to the nature and location of the Work and all other matters which can in any way affect the Work under this Contract, including, but not limited to details pertaining to boring, as shown on the drawings, are not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the site of the Work, approximately at the locations indicated. The Contractor shall examine boring data, where available, and make his own interpretation of the subsoil investigations and other preliminary data, and shall base his Bid on his own opinion of the conditions likely to be encountered. In no event shall an extension of time be considered for any conditions that existed at the time of bidding, nor shall the Contractor receive extra compensation for completion of the project as intended by the drawings and in keeping with the Contact documents. No verbal agreement or conversation with any officer, agent or employee of the County, before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

4.14 If the Contractor, in the course of the Work, finds that the drawings and/or Contract Documents cannot be followed, he shall immediately inform the County in writing, and the County shall promptly check the accuracy of the information. Any Work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's risk.

ARTICLE 5. COUNTY'S RESPONSIBILITIES

5.1 County shall furnish the data required of County under the Contract Documents promptly and shall make payments to the Contractor within a reasonable time after the Work has been accepted by the County. Payment shall be made no more than twenty (20) business days if County is its own Engineer of Record or twenty-five (25) business days if outside agent approval is required after the pay estimate has been approved by the agent for the County. The form of all submittals, notices, Change Orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the County/Engineer. Standard County forms shall be utilized.

5.2 The County shall provide the lands upon which the Work under this Contract is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same.

5.3 The County shall have the right to take possession of and use any completed portions of the Work, although the time for completing the entire Work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

ARTICLE 6. CHANGES IN THE WORK

6.1 Without invalidating the Contract and without notice to any Surety, County may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

6.2 Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented.

6.3 County and Contractor shall execute appropriate Change Orders, or Written Amendments, covering changes in the Work which are ordered by County, or which may be required because of acceptance of defective Work.

6.4 At any time Engineer may request a quotation from Contractor for a proposed change in the Work and within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract Price or Contract Time for the proposed change. Engineer shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in

sufficient detail to reasonably permit an analysis by Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, added, changed or impacted. Notwithstanding the Request for Quotation, Contractor shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.

ARTICLE 7. CHANGE OF CONTRACT PRICE

7.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at his expense without change in the Contract Price.

7.2 The Contract Price may only be changed by Change Order or by a Written Amendment. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within ten (10) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event.

7.3 The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways, at the County’s discretion:

7.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, cost will be determined by application of such unit prices to the quantities of the items involved.

7.3.2 By mutual acceptance of lump sum.

7.3.3 On the basis of the cost of the Work, plus a 15% Contractor's fee for overhead and profit. (Contractor shall submit an itemized cost breakdown together with supporting data.)

7.4 Either County or Contractor may make a claim for an adjustment in the Contract Price. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment under the following conditions:

7.4.1 If the total cost of a particular item of Unit Price Work amounts to 5% or more of the Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Contract; and

7.4.2 If there is no corresponding adjustment with respect to any other item of Work; and

7.4.3 If a Contractor believes that it has incurred additional expense as a result thereof; or

7.4.4 If County believes that the quantity variation entitles it to an adjustment in the unit price; or

7.4.5 If the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

ARTICLE 8. CHANGE OF CONTRACT TIME

8.1 Contract Time may only be changed by a Change Order or a Written Amendment. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event.

8.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by County or others performing additional Work; or to fires, floods, epidemics, abnormal weather conditions or acts of God.

8.3 All time limits stated in the Contract Documents are of the essence.

ARTICLE 9. WARRANTY, TEST/INSPECTION, CORRECTION

9.1 Contractor warrants, for a minimum period of three (3) years or as otherwise stated herein, and guarantees to County that all Work will be in accordance with the Contract Documents and will not be defective; that County, representatives of County, and governmental agencies with jurisdictional interests will have access to the Work at reasonable time for their observation, inspecting and testing (Contractor shall give Engineer timely notice of readiness of the Work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by County).

9.2 If any Work (including work of others) that is to be inspected, tested, or approved is covered without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice. Neither observations by

Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract Documents.

9.3 If the Work is defective, or Contractor fails to supply sufficient skilled workers, or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, County may order Contractor to stop the Work, or any portion thereof and terminate payments to the Contractor until the cause for such order has been eliminated. Contractor shall bear all direct, indirect and consequential costs for satisfactory reconstruction or removal and replacement with non-defective Work, including, but not limited to fees and charges of engineers, architects, attorneys and other professionals and any additional expenses experienced by County due to delays to other Contractors performing additional Work and an appropriate deductive Change Order shall be issued. Contractor shall further bear the responsibility for maintaining schedule and shall not be entitled to an extension of the Contract Time and the recovery of delay damages due to correcting or removing defective Work.

9.3.1 If Contractor fails within seven (7) days after written notice to correct defective Work, or fails to perform the Work in accordance with the Contract Documents, or fails to comply with any other provision of the Contract Documents, County may correct and remedy any such deficiency to the extent necessary to complete corrective and remedial action. County may exclude Contractor from all or part of the site, take possession of all or part of the Work, Contractor's tools, construction equipment and machinery at the site or for which County has paid Contractor but which are stored elsewhere. All direct and indirect costs of County in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Engineer and a Change Order will be issued incorporating the necessary revisions.

9.3.2 If within three (3) years after the date of completion or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to County and in accordance with County’s written instructions, either correct such defective Work or if it has been rejected by County, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instruction, County may have the defective Work corrected or removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor.

ARTICLE 10. SUSPENSION OR TERMINATION OF WORK

10.1 County reserves the right to suspend the Work, or any portion thereof, at any time without cause for a period not to exceed ninety (90) days by written notice to Contractor, which will fix the date on which Work will be resumed. Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes an approved claim therefore.

10.1.1 If Work is suspended by County for a period that exceeds ninety (90) days; or if Work is suspended by an order of court or other public authority; or if County fails to pay Contractor, then Contractor may, upon seven (7) days written notice to County, terminate the Contract and recover payment for all Work executed.

10.1.2 In lieu of terminating the Contract, if the Engineer has failed to act on any Application for Payment or County has failed to make any payment as aforesaid, Contractor may, upon seven (7) days written notice to County, stop the Work until payment of all amounts then due have been received.

10.2 County reserves the right, after giving seven (7) days written notice, to terminate this Contract if:

10.2.1 Contractor persistently fails to perform the Work in accordance with the Contract Documents;

10.2.2 Contractor disregards laws or regulations of any public body having jurisdiction;

10.2.3 Contractor commences a voluntary case under any chapter of the Bankruptcy Code or any similar action by filing a petition under any other federal or state law relating to bankruptcy or insolvency;

10.2.4 Contractor has a petition filed against them under any chapter of the Bankruptcy Code or similar relief under any other federal or state law;

10.3 County may exclude Contractor from the site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the site and use same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the Work all materials and equipment stored at the site or for which County has paid Contractor but which are stored elsewhere, and finish the Work as County may deem expedient.

10.3.1 Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the Work, but delivered and suitably stored, less the aggregate of payments previously made.

10.3.2 If the direct, indirect and consequential costs of completing the Work exceed the unpaid balance of the Contract Price, Contractor shall pay the difference to County. Such costs incurred by County shall be verified by County and incorporated in a Change Order; but in finishing the Work, County shall not be required to obtain the lowest figure for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of this Contract.

10.4 In the event sufficient budgeted funds are not available for a new fiscal year, County shall notify Contractor of such occurrence and Contract shall terminate on the last day of the current fiscal year without penalty or expense to County.

10.5 Failure of Contractor to comply with any of the provisions of this Contract shall be considered a Material Breach of Contract and shall be cause for immediate termination of Contract at the discretion of County.

10.6 In addition to all other legal remedies available to County, County reserves the right to terminate and obtain from another source, any commodities or services which have not been delivered within the Contract Time as stated in the Contract Documents.

ARTICLE 11. CONTRACT CLAIMS & DISPUTES

11.1 Except as otherwise provided herein, any dispute arising under this Contract shall be decided by the Purchasing Official in accordance with Section 2-26-63 of the Manatee County Code subject to an administrative hearing process provided in 2-26-64. The decision of the Board of County Commissioners in accordance with Section 2-26-64 of the Manatee County Code shall be the final and conclusive County decision subject to exclusive judicial review in the circuit court by a petition for certiorari.

ARTICLE 12. RESIDENT PROJECT REPRESENTATIVE - DUTIES, RESPONSIBILITIES

12.1 The Resident Project Representative is the Engineer’s Agent, who will act as directed by and under the supervision of the Engineer, and who will confer with County regarding his actions. Resident Project Representative's dealing in matters pertaining to the on-site Work shall, in general, be only with the County and Contractor and dealings with Subcontractors shall only be through or with the full knowledge of Contractor.

12.2 Resident Project Representative will:

12.2.1 Review the progress schedule, schedule of shop drawing submissions and Schedule of Values prepared by Contractor and consult with County concerning their acceptability.

12.2.2 Attend Preconstruction Conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with County and notify those expected to attend in advance. Attend meetings and maintain and circulate copies of minutes thereof.

12.2.3 Serve as County's liaison with Contractor, working principally through Contractor's superintendent and assist him in understanding the intent of the Contract Documents. As requested by Contractor, assist in obtaining additional details or information when required at the job site for proper execution of the Work.

12.2.4 Receive and record date of receipt of Shop Drawings and samples, receive samples which are furnished at the site by Contractor and notify Engineer of their availability for examination.

12.2.5 Advise Engineer and Contractor or his superintendent immediately of the commencement of any Work requiring a shop drawing or sample submission if the submission has not been approved by the County.

12.2.6 Conduct on-site observations of the Work in progress to assist Engineer in determining if the Work is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.

12.2.7 Report to County whenever he or she believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspections, tests or approvals required or if Work has been damaged prior to final payment; and advise Contractor when he believes Work should be corrected or rejected or should be uncovered of observation or requires special testing, inspection or approval.

12.2.8 Verify that tests, equipment and system start-ups and operating and maintenance instructions are conducted as required by the Contract Documents and in the presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures and start-ups.

12.2.9 Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to County.

12.2.10 Transmit to Contractor, Engineer's clarifications and interpretations of the Contract Documents.

12.2.11 Consider and evaluate Contractor's suggestions or modifications in drawings or Contract Documents and report them with recommendations to County.

12.2.12 Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and sample submissions, reproductions of original Contract Documents including all Addenda, Change Orders, field orders, additional drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress reports and other project related documents.

12.2.13 Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, Suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to County.

12.2.14 Record names, addresses and telephone numbers of all Contractors, Subcontractors and major Suppliers of materials and equipment.

12.2.15 Furnish Engineer periodic reports as required of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions.

12.2.16 Consult with Engineer in advance of scheduling major tests, inspections or start of important phases of the Work.

12.2.17 Report immediately the occurrence of any accident.

12.2.18 Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Engineer, noting particularly their relation to the Schedule of Values, Work completed and materials and equipment delivered at the site but not incorporated in the Work.

12.2.19 During the course of the Work, verify that certificates, maintenance and operations manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed, and deliver this material to County for his review prior to final acceptance of the Work.

12.2.20 Before Engineer issues a certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.

12.2.21 Conduct final inspection in the company of County and/or Engineer and Contractor and prepare a Punch List of items to be completed or corrected. Reference Florida Statutes § 218.735(7).

12.2.22 Verify that all items on final list have been completed or corrected and make recommendations to County concerning acceptance.

12.3 Except upon written instructions of Engineer, Resident Project Representative:

12.3.1 Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment;

12.3.2 Shall not exceed limitations on Engineer's authority as set forth in the Contract Documents;

12.3.3 Shall not undertake any of the responsibilities of Contractor, Subcontractors or Contractor's superintendent, or expedite the Work;

12.3.4 Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents;

12.3.5 Shall not advise on or issue directions as to safety precautions and programs in connection with the Work;

12.3.6 Shall not authorize County to occupy the project in whole or in part; and

12.3.7 Shall not participate in specialized field or laboratory tests.

ARTICLE 13. APPRENTICES

13.1 If successful Contractor employs apprentices, he shall be governed and comply with the provisions of Fla.Stat. § 446.011.

NOTE: The form of all submittals, notices, Change Orders and other documents permitted or required to be used or transmitted under the Contract shall be determined by the County. Standard County forms shall be utilized.

END OF SECTION E

SECTION F

FORM OF CONTRACT
BETWEEN THE
COUNTY OF MANATEE, FLORIDA
AND CONTRACTOR AS IDENTIFIED BELOW
ON THE BASIS OF A STIPULATED UNIT COST CONTRACT PRICE

This CONTRACT is made and entered into by and between the COUNTY OF MANATEE, a political subdivision of the State of Florida, hereinafter referred to as "COUNTY" and **XXXXXXXXXXXX**, hereinafter referred to as "CONTRACTOR," duly authorized to transact business in the State of Florida, with offices located at **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**

ARTICLE 1. WORK

CONTRACTOR shall furnish all labor, materials, supplies, and other items required to complete the Work for **IFB #14-2841CD- Manatee County Administration Building 7th Floor Data Center Renovation** in strict accordance with Contract Documents and any duly authorized subsequent Addenda thereto, all of which are made a part hereof.

ARTICLE 2. COMPENSATION

As compensation to CONTRACTOR, COUNTY shall pay and CONTRACTOR will accept as full consideration for the performance of all Work required by **IFB #14-2841CD- Manatee County Administration Building 7th Floor Data Center Renovation**, subject to additions and deductions as provided therein, the sum of **$xxxxx.xx** based on a completion time of **120** calendar days.

ARTICLE 3. LIQUIDATED DAMAGES

Time is of the essence in this CONTRACT. As of the date of this CONTRACT, the damages that will be suffered by COUNTY in the event of CONTRACTOR'S failure to timely complete the Work are impossible to determine. In lieu thereof, it is agreed that if CONTRACTOR fails to achieve Final Completion of the Work within **120** calendar days of issuance of the Notice to Proceed (accounting, however, for any extensions of time granted pursuant to approved Change Orders), CONTRACTOR shall pay to COUNTY, as liquidated damages (and not as a penalty), the sum of $**1,742** per calendar day for each day beyond **120** days until CONTRACTOR achieves Final Completion. COUNTY

shall have the option of withholding said liquidated damages from any pay application(s) thereafter submitted by CONTRACTOR. Alternatively, CONTRACTOR shall immediately pay said sums to COUNTY upon COUNTY'S demand for same.

ARTICLE 4. ENGINEER

The COUNTY of MANATEE, Property Management Department, is responsible as COUNTY and Fawley Bryant Architects, Inc. as "ENGINEER," designed this Project and is responsible for technical/engineering reviews and decisions. The ENGINEER is a member of COUNTY'S Project Management team which is collectively responsible for ensuring the Work is completed in accordance with the Contract Documents.

All communications involving this Project will be addressed to: Angela Honts, Project Manager, Property Management Department and to the Engineer of Record, Richard W. Fawley, Architect, Fawley Bryant Architects, Inc. All invoicing will be addressed to the attention of: Angela Honts (address noted below) with invoice copies sent to Richard W. Fawley, Architect (address noted below).

Manatee County Property Management Dept.
IFB# 14-2841CD
Attention: Angela Honts
Project Manager
1112 Manatee Avenue West, Suite 862
Bradenton, Florida 34205
Phone (941) 745-4501 ext. 5844

Fawley Bryant Architects, Inc.
IFB# 14-2841CD
Attn: Richard W. Fawley
Architect
5391 Lakewood Ranch Blvd. N
Sarasota, Florida 34240
Phone (941) 343-4070

Where the terms ENGINEER and/or COUNTY are used in the Contract Documents, it shall mean COUNTY'S Project Management team.

ARTICLE 5. CONTRACTOR'S REPRESENTATIONS

In order to induce COUNTY to enter into this CONTRACT, CONTRACTOR makes the following representations:

5.1 CONTRACTOR has familiarized itself with the nature and extent of the Bid Documents, Work, site, locality and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

5.2 CONTRACTOR has studied carefully all drawings of the physical conditions upon which CONTRACTOR is entitled to rely.

5.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies which pertain to the physical conditions at or contiguous to the site or which otherwise may affect the cost, progress, performance or furnishing of the Work as CONTRACTOR considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Bid Documents; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by CONTRACTOR for such purposes.

5.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Bid Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. Any additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said Underground Facilities conducted by CONTRACTOR will be done at CONTRACTOR'S expense.

5.5 CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Bid.

5.6 CONTRACTOR has given COUNTY written notice of all conflicts, errors or discrepancies that have been discovered in the Bid Documents and the written resolution thereof by COUNTY is acceptable to CONTRACTOR.

5.7 CONTRACTOR shall schedule and perform the Work subject to COUNTY'S approval and shall hold COUNTY harmless from all liabilities incurred due to CONTRACTOR'S failure to coordinate with COUNTY.

ARTICLE 6. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire CONTRACT between COUNTY and CONTRACTOR concerning the Work consist of the following:

6.1 This CONTRACT and Bid Document **IFB #14-2841CD**

6.2 Invitation for Bid # **14-2841CD**, in its entirety

6.3 Public Construction Bond Form and Insurance Certificate(s)

6.4 Drawings/Plans (not attached)

6.5 Addendum number **x** to **x** inclusive

6.6 CONTRACTOR'S Bid Form

6.7 Reports

6.8 The following, which may be delivered or issued after the Effective Date of the CONTRACT and are not attached hereto: all written Change Orders and other documents amending, modifying, or supplementing the Contract Documents.

6.9 The documents listed in paragraphs above are attached to this CONTRACT (except as noted otherwise above). There are no Contract Documents other than those listed above in this Article 6.

ARTICLE 7. DISPUTE RESOLUTION

Disputes shall be resolved as follows: good faith negotiations by the designated agents of the parties and if not resolved by such designated agents, CONTRACTOR shall submit its claim, with the basis for the dispute, in writing to the Manatee County Purchasing Official for a determination and handling in accordance with the provisions of Chapter 2-26 of the Manatee County Code.

ARTICLE 8. NO WAIVER

8.1 The failure of CONTRACTOR or COUNTY to insist on the strict performance of the terms and conditions hereof shall not constitute or be construed as a waiver or relinquishment of either party's right to thereafter enforce the same in accordance with this CONTRACT in the event of a continuing or subsequent default on the part of CONTRACTOR or COUNTY.

8.2 Nothing herein shall be interpreted as a waiver of COUNTY of its rights, including the limitations of the limited waiver of sovereign immunity, as set forth in Florida Statute 768.28, or any other statute, and COUNTY expressly reserves these rights to the full extent allowed by law.

ARTICLE 9. NO THIRD-PARTY BENEFICIARIES

This CONTRACT is solely for the benefit of the parties hereto, and no right, privilege, or cause of action shall by reason hereof accrue upon, to, or for the benefit of any third party. Nothing in this CONTRACT is intended or shall be construed to confer upon or give any person, corporation, partnership, trust, private entity, agency, or any other governmental entity any right, privilege, remedy, or claim under or by reason of this CONTRACT or any provisions or conditions hereof.

ARTICLE 10. GOVERNING LAW, JURISDICTION AND VENUE

10.1 This CONTRACT and the construction and enforceability thereof shall be interpreted under the laws of the State of Florida.

10.2 CONTRACTOR consents and agrees that all legal proceedings related to the subject matter of this CONTRACT shall be governed by the laws of the State of Florida.

10.3 CONTRACTOR consents and agrees that jurisdiction for such proceedings shall lie exclusively with such court, and venue shall be in the Circuit Court of the Twelfth Judicial Circuit in and for Manatee County, Florida.

10.4 In the event of any litigation arising under the terms of this CONTRACT, each party shall be responsible for their own attorney's fees, including appellate fees, regardless of the outcome of the litigation.

ARTICLE 11. FORCE MAJEURE

Neither party shall be considered in default of performance of such obligations hereunder to the extent that performance of such obligations or any of them is delayed or prevented by Force Majeure. Force Majeure shall include, but not be limited to hostility, revolution, civil commotion, strike, epidemic, fire, flood, wind, earthquake, hurricane, or other disruptive event of nature, act of terrorism, explosion, lack of or failure of transportation or bridge/roadway facilities, any law, proclamation, regulation, ordinance or other act of government, or any act of God or any cause whether of the same or different nature, existing or future; provided that the cause, whether or not enumerated in this Article, is beyond the control and without the fault or negligence of the party seeking relief under this Article.

ARTICLE 12. MISCELLANEOUS

12.1 Terms used in this CONTRACT are defined in Article 1 of Section E, General Conditions.

12.2 No assignment by a party hereto of any rights under or interest 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, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignee from any duty or responsibility under the Contract Documents.

12.3 COUNTY 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 of all covenants, agreements, and obligations contained in the Contract Documents.

12.4 By accepting Award of this CONTRACT, CONTRACTOR, which shall include its directors, officers and employees, represents that it presently has no interest in and shall acquire no interest in any business or activity which would conflict in any manner with the performance of duties or services required hereunder.

CONTRACT

IFB # 14-2841CD

IN WITNESS WHEREOF, the parties hereto have caused this CONTRACT **14-2841CD** to be duly executed by their authorized representatives.

CONTRACTOR

By: _____

_____
Print Name & Title of Signer

Date: _____

COUNTY OF MANATEE, FLORIDA

By: _____
Melissa M. Wendel, CPPO
Purchasing Official

Date: _____

BID FORM

(Submit in duplicate)

For: 14-2841CD- Manatee Conuty Administration Building
7th Floor Data Center Renovation

Total Offer: _____
Based on a completion time of 120 calendar days

We, the undersigned, hereby declare that we have carefully reviewed the IFB Documents in their entirety and with full knowledge and understanding of the aforementioned herewith submit this bid, completely meeting each and every specification, term, and condition contained therein.

Only one schedule for Completion of the Work shall be considered. Only one award shall be made.

As bidder, we understand that the IFB documents, in its entirety, including but not limited to, all specifications, terms, and conditions shall be made a part of any resulting Agreement between Manatee County and the successful bidder. Failure to comply shall result in Agreement default, whereupon, the defaulting successful bidder shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by County, and agrees to forfeit his/her bid bond.

Communications concerning this bid shall be addressed as follows: **(Complete all fields)**

Bidder's Name: _____

Mailing Address: _____

Telephone: ( ) _____ Fax: ( ) _____

Email Address: _____

I, _____ **on** [date(s)] _____ **attest that I have visited the project site(s) to familiarize myself with the full scope of work required for the bid.**

Acknowledge Addendum No.____ Dated: _____ Acknowledge Addendum No._____ Dated: _____
Acknowledge Addendum No.____ Dated: _____ Acknowledge Addendum No._____ Dated: _____
Acknowledge Addendum No.____ Dated: _____ Acknowledge Addendum No._____ Dated: _____

Authorized Signature(s): _____

Name and Title of Above Signer(s): _____

Date: _____

BID FORM

(Submitted in dubplicate)

MANATEE COUNTY 7th FLOOR DATA CENTER RENOVATION

Based on a Construction Schedule of 120 days

Item #	Division #	Decription	Est. Qty.	Unit	Unit Price	Extended Price
1	1.01	Mobilization	1	LS	$	$
2	1.02	Demolition	1	LS	$	$
3	7.01	Roofing - Pitch Pans	1	LS	$	$
4	8.01	Access Control- Convirgent Technologies				$18,000.00
5	10.02	ADA Signage	15	each	$	$
6	15.01	Clean Agent System - Salvage & Reconfigure	1	LS	$	$
7	15.02	Fire Sprinkler System - Wet Pipe	1	LS	$	$
8	15.03	HVAC - New Air Handler, VAVs & Ducting	1	LS	$	$
9	15.04	HVAC - CRAC Units and Condenser	3	EA	$	$
10	15.05	HVAC- Controls	1	LS	$	$
11	15.03	HVAC- Test and Balance	1	LS	$	$
12	15.07	Drain Pan	1	LS	$	$
13	16.01	Electrical - Wiring	1	LS	$	$
14	16.02	Electrical - Lighting	1	LS	$	$
15	16.03	Electrical - Switchgear	1	LS	$	$
16	16.04	Electrical - PDU Gear	1	LS	$	$
17	16.05	Electrical - Low Volatge (wiring, pathways, trim)	1	LS	$	$
18	16.06	Electrical - Fire Alarm	1	LS	$	$
19	16.07	Electrical - Data and Structured Cabling	1	LS	$	$
		TOTAL BASE BID - Based on Completion Time of 120 Calendar Days				$
20		**CONTRACT CONTINGENCY WORK (USED ONLY WITH COUNTY APPROVAL)**		**10% OF TOTAL BASE BID**		$
		TOTAL OFFER FOR BID with Contract Contingency - Based on Completion Time of 120 Calendar Days				$

Bidder Name: _____

Authorized Signature: _____

MAILING LABEL

Cut along the outside border and affix this label to your sealed bid envelope to identify it as a "Sealed Bid". Be sure to include the name of the company submitting the bid and the bid due date and time where requested.

MAILING LABEL TO AFFIX TO OUTSIDE OF SEALED BID PACKAGE:

SEALED BID - DO NOT OPEN

BIDDER: _____

SEALED BID NO: 14-2841CD

BID TITLE: Manatee Conuty Administration Building 7th Floor Data Center Renovation

DUE DATE/TIME: _____ @ _____

EXHIBIT A

INSURANCE AND BONDING REQUIREMENTS

The successful bidder will not commence Work under the resulting Agreement until all insurance under this section, and such insurance coverage as might be required by County, has been obtained. The successful bidder shall obtain, and submit to the Purchasing Division within ten (10) calendar days from the date of notice of intent to award, at his expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy):

Insurance / Bond Type	**Required Limits**
1. ☒ Automobile Liability:	Bodily Injury and Property Damage, Owned/Non-Owned/Hired; Automobile included $ 300,000 each occurrence *This policy shall contain severability of interests provisions.*
2. ☒ Commercial General Liability: (Occurrence Form - patterned after the current ISO form)	Bodily Injury and Property Damage $ 1,000,000 single limit per occurrence; $ 2,000,000 aggregate This shall include Premises and Operations; Independent Contractors; Products and Completed Operations and Contractual Liability. *This policy shall contain severability of interests provisions.*
3. ☒ Employer's Liability:	$ 100,000 single limit per occurrence
4. ☒ Worker's Compensation:	Statutory Limits of Florida Statutes, Chapter 440 and all Federal Government Statutory Limits & Requirements
5. ☐ Other Insurance, as noted:	a. ☐ Aircraft Liability $ _____ per occurrence Coverage shall be carried in limits of not less than $5,000,000 each occurrence if applicable to the completion of the services under this Agreement. b. ☐ Installation Floater $ _____ If the resulting Agreement **does not** include construction of or additions to above ground building or structures, but does involve the installation of machinery or equipment, successful bidder shall provide an **"Installation Floater"** with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s). c. ☐ Maritime Coverage (Jones Act) $ _____ per occurrence Coverage shall be maintained where applicable to the completion of the Work.

Insurance / Bond Type	Required Limits
	d. ☐ Pollution $ _____ per occurrence
	e. ☐ Professional Liability $ _____ per claim and in the aggregate • $1,000,000 per claim and in the aggregate • $2,000,000 per claim and in the aggregate f. ☐ Project Professional Liability $ _____ per occurrence g. ☐ Property Insurance $ _____ If the resulting Agreement includes construction of or additions to above ground buildings or structures, bidder *may* provide **"Builder's Risk"** insurance with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s). *To the extent that property damage is covered by commercial insurance, County and successful bidder agree to waive all subrogation rights against each other, except such rights as they may have to the proceeds of such insurance. Successful bidder shall require a similar waiver of subrogation from each of its bidder personnel and sub-consultants, to include Special Consultants; successful bidder shall provide satisfactory written confirmation to County of these additional waivers.* h. ☐ U.S. Longshoreman's and Harborworker's Act $ _____ per occurrence Coverage shall be maintained where applicable to the completion of the Work. i. ☐ Valuable Papers Insurance $ _____ per occurrence j. ☐ Watercraft, $ _____ per occurrence
6. ☒ Bid Bond:	Bid bond shall be submitted by bidder for 5% of the total amount of the bid.
7. ☒ Performance Bond:	For projects in excess of $100,000.00, performance bond shall be submitted by bidder for 100% of the award amount. $ _____

The amounts and types of insurance coverage shall conform to the minimum requirements set forth in this Insurance and Bonding exhibit, with the use of Insurance Services Office (ISO) forms and endorsements or their equivalents. If successful bidder has any self-insured retentions or deductibles under any of the listed minimum required coverage, successful bidder must identify on the certificate of insurance the nature and amount of such self-insured retentions or deductibles and provide satisfactory evidence of financial responsibility for such obligations. All self-insured retentions or deductibles will be successful bidder's sole responsibility.

Nothing herein shall in any manner create any liability of County in connection with any claim against the successful bidder for labor, services, or materials, or of subcontractors; and nothing herein shall limit the liability of the successful bidder or successful bidder's sureties to County or to any workers, suppliers, material men or employees in relation to the resulting Agreement.

By way of its submission of a bid hereto, bidder:

a. Represents that bidder maintains, and will maintain during the term of any Agreement arising from this solicitation, all insurance coverage required herein from responsible companies duly authorized to do business under the laws of the State of Florida that hold an A.M. Best rating of "A-" or better, and are deemed acceptable to County as set forth in this solicitation.

b. Agrees that insurance, as specified herein, shall remain in force and effect without interruption from the date of commencement of the Work throughout the duration of the project, including any warranty periods.

c. Agrees that if the initial or any subsequently issued certificate of insurance expires prior to completion of the Work, successful bidder shall furnish to County renewal or replacement certificate(s) of insurance no later than ten (10) calendar days after the expiration date on the certificate. Failure of successful bidder to provide County with such renewal certificate(s) shall be considered justification for County to terminate any and all agreements.

d. Agrees that bidder and/or its insurance carrier shall provide thirty (30) days written notice to County of policy cancellation or non-renewal on the part of the insurance carrier or the successful bidder. Successful bidder shall also notify County, in a like manner, within twenty-four (24) hours after receipt, of any notices of expiration, cancellation, non-renewal or material change in coverage or limits received by successful bidder from its insurer and nothing contained herein shall relieve successful bidder of this requirement to provide notice. In the event of a reduction in the aggregate limit of any policy to be provided by successful bidder hereunder, successful bidder shall immediately take steps to have the aggregate limit reinstated to the full extent permitted under such policy.

e. Agrees that failure of successful bidder to obtain and maintain proper amounts of insurance at all times as called for herein shall constitute a material breach of the resulting Agreement, which may result in immediate termination.

f. Agrees that, should at any time the successful bidder not maintain the insurance coverage(s) required herein, County may terminate the Agreement or at its sole discretion shall be authorized to purchase such coverage(s) and charge successful bidder for such coverage(s) purchased. If successful bidder fails to reimburse County for such costs within thirty (30) days after demand, County has the right to offset these costs from any amount due successful bidder under this Agreement or any other agreement between the County and successful bidder. County shall be under no obligation to purchase such

insurance, nor shall it be responsible for the coverage(s) purchased or the insurance companies used. The decision of County to purchase such insurance coverage(s) shall in no way be construed to be a waiver of any of its rights under the Contract Documents.

g. Agrees to provide, upon request, the entire and complete insurance policies required herein.

Certificate of Insurance Requirements:

a. Certificates of insurance in duplicate evidencing the insurance coverage specified herein shall be filed with the Purchasing Division before operations are begun. The required certificates of insurance shall name the types of policy, policy number, date of expiration, amount of coverage, companies affording coverage, and also shall refer specifically to the bid number and title of the project, and must read: For any and all work performed on behalf of Manatee County.

b. **Additional Insured:** The Automobile Liability and Commercial General Liability policies provided by the successful bidder to meet the requirements of this IFB shall name Manatee County, Board of County Commissioners, as an additional insured as to the operations of the successful bidder under this IFB and shall contain severability of interests provisions.

c. In order for the certificate of insurance to be accepted it **must** comply with the following:

   1. The "Certificate Holder" shall be:
      Manatee County
      Board of County Commissioners
      Bradenton, FL
      IFB# 14-2841CD, Manatee County Administration Building 7th Floor Data Center Renovation
      For any and all work performed on behalf of Manatee County.

   2. Certificate shall be mailed to:
      Manatee County Purchasing Division
      1112 Manatee Avenue West, Suite 803
      Bradenton, FL 34205
      Attn: Chris Daley,CPPO, CPPB, Contract Specialist

Bid Bond/Certified Check:

By submitting a bid to this Invitation for Bid, the bidder agrees should the bidder's bid be accepted, **to execute the form of Agreement and present the same to Manatee County for approval within ten (10) calendar days after notice of intent to award**. The bidder further agrees that failure to execute and deliver said form of Agreement **within ten (10) calendar days** will result in damages to Manatee County and as guarantee of payment of same a bid bond/certified check shall be enclosed within the submitted sealed bid in the amount of five (5%) percent of the total amount of the bid. The bidder further agrees that in case the bidder fails to enter into an Agreement, as prescribed by Manatee County, the bid bond/certified check accompanying the bid shall be forfeited to Manatee County as agreed liquidated damages. If County enters into an Agreement with a bidder, or if County rejects any and/or all bids, accompanying bond will be promptly returned.

Performance and Payment Bonds:

Successful bidder shall furnish surety bonds using the Public Construction Bond form prescribed in Florida Statutes § 255.05, which is provided herein, as security for faithful performance of the

Agreement awarded as a result of this bid and for the payment of all persons performing labor and/or furnishing material in connection therewith. Failure to provide the required bonds on the prescribed form may result in successful bidder being deemed nonresponsive. Bonds must be in the form prescribed in Florida Statutes § 255.05, and must not contain notice, demand or other terms and conditions, including informal pre-claim meetings, not provided for in Florida Statutes § 255.05.

Surety of such bonds shall be in an amount equal to 100% of the Contract Price issued by a duly authorized and nationally recognized Surety company, authorized to do business in the State of Florida, satisfactory to this County. Surety shall be rated as “A-” or better as to general policy holders rating and Class V or higher rating as to financial size category and the amount required shall not exceed five (5%) percent of the reported policy holders’ surplus, all as reported in the most current Best Key Rating Guide, published by A.M. Best Company, Inc. of 75 Fulton Street, New York, New York, 10038. The attorney-in-fact who signs the bonds must file with the bonds, a certificate and effective dated copy of power-of-attorney. Performance and payment bonds shall be issued to Manatee County, a political subdivision of the State of Florida, within ten (10) calendar days after notice of intent to award.

In addition, pursuant to Florida Statutes § 255.05(1)(b), prior to commencing Work, the successful bidder shall be responsible and bear all costs associated to record the performance and payment bond with the Manatee County Clerk of the Circuit Court. A certified copy of said recording shall be furnished to the Purchasing Division upon filing. Pursuant to Florida Statutes § 255.05(1)(b), County will make no payment to the successful bidder until the successful bidder has complied with this paragraph.

Furnishing performance and payment bonds shall be requisite to execution of an Agreement with County. Said performance and payment bonds will remain in force for the duration of the Agreement with the premiums paid by the successful bidder. Failure of the successful bidder to execute such Agreement and to supply the required bonds shall be just cause for cancellation of the award. County may then contract with the next lowest, responsive and responsible bidder or re-advertise this IFB. If another bidder is accepted, and notice given within ninety (90) days after the opening of the bids, this acceptance shall bind the bidder as though they were originally the successful bidder.

Failure of County at any time to require performance by the successful bidder of any provisions set out in the resulting Agreement will in no way affect the right of County, thereafter, to enforce those provisions.

When activity occurs within the resulting Agreement that increases the amount of the Agreement by either an approved Administrative Contract Adjustment (ACA) or an approved Change Order, a recorded bond rider shall be provided before the additional Work can proceed. All premiums shall be paid by the successful bidder.

EXHIBIT B

BIDDER'S QUESTIONNAIRE

(Submit in Duplicate)

The bidder warrants the truth and accuracy of all statements and answers herein contained. (Attach additional pages if necessary.)

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID

1. Contact Information:

   FEIN #: _____

   License #: _____
   License Issued to: _____
   Date License Issued (MM/DD/YR): _____
   Company Name: _____
   Physical Address: _____
   City: _____ State of Incorporation: _____ Zip Code: _____
   Phone Number: ( ) _____ Fax Number: ( ) _____
   Email address: _____

2. Bidding as: an individual __; a partnership __; a corporation __; a joint venture __

3. If a partnership, list names and addresses of partners; if a corporation, list names of officers, directors, shareholders, and state of incorporation; if joint venture, list names and address of ventures' and the same if any venture are a corporation for each such corporation, partnership, or joint venture:

   _____
   _____
   _____
   _____

4. Bidder is authorized to do business in the State of Florida: ☐ Yes ☐ No

   For how many years? _____

5. Your organization has been in business (under this firm's name) as a

   _____

   Is this firm in bankruptcy? _____

6. Attach a list of projects where this specific type of Work was performed.

BIDDER: _____

7. Is this firm currently contemplating or in litigation? Provide summary details.

_____

_____

_____

8. Have you ever been assessed liquidated damages under a contract during the past five (5) years? If so, state when, where (contact name, address and phone number) and why.

_____

_____

_____

9. Have you ever failed to complete Work awarded to you? Or failed to complete projects within contract time? If so, state when, where (contact name, address, phone number) and why.

_____

_____

_____

10. Have you ever been debarred or prohibited from providing a bid to a governmental entity? If yes, name the entity and describe the circumstances.

_____

_____

_____

11. Will you subcontract any part of this Work? If so, describe which portion(s) and to whom.

_____

_____

_____

BIDDER: _____

12. If any, list MBE/DBE (with Agreement amount) to be utilized:

_____

_____

_____

13. What equipment do you own to accomplish this Work? (A listing may be attached)

_____

_____

_____

14. What equipment will you purchase/rent for the Work? (Specify which)

_____

_____

_____

15. List the following in connection with the Surety which is providing the bond(s):

Surety's Name: _____

Address: _____

_____

Name, address, phone number and email of Surety's resident agent for service of process in Florida:

Agent's Name: _____

Address: _____

_____

Phone: _____

Email: _____

BIDDER: _____

EXHIBIT C

PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO ARTICLE V,
MANATEE COUNTY PURCHASING ORDINANCE

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

This sworn statement is submitted to the Manatee County Board of County Commissioners by

_____

[Print individual's name and title]

____ for _____[Print name of entity submitting sworn statement]

whose business address is _____

and (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: _____.

I understand that no person or entity shall be awarded or receive a County agreement for public improvements, procurement of goods or services (including professional services) or a County lease, franchise, concession or management agreement, or shall receive a grant of County monies unless such person or entity has submitted a written certification to County that it has not:

(1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or

(2) been convicted of an agreement or collusion among bidders or prospective bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or

(3) been convicted of a violation of an environmental law that, in the sole opinion of County's Purchasing Official, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or

(4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or

(5) where an officer, official, agent or employee of a business entity has been convicted of or has admitted guilt to any of the crimes set forth above on behalf of such an entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common Board of Directors. For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests among family members, shared organization of a business entity following the ineligibility of a business entity under this Article, or using substantially the same management, ownership or principles as the ineligible entity.

(Continued)

Any person or entity who claims that this Article is inapplicable to him/her/it because a conviction or judgment has been reversed by a court of competent jurisdiction shall prove the same with documentation satisfactory to County's Purchasing Official. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with County.

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR MANATEE COUNTY IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT ANY CONTRACT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE CONTRACTING OFFICER OR COUNTY ADMINISTRATOR DETERMINES THAT **SUCH PERSON OR ENTITY HAS MADE FALSE CERTIFICATION.**

_____
[Signature]

STATE OF FLORIDA
COUNTY OF _____

Sworn to and subscribed before me this ____ day of _____, 20_____ by _____

Personally known _____ OR Produced identification _____
[Type of identification]

_____ My commission expires _____
Notary Public Signature

_____
[Print, type or stamp Commissioned name of Notary Public]

Signatory Requirement - In the case of a business entity other than a partnership or a corporation, this affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, this affidavit shall be executed by the general partner(s). In the case of a corporation, this affidavit shall be executed by the corporate president.

EXHIBIT D

SWORN STATEMENT

THE FLORIDA TRENCH SAFETY ACT

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR BY AN OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This Sworn Statement is submitted with **IFB NO. 14-2841CD**
2. This Sworn Statement is submitted by_____ whose business address is_____ and, 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 _____.
3. Name of individual signing this Sworn Statement is: _____,
   Whose relationship to the above entity is: _____.
4. The Trench Safety Standards that will be in effect during the construction of this project shall include, but are not limited to: Laws of Florida, Chapters 90-96, TRENCH SAFETY ACT, and OSHA RULES AND REGULATIONS 29 CFR 1926.650 Subpart P, effective October 1, 1990.
5. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless County and Engineer, and any of their agents or employees from any claims arising from the failure to comply with said standard.
6. The undersigned has appropriated the following costs for compliance with the applicable standards:

Trench Safety Measure (Description)	Units of Measure (LF, SY)	Unit Quantity	Unit Cost	Extended Cost
a. _____	_____	_____	$_____	_____
b. _____	_____	_____	$_____	_____
c. _____	_____	_____	$_____	_____
d. _____	_____	_____	$_____	_____

7. The undersigned intends to comply with these standards by instituting the following procedures:
   _____
   _____
   _____

THE UNDERSIGNED, in submitting this bid, represents that they have reviewed and considered all available geotechnical information and made such other investigations and tests as they may deem necessary to adequately design the trench safety system(s) to be utilized on this project.

_____

(AUTHORIZED SIGNATURE / TITLE)

SWORN to and subscribed before me this _____ day of _____, 20_____.

(Impress official seal)

Notary Public, State of Florida: _____

My commission expires: _____

R. B. "Chips" Shore
CLERK OF THE CIRCUIT COURT AND COMPTROLLER OF MANATEE COUNTY
1115 Manatee Avenue West, Bradenton, Florida 34205 - Phone (941) 749-1800 – Fax (941) 741-4082
P.O. Box 25400, Bradenton, Florida 34206 - www.manateeclerk.com

EXHIBIT E: E PAYABLES APPLICATION

Company name_____

Contact person_____

Phone number_____

Email Address_____

FINANCE USE ONLY

Open orders: YES or NO

PEID _____

CREATE DATE _____

CONFIRMED WITH _____
Name and phone number

IFAS _____

BANK _____

INITIALS_____

Return completed form to:

Via email to: lori.bryan@manateeclerk.com

Via fax to: (941) 741-4011

Via mail:

PO Box 1000

Bradenton, Fl 34206

Revised: June 26, 2013

Construction Document Specifications

for

MANATEE COUNTY ADMINISTRATION BUILDING 7TH FLOOR DATA CENTER RENOVATION PROJECT

1112 Manatee Avenue West, Bradenton, FL 34205

Prepared By:
Fawley Bryant Architects, Inc.
5391 Lakewood Ranch Blvd. N.
Suite 300
Sarasota, Florida 34240
Phone (941) 343-4070

Revision 2 – 10.22.14

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - SITE

N/A

DIVISION 03 - CONCRETE

N/A

DIVISION 04 - MASONRY

N/A

DIVISION 05 - METALS

N/A

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

N/A

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

N/A

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

N/A

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

N/A

DIVISION 12 – FURNISHINGS

N/A

MECHANICAL SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

END OF TABLE OF CONTENTS

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Access to site.
6. Work restrictions.
7. Specification and drawing conventions.

B. Related Section:

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

1.3 PROJECT INFORMATION

A. Project Identification: Manatee County Administration Building, 7th Floor Data Center Renovation

1. Project Location: Manatee County Administration Building, 1112 Manatee Avenue West, Bradenton, FL 34205.

B. Owner: Manatee County Government

1. Owner's Representative: Angela Honts, Project Manager, tel. 941.748.4501

C. Architect: Fawley Bryant Architects, Inc. 5391 Lakewood Ranch Blvd. N., Suite 300, Sarasota, Florida, 34240
1. Project Architect: Jason B. Taylor, tel. 941.343.4070 email: jason.taylor@fawley-bryant.com

D. Mechanical, Plumbing, and Electrical Engineer: Global Sanchez, Inc. 816 Manatee Avenue East, Suite 18, Bradenton, FL 34208
1. Project Engineer: Phil Feikema, tel. 941.758.2551 email: phil@global-sanchez.com

E. Fire Protection Engineer: Hatcher Engineering, Inc. 2108 West Risk Street, Plant City, FL 33563
1. Project Engineer: Nathan Hatcher, tel. 813.752.6911 email: njh@hatcherengineering.com

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of, but is not limited to, the following:

1. Renovation of the east portion of the 7th floor containing the existing data center. The project consists of reducing the footprint of the existing data center and removing the unused portion of the data floor for use as offices. The data center will receive new HVAC, electrical power supplies, and new A/B power leads. Surrounding open office area to be workstation furniture.

2. Contractor to review contract documents and existing conditions to familiarize themselves with the scope of the project and project area.

3. Project area – see section 1.6.

4. The project area lies within an occupied structure with limited parking and access. Contractor to coordinate all access, parking, laydown areas and other construction related activities with Manatee County Government and all applicable jurisdictional authorities.

5. Contractor to provide dumpster and waste collection services as part of their contract.

B. Type of Contract

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

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
1. IT equipment, servers, computers, switches and racks are provided by the Owner. Modification, moving and network wiring by Owner as well.
2. Access control and security is by Owner.
3. Contractor to schedule a coordination meeting with the Owner to review the Owner's scope of Work and provided items inclusive of the above and any other items in addition.

1.6 ACCESS TO SITE

A. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

B. Project Area: Project area is generally defined as the 7th floor data center area and immediate surrounding area as detailed in the drawings. Also affected will be the roof area, the east stairwell, north service drive area and electrical spaces on the first floor.

C. Contractor to ensure all driveways, walkways, entrances, fire lanes and access points are clear for use and egress.

D. Contractor shall schedule all deliveries with Manatee County Property Management.

E. The project area lies within an occupied structure with limited parking and access. Contractor to coordinate all access, parking, laydown areas and other construction related activities with Manatee County Government and all applicable jurisdictional authorities.

1. Parking: Contractor shall coordinate required worker parking with Manatee County Property Management. Parking is available from the City of Bradenton at a nominal cost (contact number: 941.932.9400).

1.7 WORK RESTRICTIONS

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

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

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8 a.m. to 5 p.m., Monday through Friday, with no access on the weekends and scheduled holidays. Contractor to coordinate access with Manatee County Property Management.

1. Work outside of normal business hours shall be requested in writing minimum 72 hours in advance and a $75 per hour back charge to the Contractor is applicable upon approval.
2. Written notice provided minimum 72 hours in advance is required for any activities that will disturb Owner operations.

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 in writing not less than 7 days in advance of proposed 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 in writing not less than 7 days in advance of proposed utility interruptions.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

F. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.

G. Employee Identification: Provide identification tags for Contractor personnel working on the Project site. Require personnel to utilize identification tags at all times.

H. Employee Screening: Comply with Owner's requirements regarding background screening of Contractor personnel working on the Project site.

1. Maintain list of approved screened personnel with Owner's Representative.

1.8 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012000 – MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SCOPE

A. The scope of this section of the Contract Specifications is to further define the items included in each Bid Item in the Bid Form section of the Contract Documents. Payment will be made based on the specified items included in the description in this section for each bid item.

B. All contract prices included in the Bid Form section will be full compensation for all required work, identified or not, required, including but not limited to shop drawings, working drawings, labor, materials, tools, equipment, incidentals and mobilization necessary to complete the requirements of this project, as shown on the Drawings and/or as specified in the Contract Specifications to be performed under this Contract. Actual quantities of each item bid on a unit price basis will be determined upon completion of the construction in the manner set up for each item in this section of the Specifications. Payment for all items listed in the Bid Form will constitute full compensation for all work required to render a complete product, specified to be performed under this Contract.

1.2 EXPLANATION AND DEFINITIONS

A. The following explanation of the Measurement and Payment for the Bid Schedule items is made for information and guidance. The omission of reference to any item in this description shall not, however, alter the intent of the Bid Schedule or relieve the CONTRACTOR of the necessity of furnishing such as a part of the Contract. Measurement and payment for all Bid Items shall be in accordance with this section.

1.3 MEASUREMENT

The quantities set forth in the Bid Form are approximate and are given to establish a uniform basis for the comparison of bids. The COUNTY reserves the right to increase or decrease the quantity of any class or portion of the work during the progress of construction in accord with the terms of the Contract.

1.4 PAYMENT

A. Make payment for the items listed on the Bid Form on the basis of the work actually performed and completed, such work including but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, clean up, restoration of disturbed areas, and all other appurtenances to complete the construction and installation of the work as shown on the drawings and described in the specifications.

B. Unit prices are used as a means of computing the final figures for bid and contract purposes, for periodic payments for work performed, for determining value of additions or deletions and wherever else reasonable.

C. Lump sum items
   1. Where payment for items is shown to be paid for on a lump sum basis, no separate payment will be made for any item of work required to complete the lump sum items. Lump sum contracts shall be complete, tested and fully operable prior to request for final payment. Contractor shall be required to provide a break-down of the lump sum totals in their schedule of values.

D. Unit price items
   1. Separate payment will be made for the items of work described herein and listed on the Bid Form as a unit price item. Any related work not specifically listed, but required for satisfactory completion of the work shall be considered to be included in the scope of the appropriate listed work items.
   2. No separate payment will be made for the following items and the cost of such work shall be included in the applicable pay items of work. Final payments shall not be requested by the Contractor or made by the County until as-built (record) drawings have been submitted and approved by the County.
      a. Shop Drawings, Working Drawings
      b. Cleanup and miscellaneous work
      c. Testing and placing systems in operation
      d. Any material and equipment required to be installed and utilized for the tests
      e. Maintaining the existing quality of service during construction
      f. Maintaining or detouring of traffic
      g. Appurtenant work as required for a complete and operable system
      h. As-built record drawings

1.5 SCHEDULE OF VALUES

A. Approval of Schedule: Submit for approval a schedule of values, in duplicate, for all of the Work. Prepare schedule of values as based on the County provided schedule of values, and submit within 10 calendar days after the Effective Date of the Agreement. Submit final schedule of values in accordance with the Terms and Conditions of the Agreement.

B. Format: Utilize a format similar to the Table of Contents of the Project Specifications. Identify each line item with number and title of the major specification items. Identify site mobilization, bonds and insurance. Include within each line item, a direct proportional amount of Contractor's overhead profit.

C. Contractor to use County provided pay application form only for payment submission. All other forms shall be rejected.

D. Revisions: With each application for Payment, revise schedule to list approved Change Orders.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 MEASURMENT AND PAYMENT (BID FORM ITEMS)

A. Make payment on the basis of work actually performed completing each item in the Bid, such work including, but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, cleanup, and all other appurtenances to complete the construction and installation of the work to the configuration and extent as shown on the drawings and described in the specifications. Payment for each item includes compensation for cleanup and restorations. Cost of cleanup and surface restorations will be considered as the percentage retained in accordance with the Contract Documents, and complete payment will not be made until cleanup, restorations and as-builts are completed.
   1. <u>1.01 Mobilization:</u> Measurement and payment for the Mobilization Bid Item shall include full compensation for the required 100 percent (100%) Performance Bond, 100 Percent (100%) Payment Bond, all required insurance for the project, and any permits not already obtained by the

County. This may include those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site and for the establishment of temporary offices, safety equipment and first aid supplies, and sanitary and other facilities/utilities. The mobilization pay item also includes demobilization of all equipment, personnel, supplies and incidentals from the project site upon final completion. Payment for mobilization shall not exceed 10 percent (10%) of the total Contract cost unless the Contractor can prove to the County that his actual mobilization cost exceeds 10 percent (10%). The basis of payment for all work associated with Mobilization shall be paid for under the Lump Sum Pay Item and in accordance with the following schedule:

Percent of the Total Contract Amount Earned	Allowable Percent of the Lump Sum Price for Mobilization
5	25
10	50
25	75
100	100

2. 1.02 Limited Demolition (Electrical, Mechanical and Fire Related): Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, the removal of specified Electrical, Mechanical, and Fire Related items in and around the site. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included in Sheets A3.0, FP2.0, FX2.0. **Note – Contractor shall be responsible for coordinating demolition with Manatee County Property Management.**
3. 7.01 Roofing – Pitch Pans: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install all roofing pitch pans as required for new construction. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. Before final payment is completed the Framing and Drywall shall be inspected and accepted by the Architect, Manatee County Property Management, and the City of Bradenton (if required).
4. 8.01 Access Control – Convergint Tech: Provide and install all Access Control as shown on the plans and related specification sections. Work for this item shall be by Convergint Technologies per Manatee County requirements. All work covered for this Item is included in Sheets A3.1 and A8.1 and related specification sections. Before final payment is completed the Access Control shall be inspected and accepted by the Architect, Manatee County Property Management, and the City of Bradenton (if required).

   General Contractor shall use an allowance of $18,000.00 to contract with the Manatee County security continuing services contractor listed below:

   Convergint Technologies, Inc.
   6996 Anderson Road, Tampa, FL 33634
   Office: 813.885.3705 Fax: 866.306.1799
   Larry Phillips, Branch Manager Cell:813.523.8685

5. 10.02 ADA Signage Installation: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Install all code required ADA signage (provided by Manatee County) as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the unit price bid for the work required. All work covered for this Item is included on Sheet A3.1. Before final payment is completed the signage shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
6. 15.01 Clean Agent Suppression System – Salvage & Reconfigure: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Salvage, reconfigure and install

the Clean Agent system as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on Sheet FX1.0 and FX 2.0. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the Clean Agent System shall be inspected and accepted by the Architect, Manatee County Property Management, the City of Bradenton, and the City of Bradenton Fire Marshall. **Note – Contractor is responsible for the entire fire protection and suppression system.**

7. 15.02 Fire Sprinkler System – Wet Pipe: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the wet pipe sprinkler system as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on Sheet FP1.0, FP1.1, FP2.0 and FP 2.1. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the sprinkler system shall be inspected and accepted by the Architect, Manatee County Property Management, the City of Bradenton, and the City of Bradenton Fire Marshall. **Note – Contractor is responsible for the entire fire protection and suppression system.**
8. 15.03 HVAC - New Air Handler, VAVs & Ducting: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the New Air Handler, VAVs & ducting as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Mechanical and Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the HVAC New Air Handler, VAVs & ducting shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
9. 15.04 HVAC - CRAC Units and Condensers: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the CRAC units and condensers as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the unit price bid for the work required. All work covered for this Item is included on the Mechanical and Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the CRAC units and condensers shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
10. 15.05 HVAC - Controls: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install all HVAC controls as shown on the plans and as required by the existing building automation system. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum bid for the work required. All work covered for this Item is included on the Mechanical and Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the HVAC controls shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
11. 15.03 HVAC – Test and Balance: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Contractor shall test and balance the new HVAC system. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum bid for the work required. All work covered for this Item is included on the Mechanical and Electrical Sheets. Before final payment is completed the test and balance report shall be reviewed and accepted by the Architect, Manatee County Property Management and the City of Bradenton.

12. 15.07 Drain Pan: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the drain pan as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the A6.2 and the Mechanical Sheets. Before final payment is completed the drain pan and related components shall be inspected and accepted by the Architect and Manatee County Property Management.
13. 16.01 Electrical - Wiring: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the electrical wiring, pathways, and conduits as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the electrical wiring, pathways and conduits shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
14. 16.02 Electrical - Lighting: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the data wiring, pathways, conduits and trim as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the lighting (both new and reused existing fixtures) shall be inspected and accepted by the Architect and Manatee County Property Management.
15. 16.03 Electrical - Switchgear: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the electrical switchgear and related components as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the switchgear and related components shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
16. 16.04 Electrical – PDU Gear: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the PDU gear and related components as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the PDU gear and related components shall be inspected and accepted by the Architect, Manatee County Property Management and the City of Bradenton.
17. 16.05 Electrical – Low Voltage (wiring, pathways, trim): Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the low voltage, wiring, pathways and trim as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the low voltage, pathways and trim shall be inspected and accepted by the Architect and Manatee County Property Management.
18. 16.06 Electrical – Fire Alarm: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the fire alarm as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the

lump sum price bid for the work required. All work covered for this Item is included on the Fire Protection Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the fire alarm shall be inspected and accepted by the Architect, Manatee County Property Management, the City of Bradenton, and the City of Bradenton Fire Marshall.

19. 16.07 Electrical – Data and Structured Cabling: Measurement and payment for this Bid Item shall include full compensation for all required work included to complete this portion of this project, rendering a complete and operable system. Provide and install the data wiring, pathways, conduits, pull strings and trim as shown on the plans. Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the work required. All work covered for this Item is included on the Electrical Sheets. Contractor to provide a separate schedule of values for the individual components of this system along with their payment requests. Before final payment is completed the data wiring, pathways, conduits and trim shall be inspected and accepted by the Architect and Manatee County Property Management.

END OF SECTION 012000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
2. All provided specification sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A or form approved by Owner and Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect,

sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project, from 2010 Florida Building Code.

j. 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 date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.
    c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    d. Substitution request is fully documented and properly submitted.
    e. Requested substitution will not adversely affect Contractor's construction schedule.
    f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    g. Requested substitution is compatible with other portions of the Work.
    h. Requested substitution has been coordinated with other portions of the Work.
    i. Requested substitution provides specified warranty.
    j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

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

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Manatee County Purchasing for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

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

1.7 CONSTRUCTION CHANGE DIRECTIVE

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

1. Construction Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 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 specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Progress payments shall be submitted to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

   a. Materials previously stored and included in previous Applications for Payment.
   b. Work completed for this Application utilizing previously stored materials.
   c. Additional materials stored with this Application.
   d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Certificates of insurance and insurance policies.
11. Performance and payment bonds.
12. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
5. AIA Document G707, "Consent of Surety to Final Payment."
6. Evidence that claims have been settled.
7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project meetings.

B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

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 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. Progress meetings.
4. Preinstallation conferences.
5. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
e. Indicate required installation sequences.
f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
3. Fire Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

4. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
5. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as the original Drawings.
2. File Preparation Format: DWG, Version AutoCad 2013 or earlier format or Revit 2013 or earlier format, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.
4. Architect will furnish Contractor one set of digital data files of the Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings.
    b. Digital Data Software Program: The Drawings are available in DWG, Version AutoCad 2004 or Revit 2012.
    c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.6 KEY PERSONNEL

A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. 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.

1.7 REQUESTS FOR INFORMATION (RFIs)

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

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor 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 information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following 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 inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. 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 at project meetings. Software log with not less than the following:

1. Project name.

2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were 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.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 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: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three business days of the meeting.

B. Preinstallation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and County Project Representative, of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.

w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Progress Meetings: Conduct progress meetings at weekly regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner (County Project Representative) and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Start-up construction schedule.
2. Contractor's construction schedule.
3. Daily construction reports.
4. Material location reports.
5. Field condition reports.
6. Special reports.

B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.
2. Two paper copies.

B. Start-up construction schedule.

1. Approval of cost-loaded start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. Construction Progress Management (CPM) Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work the Notice to Proceed until most recent Application for Payment.

E. Daily Construction Reports: Submit at monthly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Field Condition Reports: Submit at time of discovery of differing conditions.

H. Special Reports: Submit at time of unusual event.

1.4 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, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final 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.

B. 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 the following 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 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include not less than 15 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.

C. 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 by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. 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. Use of premises restrictions.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Submittals.
    b. Purchases.
    c. Mockups.
    d. Fabrication.
    e. Deliveries.
    f. Installation.
    g. Tests and inspections.
    h. Adjusting.
    i. Startup and placement into final use and operation.

7. Construction Areas: 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.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

G. Recovery Schedule: When periodic update indicates the Work is 7 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Utilize Microsoft Project, for Windows operating system.

2.2 START-UP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 15 days of date established for the Notice to Proceed. Base schedule on the start-up construction schedule and additional information 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 three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 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. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. Accidents.
6. Meetings and significant decisions.

7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Emergency procedures.
10. Orders and requests of authorities having jurisdiction.
11. Change Orders received and implemented.
12. Construction Work Change Directives received and implemented.
13. Services connected and disconnected.
14. Equipment or system tests and startups.
15. Partial completions and occupancies.
16. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit 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 and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) 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

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

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 final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, 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 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

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

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action, informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Architect's and Construction Manager's final release or approval.
   g. Scheduled dates for purchasing.
   h. Scheduled dates for installation.
   i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: **Limited** electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor limited digital data drawing files upon request of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

   a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   b. Digital Drawing Software Program: The Contract Drawings are available in AutoCad export from Revit.
   c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
5. Do not combine submittals from different specification sections. Submittal packages that contain items from multiple specification sections will be returned without review.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Include the following information on an inserted cover sheet:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Name of subcontractor.
    h. Name of supplier.
    i. Name of manufacturer.
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

F. Options: Identify options requiring selection by the Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect and Construction Manager will return submittals, without review, or discard submittals received from sources other than Contractor.

1. Transmittal Form: Use AIA Document G810 or transmittal form approved by the Architect.
2. 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. Specification Section number and title.
i. Indication of full or partial submittal.
j. Drawing number and detail references, as appropriate.
k. Transmittal number, numbered consecutively.
l. Submittal and transmittal distribution record.
m. Remarks.
n. Signature of transmitter.

3. 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 in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. 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.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email electronic submittals as PDF electronic files directly to Architect's representative’s email address.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Action Submittals: Submit four paper copies of each submittal, unless otherwise indicated. Architect will retain one copy.
4. Informational Submittals: Submit six paper copies of each submittal, unless otherwise indicated. Architect will not return copies.

5. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
6. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

7. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

7. Six paper copies of Product Data, unless otherwise indicated. Architect will retain one copy.

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, unless submittal based upon Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.

e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:

a. Six opaque copies of each submittal. Architect will retain two copies; remainder will be returned.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

a. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. 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. Use CSI Form 1.5A. 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.
4. Submit subcontract list in the following format:

a. PDF electronic file.
b. Number of Copies: Three paper copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

J. LEED Submittals: Comply with requirements specified in Division 01 Section "Sustainable Design Requirements."

1. Submit LEED submittals in the following format:

a. PDF electronic file.
b. Three paper copies of LEED submittals, unless otherwise indicated.

K. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and

Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

V. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

W. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

X. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

Y. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

Z. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 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 and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action on advice of counsel, select appropriate terms for action stamp and insert term and explanation of each action taken in subparagraph below. See Evaluations.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Manatee County will hire and pay for independent laboratory services as required by the Project.

C. Related Sections:

1. See provided specification sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

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

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision via a written RFI before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.

1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 or the Florida Building Code; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

   a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed, unless otherwise indicated.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least per their notification requirements in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

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 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 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 date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should 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, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl1

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150

ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000

CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek.com	(800) 967-5352
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000

IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110

NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
RCSC	Research Council on Structural Connections www.boltcouncil.org	
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331

SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. (Now TCNA)	
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl2

FBC	Florida Building Code – 2010 Edition with all adopted amendments	
FFPC	Florida Fire Prevention Code	
SWFWMD	Southwest Florida Water Management District www.swfwmd.org	(800) 423-1476

Mantee County Health Department www.floridahealth.goc/ChdManatee/Index.htm	(941) 748-0747
City of Palmetto Fire Marshall	

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl3

CE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999

PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl4

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	

UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air filtration system discharge.
4. Other dust-control measures.
5. Waste management plan.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.

D. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

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

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 12 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures" as well as all LEED requirements.

C. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

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.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. 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.

E. 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.

1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.

   a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
   b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or

elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

I. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

J. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead or underground, unless otherwise indicated.
2. Connect temporary service to Owner's existing power source, as directed by Owner.
3. Contractor to add warning signs to all power outlets other than 110V and 120V.

K. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.

L. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one (minimum) telephone line(s) for each field office.

1. Provide additional telephone lines for the following:

   a. Provide a dedicated telephone line for each facsimile machine in each field office.
   b. Provide one telephone line(s) for Owner's use.

2. At each telephone, post a list of important telephone numbers.

   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Architect's office.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.

3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course.

C. 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.

D. Parking: Parking onsite is limited. Any on-site parking shall be approved by Manatee County Property Management prior to Project Commencement. Parking is available from the City of Bradenton at remote lots (contact 941.932.9400). Any vehicles parked in unauthorized areas are subject to ticket and/ or towing.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform the public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

F. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Elevator Use: Use of elevators is permitted – coordinate use with Manatee County Property Management.

J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.

2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

B. Temporary Erosion and Sedimentation Control: Comply with requirements of Southwest Florida Water Management District’s General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

G. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

L. 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.

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.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

M. Temporary Lighting: Install and maintain temporary lighting as required for construction activities and egress.

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 as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

   a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48hours are considered defective.
   b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

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. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. 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. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. 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 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.
2. Division 01 Section "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 10 days of receipt of request, or 5 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. 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.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide new, undamaged products that comply with the Contract Documents.

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. Limit selection to products with warranties which are not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting surveys.
2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Demolition plan – per Construction Drawings

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Mechanical systems piping and ducts.
   e. Control systems.
   f. Communication systems.
   g. Electrical wiring systems.
   h. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Equipment supports.
   d. Piping, ductwork, vessels, and equipment.
   e. Noise- and vibration-control elements and systems.
   f. All interior finish elements.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, Contractor is to investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. 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.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility, Architect 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. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor or 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 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 rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 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: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, 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."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. 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.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to adjacent, occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

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. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Contractor ahll provide a broom clean finish to the floor at the end of each work day. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Utilize containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls" and Division 01 Section "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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

3.10 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.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

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

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Disposing of non-hazardous construction waste.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Division 01 Section "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Division 01 Section "Execution" for progress cleaning of Project site.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
6. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. 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

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.

B. Inspection: Submit a written request for final inspection for 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 space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or Contractor’s form that is acceptable to the Architect.

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
2. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

3. Submit list of incomplete items in the following format:

a. PDF electronic file.
b. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

1.6 WARRANTIES

A. Submittal Time: 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.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. 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 table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

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 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. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
e. Remove debris and surface dust from limited access spaces, including roofs, plenums, and similar spaces.
f. Sweep concrete floors broom clean in unoccupied spaces.
g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
i. Remove labels that are not permanent.
j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy

starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

q. Leave Project clean and ready for occupancy.

C. Under Data Floor cleaning: Contractor shall provide for a high level cleaning under the existing data floor including removing all dust, dirt and debris above and beyond normal cleaning.

D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

E. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls" and Division 01 Section "Construction Waste Management and Disposal."

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

2. Include required LEED submittals to comply with commissioning requirements.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. See provided specification sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit two set(s) of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit two set(s) of plots from corrected Record CAD Drawings and two set(s) of marked-up Record Prints. Architect will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return plots and prints for organizing into sets, printing, binding, and final submittal.

b. Final Submittal: Submit one set(s) of marked-up Record Prints, one set(s) of Record CAD Drawing files, one set(s) of Record CAD Drawing plots, and three copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.

1) Electronic Media: PDF format on CD-R or thumb drive.

B. Record Specifications: Submit two copies of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit two copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: 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.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.

2. Refer instances of uncertainty to Architect for resolution.
3. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.

C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.

    a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
    b. CAD Software Program: The Contract Drawings are available in exported Revit file into AutoCad format.

D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

E. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training videotapes.

B. Related Sections include the following:

1. See provided specification sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit one complete training manual(s) for Owner's use.

B. Qualification Data: For instructor and photographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Demonstration and Training DVD: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date videotape was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
1. Equipment, including projection screens and displays.
2. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
3. Intrusion detection systems.
4. Refrigeration systems, including condensers pumps and distribution piping.
5. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
6. HVAC instrumentation and controls.
7. Electrical service and distribution, including transformers switchboards panelboards uninterruptible power supplies and motor controls.
8. Lighting equipment and controls.
9. Communication systems, including intercommunication surveillance clocks and programming voice and data and television equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.

d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project Record Documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least 30 days' advance notice.

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

END OF SECTION 017900

SECTION 087111 - DOOR HARDWARE

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. Mechanical door hardware for the following:

a. Swinging doors.

B. Products furnished, but not installed, under this Section include the products listed below. Coordinating and scheduling the purchase and delivery of these products remain requirements of this Section.

1. Permanent lock cores to be installed by Owner.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

a. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
c. Content: Include the following information:

1) Identification number, location, hand, fire rating, size, and material of each door and frame.
2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
4) Fastenings and other pertinent information.
5) Explanation of abbreviations, symbols, and codes contained in schedule.

6) Mounting locations for door hardware.
7) List of related door devices specified in other Sections for each door and frame.

C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

D. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware schedule.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

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

C. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the Florida Building Code.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for access control.
4. Address for delivery of keys.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1.6 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

a. Exit Devices: Two years from date of Substantial Completion.
b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

2.2 HINGES

A. Hinges: BHMA A156.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *IVES
b. Hager Companies.
c. Stanley Commercial Hardware; Div. of The Stanley Works.

B. Antifriction-Bearing Hinges:

1. Mounting: Full mortise (butts).
2. Bearing Material: Ball bearing.
3. Grade: Grade 1 (heavy weight).
4. Base and Pin Metal:

a. Exterior Hinges: Stainless steel with stainless-steel pin.
b. Interior Hinges: Steel with stainless-steel pin.
c. Hinges for Fire-Rated Assemblies: Steel with steel pin.

5. Pins: Nonremovable.

a. Outswinging Exterior Doors: Maximum security.

6. Tips: Flat button.
7. Corners: Square.

2.3 SURFACE CLOSERS

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
b. DORMA Architectural Hardware; Member of The DORMA Group North America.

c. *LCN Closers; an Ingersoll-Rand company.
d. Norton Door Controls; an ASSA ABLOY Group company.
e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
f. Falcon Closers; an Ingersoll-Rand company.

2.4 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hager Companies.
b. Rockwood Manufacturing Company.
c. Stanley Commercial Hardware; Div. of The Stanley Works.
d. *IVES; an Ingersoll-Rand company.

B. Wall Bumpers: Grade 2; with rubber bumper; 2-1/2-inch diameter, minimum 3/4-inch projection from wall; with backplate for concealed fastener installation; with convex bumper configuration.

2.5 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. *IVES Hardware; an Ingersoll-Rand company.
b. Rockwood Manufacturing Company.

B. Kick Plates: 10 inches high by door width with allowance for frame stops.

2.6 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

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

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:

    a. Steel Through Bolts: For the following unless door blocking is provided:

        1) Closers to doors and frames.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.7 FINISHES

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

J. Access Controls: Contractor to use County security vendor – Convergint Technologies, 6996 Anderson Road, Tampa, FL 33634. Office Number 813.885.3705. Larry Phillips, Branch Manager (contact telephone 813.523.8685).

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

PART 4 - HARDWARE GROUPS

Hardware Group No. 01

For use on mark/door #(s):
7-100D 7-107

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD	628	IVE
1	EA	MORTISE LOCK	4530-4560	689	ADA
1	EA	MORTISE CYLINDER	20-061	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	MAGNETIC LOCK	M422P ATS/LED-2	628	SCE
2	EA	90 DEG OFFSET PULL	8190 10" O	630	IVE
2	EA	SURFACE CLOSER	4040XP	689	LCN
2	EA	MOUNTING PLATE	4040-18	689	LCN
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
1	EA	PUSHBUTTON	621AL DA NS	629	SCE
1	EA	MOTION SENSOR	SCANII	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-BBK FA900	LGR	SCE

Card reader by security supplier
Wiring Diagram by Hardware Supplier
Card reader to release Magnetic lock, Push button to release magnet also to release on fire alarm

Hardware Group No. 02

For use on mark/door #(s):
7-105 7-108A 7-108B 7-110A 7-110B 7-110C
7-106 7-123

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	MORTISE LOCK	4530-4560	689	ADA
1	EA	MORTISE CYLINDER	20-061	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	MAGNETIC LOCK	M422P ATS/LED-2	628	SCE
1	EA	90 DEG OFFSET PULL	8190 10" O	630	IVE
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	MOUNTING PLATE	4040-18	689	LCN
1	EA	THRESHOLD	65A MSLA-10	AL	ZER
1	EA	PUSHBUTTON	621AL DA NS	629	SCE
1	EA	MOTION SENSOR	SCANII	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-BBK FA900	LGR	SCE

Card reader by security supplier
Wiring Diagram by Hardware Supplier
Card reader to release Magnetic lock, Push button to release magnet also to release on fire alarm

END OF SECTION 087111

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SECTION 101400 - SIGNAGE

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. Panel signs (Provide signage required to meet current code as required for occupancy. All other signage provide by owner.)

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.

   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

   1. Aluminum.
   2. Acrylic sheet.
   3. Fiberglass sheet.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

   1. Plaque: 6 inches square.
   2. Aluminum: For each form, finish, and color, on 6-inch- long sections of extrusions and squares of sheet at least 4 by 4 inches.
   3. Acrylic Sheet: 8 by 10 inches for each color required.
   4. Fiberglass Sheet: 8 by 10 inches for each color required.
   5. Panel Signs: Not less than 12 inches square.
   6. Trim: 6-inch- long sections of each profile.

7. Accessories: Manufacturer's full-size unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For fabricator.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and the Florida Building Code.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Deterioration of polymer finishes beyond normal weathering.
   b. Deterioration of embedded graphic image colors.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.2 PANEL SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACE Sign Systems, Inc.
2. ASI-Modulex, Inc.
3. Best Sign Systems Inc.
4. Gemini Incorporated.
5. Mohawk Sign Systems.
6. Signature Signs, Incorporated.

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Acrylic Sheet: 0.080 inch thick.
2. PVC Sheet: 0.080-inch- thick, extruded, high-impact PVC plastic in color to match face color.
3. Edge Condition: Beveled.
4. Corner Condition: Rounded to radius indicated.
5. Mounting: Unframed.

a. Wall mounted with concealed anchors.

6. Custom Paint Colors: Match Pantone color matching system.
7. Color: As selected by Architect from manufacturer's full range.
8. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.

C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Opaque acrylic sheet.
2. Raised-Copy Thickness: Not less than 1/32 inch.

D. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.

1. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
2. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to back face of acrylic sheet.

E. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.

1. Custom Paint Colors: Match Pantone color matching system.
2. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 23 00 00 – HEATING VENTILATION AND AIR CONDITIONING (HVAC) GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Division 23. When in conflict the requirements of the Contract and Division 01 supersede those listed on Division 23.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Provide the labor, materials and equipment for the installation and testing of the mechanical equipment and systems shown on the drawings and herein specified.

B. All systems shall be complete, tested and ready for operation at time of Substantial Completion. Refer to Specification Division 01 and Sections 23 01 00 and 23 02 00.

C. Refer to each Section of this Division 23 for the specific scope of work under that Section.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 RELATED WORK NOT INCLUDED IN THIS DIVISION

A. Refer to related Sections of the Contract Documents for work to be provided by others such as but not limited to:

Finish Painting – Refer to Division 09
Electrical Work - Refer to Division 26
Equipment Foundations: Masonry, concrete or structural steel – Refer to Divisions 03, 04 and 05.
Access doors – Refer to Division 08
Flashing, but counter flashing shall be included herein
Cutting and patching – Refer to Division 01
Wall Louvers – Refer to Division 08
Furnishing and setting food service equipment
Furnishing and setting sterilizer equipment
Furnishing and setting laboratory equipment
Test and Balance

1.05 DEFINITIONS

A. Specific items of terminology, as used herein, shall have the following meanings:

1. BY OTHER TRADES: Shall mean work that is to be provided by persons or parties responsible for work at the project other than the party or parties who have been awarded a contract for work under this Division15. In the event that this document is used to acquire work as part of a general construction contract, the words "by other trades" shall mean by persons or parties who are not anticipated to be the installers for the work shown under this Division 23. In this context, the words "by other trades" shall not be interpreted to mean, “not included” in the overall contract.

2. CONCEALED: Shall mean work is embedded in masonry or other construction, installed behind walls, above ceilings, in crawl and attic spaces or shafts.

3. DEMOLITION: Shall mean the removal of any existing equipment, piping, ducts, etc. and the temporary or permanent capping or plugging of indicated existing services

4. DUCTWORK: Shall mean ducts, fittings, dampers, controls, hangers, insulation, and any other items customarily required in connection with the installation of systems for the movement and or distribution of air. Include all tests and the test and balance of such systems.

5. EXPOSED: Shall mean work that is not concealed.

6. FURNISH: Shall mean purchase and deliver to the project site indicated equipment and/or materials complete with necessary rigging, appurtenance and supports.

7. INSTALL: Shall mean unload equipment and materials at site delivery point; store in a dry safe protected location at site and perform every operation necessary to establish secure mounting and correct operation at proper location in the project. Include necessary connections to required services.

8. PIPING: Shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents, and any other items customarily required in connection with the installation of systems for the transfer of fluids. Include the tests and the test and balance of such systems.

9. PROVIDE: Shall mean FURNISH and INSTALL.

10. WORK: Shall mean to include all materials, labor, equipment, tests and test and balance required for a complete and operable installation.

B. Except where modified by specific notation to the contrary, it shall be understood that the indication and/or description of any item, in drawings or specifications or both, carries with it the instruction to furnish and install item, regardless of whether or not this instruction is explicitly stated as part of indication or description.

1.06 QUALITY ASSURANCE

A. General

1. It is the intent of the drawings and specifications to obtain a complete and operable installation.

2. All materials shall be new, properly labeled and/or identified, and in full compliance with the contract documents and applicable Codes and Standards.

3. All work shall comply with applicable Codes and Standards at the time the project is bid.

4. Manufacturer's model names and numbers used in this Division 23 are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Architect / Engineer of any changes and promptly furnish, for their review, information on new or replacement product. Changes shall be at no cost to the contract.

B. Installer's Qualifications

1. Installers performing work under this Division 23 shall be both a State and local licensed firms regularly engaged in providing the work specified under each Section of these Specifications. Provide copy of license upon request.

2. Each installer shall provide, upon request, a list of at least five similar jobs he has completed in the last two (2) years.

C. Drawings and Specifications

1. Drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit.

2. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Notes or details on drawings which refer to an individual element of work and that may conflict with the specifications shall be brought up to the attention of the Architect / Engineer for clarification before any equipment or materials are purchased or work is installed. Failure to follow these guidelines may cause the contractor to replace / correct the work at no cost to the contract.

3. The separate divisional drawings and specifications do not relieve the contractor from the responsibility to provide the work, which is indicated on any of the drawings or division of the specifications.

4. The drawings of necessity utilize notes, details, symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the

limitations of such notes, details, symbols and diagrams that any elements of work necessary for a complete installation are excluded. Any discrepancies shall be brought to the attention of the Architect / Engineer for clarification before bid time and the purchasing and installation of any equipment or materials. No work shall proceed until issues are resolved. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract.

5. Details, sections and enlarged plans that appear on the drawings are intended only for the purpose of establishing general feasibility. They do not supersede field coordination of the indicated work among the various trades working in that area.

6. Examine and coordinate site conditions, civil engineering documents and the architectural, structural, electrical, mechanical, plumbing and fire protection drawings and specifications prior to submitting bid. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

7. Architectural and Structural drawings take precedence over mechanical drawings with reference to building construction. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

8. Architectural drawings take precedence over mechanical drawings with reference to reflected ceiling plans. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

9. Examine documents provided by specialty design professionals. Provide the mechanical services required by those documents. When in conflict with information in the mechanical documents, the specialty documents take precedence. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

10. The Architect / Engineers shall be notified of any discrepancies, omissions, conflicts or interferences, which occur between drawings and specifications. If such notification is received in adequate time prior to bid time additional data or clarifications will be issued by addendum to all bidders. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract. See note 4 above.

11. When extra work involving Division 23 trades is authorized, the work as shown on drawings, sketches, described by Addendum or Change Order is subject to this Specification in all respects.

D. Standards

1. Certain materials and installation procedures are described by reference to industry standards published by nationally recognized organizations such as, but not limited to, those listed below:

American Society for Testing Materials (ASTM)
American Society for Mechanical Engineers (ASME) Code of Unfired Pressure Vessels
National Fire Protection Association (NFPA)
National Electrical Manufacturers Association (NEMA)
Underwriter's Laboratories (UL)
American National Standards Institute (ANSI)
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
Air Movement and Control Association (AMCA)
Air Conditioning Heating and Refrigeration Institute (AHRI)

2. Additional standards may be listed in other Sections of the Specifications and in the Florida Building Code 2010.

3. Whenever a reference is made to a standard, installation and materials shall comply with the latest adopted and published edition of the Standard at the time project is bid.

E. Requirements of Government Agencies

1. The work under this contract shall comply with the standards and requirements of Hillsborough County Parks Department and Hillsborough County Department of Facilities Management.

2. The contractor, at no cost to the contract, shall correct any work found to be in noncompliance with those Standards.

1.07 PERMITS, FEES AND INSPECTIONS

A. Contractor shall give the necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work.

B. Obtain all required certificates of inspection for work and deliver them to the Architect / Engineer before requesting acceptance and final payment for the work.

1.08 CODES AND RULES

A. All work specified and installed under Division 23 shall comply with the Florida Building Code, 2010.

B. Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

C. Installer's of work specified under Division 23 shall include in the work, without extra cost to the contract the labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations before submitting his bid.

D. Installer shall inform the Architect / Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.09 FIELD CHANGES DURING CONSTRUCTION

A. Occasionally during construction changes that deviate from the approved permit documents may occur.

B. Local authorities may require that the changes be submitted for their review via signed and sealed documents indicating the design professional concurrence with said changes. Contractor shall therefore notify the design professional of any changes before proceeding with the work and provide justification for the change including supporting sketches detailing the extent and nature of the change.

C. Failure to follow this procedure may delay the design professional response until he / she is satisfied with the need for the change.

D. When changes are made for the contractor's sole convenience, contractor assumes full responsibility for reimbursing the design professional's for his / her time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS – GENERAL REQUIREMENTS

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number represent a standard of quality or performance on which the design of this project is based.

B. Since manufacturers reserve the right to change, at anytime, the design and quality of their products, installers shall verify such information to assure that the equipment and materials being submitted are in compliance with the intent of the drawings and specifications. Shop drawings shall clearly note such changes. Any required changes shall be made at no cost to the contract.

C. For consideration of manufacturers' and/or products other than those used as the basis of design or listed on the contract documents, bidders shall submit, before bid time and within the specified time frame, a request in writing as indicated on the General and Supplementary Conditions of the Contract and Division 01 of the Specifications. Include all required information; incomplete or late information will not be considered. Acceptance, when granted, will be in the form of an addendum and subject to the review of complete shop drawings proving compliance with the contract documents.

D. Requests shall clearly define and describe the manufacturers and product for which acceptance is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, performance data, list of references and other information necessary to completely describe the product and prove compliance with the contract documents.

E. Accepted substitution and listed manufacturers, other than those used as the basis of design, may have different requirements regarding the characteristics (dimensions, weight, etc.), quantity or arrangement of items such as foundations, supports, ductwork and piping connections, electrical characteristics and power demand and any other equipment or accessories that are standard or required for the proper installation and operation of the product. Manufacturer of accepted substitution and listed manufacturers, other than those used as the basis of design is responsible to disclose such changes to the Bidders/Contractors so that the latter can include additional costs to cover such changes in their bid. Subsequently, successful Bidder/Contractor shall furnish those changes at no additional costs to the contract. These additional costs include all changes and additions to his work and the work of others, including design professionals affected by the substitution or deviation.

F. A list of all materials and equipment, which the installer proposes to furnish, shall be submitted for approval within ten (10) days after the contract has been awarded.

G. Requests for substitution submitted after the project is awarded will only be considered when directed by the Owner. Provide complete data as hereinbefore specified for any substitution. Contractor submitting request shall be responsible for reimbursing the design professional for the expenses associated with the review of such late request.

2.02 SHOP AND ERECTION DRAWINGS AND SAMPLES

A. Submit required and/or requested performance data, fabrication and installation drawings, for review by Architect / Engineer. Refer to Division 01 and each Section of the Specifications for

specific shop drawing requirements. Equipment or materials ordered or installed before Architect / Engineer reviews the information may have to be removed from the project and replaced at contractor's expense if submitted information is found unacceptable.

B. Shop drawings shall consist of manufacturer's scale drawings, copies of catalogs, and other descriptive literature that clearly indicates performance, construction materials, physical dimensions, utility requirements, wiring diagrams, operating data clearly marked for each item. Data of general nature is not acceptable. Contractor shall verify equipment dimensions with available clearances in the area where the equipment is to be installed prior to ordering equipment.

C. Submittals for equipment shall include detailed and itemized schedules in the same format as shown on the drawings. Failure to provide required schedule will result in rejection of the complete submittal.

D. All manufacturers, whether named in the specifications or listed by addendum, are subject to full compliance with the specifications, schedules, and drawings. Therefore it is the contractor's responsibility to submit for review only products that meet the intent of the Contract Documents. When submitted and reviewed products and materials fail to perform within the specified parameters, contractor shall modify and/or replace such products and materials at no additional cost to the contract.

E. Shop drawings for equipment or materials that deviate from the contract documents shall list all differences in a cover letter attached to the submittal. Any unlisted deviations found during review or installation will result in the rejection of the entire submittal and installation.

F. Submit required number shop drawings assembled together in a 3-ring hard cover binder. Provide an index for ease of processing and record keeping. Index shall correspond to specification section numbers applicable to each item. Shop drawings submitted via e-mail do not supersede or void the requirements of this paragraph. Contractor is responsible for submitting only those pages of the catalogs that are applicable to the product being considered. Applicable data shall be clearly identified on each page. Failure to follow these procedures will result in a delay of processing the electronic submittal or cause its rejection.

G. Large scale (minimum 1/4") erection drawings with plan and elevations shall be provided for all air handler rooms, chiller plants and similar mechanical spaces. Include foundations for equipment. Provide drawings for other areas when requested by the Architect / Engineer. Drawings shall clearly indicate service clearances as recommended by the equipment manufacturer and required by Code. Include and indicate location and access clearances for other equipment in the room such as water heaters, electrical and control panels.

H. All these drawings shall become part of the final as-built record documents. Refer to Specifications Division 01 and Section 23 02 00.

I Ductwork shop drawings shall be provided in accordance with requirements of Section 23 73 00. Piping shop drawings shall be provided for chilled and condenser water systems, steam and steam condensate return systems and as required by Engineer.

J. When requested, submit samples for review. The samples shall be properly tagged and will remain in the Architect's possession until final acceptance of the work.

K. The Architect's / Engineer's review does not relieve the contractor of his responsibility to comply with all requirements of the contract documents and Division 01.

2.03 ACCESS DOORS AND/OR PANELS

A. Access doors or panels are required for access to service valves, dampers, filters, fire dampers, electrical disconnects and other Division 23 equipment concealed in or behind walls, above ceilings, other than lay-in tile, and where it may be necessary for the test and balance and service of equipment.

B. Access doors and panels shall conform to the finish of adjacent construction as indicated on the Architectural construction documents. Access doors/panels shall be as specified in another section of the specifications and be provided by the contractor for general construction.

C. Access doors or panels installed in fire rated assemblies shall meet all the requirements of the assembly. Refer to Architectural Construction Documents for location and classification of rated assemblies.

D. Each installer providing work under this section of the specifications shall be responsible for determining the size of each door/panel required for access to his work. Dimensions shall be determined in the field prior to ordering doors or panels.

E. All doors/panels shall be of the hinged type with easy to open locking devices. Provide locks when security or fire rated considerations so require and as directed by Owner and Architect / Engineer.

F. Submit shop drawings for review by Architect / Engineer.

2.04 FIRE STOPPING

A. Unless otherwise noted on drawings; modified by Architect and/or authorities having jurisdiction, the following materials may be used to seal penetrations of fire rated assembly by work installed under this Division 23. For location of fire rated walls refer to Architectural Plans.

1. Rock wool: Minimum four pounds for cubic foot density; flame spread 15, smoke developed 0, fuel distribution 0 by ASTM E84; minimum melting point 2000ºF.

2. Concrete and masonry are also approved firestop materials by NFPA 90A.

3. UL approved products such as those manufactured by Dow-Corning and 3M.

B. When using any of these products, UL, NFPA and manufacturer's recommendations shall be followed.

C. Submit shop drawing data on fire stopping materials and construction methods.

PART 3 EXECUTION

3.01 ORGANIZATION OF THE WORK

A. At all times a competent superintendent shall be on site in charge of the work. Replace if performance is unsatisfactory to the Owner and/or Architect / Engineer.

B. Maintain a complete file of all contract and shop drawings at the site available for review by Owner's representatives and Architect / Engineer. A set of drawings shall be dedicated as the “As Built Record Set” where all changes and / or deviations from the contract documents are noted as they occur. Refer to Specifications Division 01 and Section 23 01 00.

C. Upon installation of equipment, shop drawings shall be initialed and dated. This procedure will

ensure proper scheduling and allow Owner's representatives and Architect / Engineer to check the work in progress.

D. A set of the ductwork shop drawings shall be kept on site for use by the Test and Balance Agency and the contractor. They shall highlight the sections of duct being pressure tested and note date of the test. Names of individuals conducting the test shall be listed next to the date.

3.02 COORDINATION WITH OTHER TRADES

A. Coordinate work to be installed under Division 23 with other trades and existing field conditions to avoid interferences and delays. Assist in working out space requirements to make a satisfactory installation. Notify the Architect / Engineer of any major conflicts that cannot be resolved through normal field coordination with other trades.

B. When work by others is installed before it is coordinated with the work of Division 23 trades, and as a result interferes with the Division 23 trades work, the installer responsible for causing the conflict shall make the necessary changes in his work to correct the condition at no cost to the contract. Notify Architect / Engineer of such conflicts. Contractor is responsible for reimbursing the Architect / Engineer for his time and cost in assisting in the resolution of such issues.

C. Furnish to other trades all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. All work outside buildings shall be coordinated with site contractor. Verify grade and invert elevations before proceeding with any work.

E. Local authorities may require that field changes that deviate from the contract documents be submitted for their review via signed and sealed documents that indicate design professional concurrence with said changes. Contractor shall notify the design professional of such changes before proceeding with work and provide justification for the change. Failure to follow this procedure will make the contractor responsible for all costs associated with the change including design professional's time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

3.03 EXCAVATION AND BACKFILL

A. Provide trench and pit excavating and backfilling inside and outside the building for Mechanical work as indicated in Contract Documents. Comply with the Owner's and State/Local environmental regulations.

B. The drawings for this project may not show all the existing underground utilities at locations where they may interfere with proposed construction. Proceed with caution and verify locations, invert elevations, etc. before proceeding with construction work. Contact local utilities. Should existing facilities be damaged, repair to Owner's and/or utility satisfaction at no additional cost to the Contract.

C. For new construction work, coordinate trenching for mechanical lines with structural documents and determine location and depth of foundations in the way of lines. When running lines close to foundations, maintain distance and slope as directed by the structural engineer.

3.04 ACCESS DOORS AND/OR PANELS

A. Mechanical installer shall be responsible for coordinating with the project superintendent the number, size and location of the access doors/panels required by his work. When field conditions allow it, one single, larger door/panel shall be used when several items furnished by different trades are located in the same area.

B. Doors / panels that are found to be of inadequate size to allow proper removal or access to service equipment and other concealed devices shall be replaced with larger doors / panels at no cost to the contract.

C. Doors / panels that are found to be improperly located with relation to the equipment or concealed devices they serve, shall be relocated at no cost to the contract. Climbing above ceilings to reach concealed devices or equipment is not an acceptable option.

3.05 FIRE STOPPING

A. Duct and pipe penetrations of fire rated walls, ceilings and/or floors shall be sealed to maintain integrity of construction.

B. The opening in the construction around air ducts shall not exceed 1" average clearance on all sides prior to application of sealant. Where fire dampers are installed, proper clearance for expansion shall be maintained as required by the fire damper installation instructions.

C. All products, materials and methods of installation shall be UL labeled and approved and meet NFPA 251 requirements.

D. Fire rated construction assemblies are indicated and specified under Architectural Section of the Contract Documents. Notify Architect / Engineer of any discrepancies with information shown in this Division 23 Contract Documents.

3.06 CUTTING AND PATCHING

A. The cutting and patching of walls, partitions, ceilings and floors necessary for reception of work indicated in this Section of the contract documents or caused by the mechanical installer’s failure to provide or properly locate sleeves, forms and inserts, or caused by incorrect location of the work shall be the installer’s responsibility.

B. When it becomes necessary to cut finished materials, submit for the Architect approval, drawings showing the work required and obtain approval before doing such cutting.

C. Chases and openings in walls/roofs and floors may be provided under the work of other sections. Furnish exact dimensions and locations of these openings to suit the apparatus to be used before such walls are built.

D. No structural members shall be cut without the previous written approval of the Structural Engineer and the Architect.

3.07 EXAMINATION OF EXISTING CONDITIONS

A. This project includes work in an existing facility; therefore contractors shall visit the site and examine those areas of the existing buildings affected by this work. Contractors shall become familiar with existing conditions and difficulties that may affect the execution of the work before submitting proposals.

B. Submission of a proposal shall therefore be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

C. Upon completion of his site visit contractor may submit a list of questions requesting the clarification of items noted during his visit. Submit request within the time frame shown on the General Conditions of the contract. Late requests will not be accepted.

3.08 DEMOLITION

A. Demolition shall be as shown on drawings and/or herein specified.

B. Schedule all demolition work with Owner to cause minimum downtime of any building service or function. No extra cost to the contract will be allowed for overtime work unless authorized in writing by the Owner / Architect.

C. Drawings are diagrammatic and show only major obstructions; coordinate with other trades for removal or relocation of pipes, conduits, hangers, etc., in path new of work.

D. Caps on insulated ductwork or piping shall be insulated.

E. At each location where work is to be performed, the Contractor shall examine the existing conditions to determine the nature and extend to which the existing systems must be removed, modified or rearranged to accomplish the work of this contract. In addition, the Contractor shall determine the extent to which portions of the existing building must be cut, altered and restored to accommodate the project modifications. In every instance, the Contractor shall be responsible for the correctness, adequacy, fit and alignment of new work with existing conditions, and for the satisfactory restoration of affected building work as approved by the Owner.

F. The Contractor shall protect existing building contents, equipment, fixtures, the building structure and its finishes from damage due to dust, falling debris, or any other work operations. Repair or replace any damage to existing facilities at no extra cost to the contract.

G. Equipment or other items to be modified or relocated shall be carefully dismantled or disconnected in a manner to avoid damage. Items damaged by the contractor's operations shall be replaced or repaired in a manner satisfactory to the Owner. Items not to be re-used shall be removed from the site by the Contractor. Those items that are identified to be turned over to the Owner shall be stored on the site at a designated location.

H. In each area where work is performed, the work area shall be kept in a neat, clean condition. Rubbish and debris shall not be allowed to accumulate and shall be removed daily if necessary to maintain clean conditions satisfactory to the Owner.

3.09 AIR CONDITIONING SYSTEM OPERATION DURING CONSTRUCTION

A. The operation of air conditioning equipment during construction is prohibited unless the following procedures are strictly followed and required records are kept.

B. Contractor shall notify the owner in writing of his intent to use the equipment to cool and/or dehumidify the building and control air borne contaminants while building is under construction.

C. For each piece of equipment a record log shall be maintained which indicates starting date and every day of operation. Log shall indicate all service and maintenance work done on the equipment.

D. Filters shall be in place and replaced periodically (daily in the case of high dust loads). Maintain a record of filter changes at each filter location. Filters efficiency rating to be MERV 8 or better.

E. Filter media shall be installed on all return air grilles and be secured on all four sides to protect air distribution system and equipment against dust contamination. Filters efficiency rating to be MERV 8 or better.

F. Upon completion of the work, and prior to substantial completion, the interior of air handling equipment used during construction shall be vacuum cleaned, coils and drain pans washed and disinfected.

G. Ducts showing high dust concentrations shall be cleaned under the supervision of an approved indoor air quality testing company at no cost to the contract. Upon completion of cleaning, test for airborne dust concentrations. Submit report to Architect / Engineer.

H. Substantial completion will not proceed unless information and records required under this section are submitted to the Owner, Architect and Engineer.

I. Failure to follow these procedures and keep the required records will mandate that all air moving equipment and ductwork be opened and cleaned in the presence of the Owner and Architect / Engineer representative. Contractor will be liable for the cost of the personnel assigned by the owner and Architect / Engineer to witness the cleaning process.

3.10 SEQUENCING AND SCHEDULING OF WORK

A. All work to be performed under this contract shall be carried out in accordance with an approved construction sequence and schedule. Upon award of the contract, and prior to commencing work at the building, the Contractor shall prepare and submit a detailed schedule of his proposed sequence of work and the dates of completion of the various portions of the work.

B. Work shall be sequenced and scheduled to maintain comfort conditions in occupied areas to the extent possible, and to minimize downtime and disruption of active HVAC systems. When HVAC must be interrupted and space needs to remain occupied, contractor shall provide temporary cooling in a manner acceptable to the owner.

C. Where existing active building systems and services must be disrupted to permit modification, relocation or connection of new work, the work shall be carefully planned to minimize downtime. In each instance, preparatory work shall be completed to the maximum extent possible, and required tests completed where feasible, before the particular system or service is shut down to permit final connection or switch over.

D. Certain operating areas may be available to the Contractor on a restricted time basis each day or at night. Schedule work so that such areas are fully functional during the periods they are in use by

the Owner. Contractor shall insure that all temporary barricades, access ways, protection and related items are satisfactorily in place during the periods that these areas are in use by the Owner.

3.11 AIR CONDITIONING EQUIPMENT REFRIGERANT REMOVAL

A. The scope of work for this project includes the removal of air conditioning equipment containing CFC or HCFC based refrigerants. Venting of these refrigerants to the atmosphere is prohibited.

B. Contractor shall be responsible for the removal and disposal of the refrigerants prior to commencing any demolition work. This shall prevent the release of such refrigerants through the accidental rupture of any pipe or vessel by the work of other trades.

C. Contractor shall follow EPA regulations and recommended procedures by recognized trade associations such as ARI and RACCA. Submit copy of procedures before commencing work.

D. Refrigerants shall be stored in DOE approved pressure vessels and shall be properly labeled. All vessels shall be ASME stamped for the allowed pressure.

E. Storing of different types of refrigerants in same container is prohibited.

F. Contractor shall provide, upon request, proof of their qualifications and any other required government certifications as to their ability to perform these services.

G. Containers with removed refrigerant shall be delivered to the owner for his use.

G. Contractor shall dispose of removed refrigerant in accordance with EPA regulations.

H. When existing refrigerant pipes are to be reused, they shall be filled with nitrogen and sealed at both ends. Provide gauge connection to verify lines are under pressure

3.12 CONNECTIONS TO EXISTING WORK

A. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing facilities.

B. Submit to the Owner for approval, a schedule of necessary temporary shut-downs of existing services. All shutdowns shall be made at such times as will not interfere with regular operating of existing facilities and only after written approval has been received.

C. To insure continuous operation, make necessary temporary connections between new and existing work.

D. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.

E. After connections to existing work are completed, remove all existing work such as ductwork, piping, conduit, wiring, etc., which is no longer, required as part of the new work.

3.13 STORAGE OF EQUIPMENT AND MATERIALS

A. All equipment and materials stored on site shall be located in a dry location where they are properly protected from the weather, injury or deterioration. Materials shall <u>not</u> be stored in contact with the ground or floor.

B. Do not remove manufacturer's packing materials until ready to install.

C. Materials showing signs of corrosion or damage due to improper handling or storage shall be replaced at no cost to the contract.

D. Provide continuous protection for all equipment and materials already installed.

3.14 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

3.15 TESTS

A. Include all tests specified and/or required under applicable codes, laws, rules and regulations. Additional tests shall also be performed as indicated herein and other sections of the specifications.

B. Notify the Architect / Engineer at least 72 hours in advance of all tests. Furnish all necessary instruments, gauges and other equipment required for tests. Make preliminary tests prior to giving notice of final tests.

C. All parts of the work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition.

D. Correct defects disclosed by these tests without any additional cost to the Owner. Repeat tests on repaired or replaced work.

E. Maintain a log of all tests being conducted and have it available for review by the Architect / Engineer. Log to indicate date, type of tests, duration, and defects noted and when corrected.

3.16 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code, owner standards and equipment manufacturer for the proper maintenance or removal of equipment. The most stringent requirements shall apply.

B. Concrete pads for equipment on grade, such as condensing units, shall cover the full service area required by the equipment.

B. Coordinate with other trades so no conduit, pipes, ceiling hangers, other equipment, etc. interfere with the required clearances.

C. Notify project superintendent when work by other trades needs to be relocated in order to maintain required clearances. Notify Architect / Engineer if conditions persist and are not corrected by the responsible trade.

END OF SECTION 230000

SECTION 23 01 00 - PROJECT CLOSE OUT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

3.01 TOOLS

A. All special tools for proper operation and maintenance of the equipment provided under this specification shall be delivered to the Owner's representative and a receipt requested.

3.02 SUBSTANTIAL COMPLETION

A. Refer to the General and Supplementary Conditions of the Contract and Division 01 of the Specifications for additional requirements applicable to this Section. When in conflict, those requirements take precedence over this Section.

B. Representatives of the installers responsible for work under this Division 23 shall be present at the time of the Substantial Completion. They shall have tools and ladders available to assist the Architect / Engineer and to promptly correct any deficiencies that may be identified.

C. Division 23 installers shall be in compliance with the following:

1. All work shown on the contract documents shall be completed and fully operational.

2. The contractor shall perform his own review of the work prior to requesting the Substantial Completion visit. The contractor shall provide a hard copy of his punch list to the Architect / Engineer when submitting his request.

3. Systems and equipment shall be tested and balanced to assure compliance with contract documents. Provide the Architect / Engineer with copies of Test and Balance Report at least one week prior to the scheduled Substantial Completion visit.

4. Furnish a letter from the Building Automation System (BAS) manufacturer and/or installer certifying that the controls for the air conditioning system have been tested and calibrated and that systems perform as intended. Testing shall include controls software and all Sequence of Operations.

5. Clean all strainers and replace any fine mesh strainers with regular ones.

6. Replace temporary filters with the specified clean final filters.

7. Clean coils, equipment and ducts that may have accumulated dust during construction. Refer to requirements of Section 23 00 00, Paragraph, Operation of Air Conditioning Equipment during construction.

D. Architect / Engineer shall furnish contractor with a list of items noted during the Substantial Completion visit that need to be corrected. Contractor shall notify the Architect / Engineer in writing of any items appearing on that list that are disputed by Installer.

E. When listed items have been corrected and/or completed, Contractor shall request in writing another review of the work. Request shall include a copy of the original punch list with the initials of the contractor's representative who has verified that the items on the punch list have been completed.

F. Contractor shall be responsible for the costs associated with additional site visits by the Architect / Engineer beyond the substantial and final visits due to the contractor’s failure to complete all listed deficiencies. Contractor will pay these additional visits to the Architect / Engineer whose time is involved at the rate of $75.00 per hour. This amount may be deducted from the project's final payment.

3.03 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks, damage or defects. Any defective equipment, materials or workmanship shall be replaced or repaired at any time during the duration of the guarantee period.

B. Unless otherwise noted, all work shall be guaranteed for one year. Refer to other sections of the specifications for extended warranty requirements in items such as air conditioning compressors, water heaters, and others. The listed warranty time limits do not relieve the contractor's or equipment supplier responsibility for any hidden latent installation or manufacturing defects that may appear at a later date.

D. The date of acceptance and start of all warranties and guaranties shall be established by the Owner and Architect through a formal notice to the Contractor. That date supersedes any date or term limits that may be listed on any of the manufacturer's standard warranties. Also refer to Division 01 of the Specifications.

3.04 RECORD DRAWINGS

A. During the course of construction the contractor shall keep at the site a set of mark-up prints indicating all deviations and changes from the work indicated on the contract drawings. Set shall be clearly labeled "RECORD DRAWINGS" and be available for review by Architect / Engineer.

B. Above information shall be used by the contractor to prepare one set of as-built reproducible drawings as a record of all construction revisions and changes from the contract drawings. Include all revisions to equipment schedules.

C. As indicated in Specifications Section 23 00 00, contractor shall keep a separate set of ductwork shop drawings indicating the duct sections, as they are pressure tested. Test and Balance technician shall initial and date drawings as duct sections are satisfactorily tested.

D. Upon completion of the work, and unless otherwise noted on the General and Supplementary Conditions of the Contract; and Division 01 of the Specifications, contractor shall furnish the Architect / Engineer a revised and final set of reproducible or electronic media CAD documents and a set of prints of the work as installed.

3.05 OPERATIONS AND MAINTENANCE MANUALS

A. Refer to Specifications Division 01 and Section 23 02 00.

3.06 OPERATING INSTRUCTIONS

A. Instruct representatives of Owner in operation and maintenance of all installed systems and equipment. Provide a minimum of two (2) working days of such instruction, more if required. Instruction period shall be video taped with copy of tape provided to the Owner.

B. Provide Maintenance Manual, see Specifications Division 01 and Section 23 02 00 and acquaint Owner's representative with its contents during instruction.

C. Furnish letter naming Owner's personnel receiving instruction and dates when instructions was given.

D. Provide, for each piece of equipment, the name, address and telephone number of the manufacturer's representative and Service Company, so that service or spare parts can be readily obtained.

END OF SECTION 230100

SECTION 23 05 00 - ELECTRICAL POWER AND AUXILIARIES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Provide motor controllers including accessories such as H.O.A.'s, selector switches, pilot lights, etc., as required for the proper control and operation of the mechanical equipment and systems they are part of. Coordinate with Division 26 installer the power required for equipment provided under this Division 23.

B. Provide, under this Section, all low voltage (120V and under) control wiring for equipment and systems specified under this Division 23 such as:

1. Temperature control wiring

2. Equipment control wiring

3. Interlock wiring

C. All control wires shall be installed in conduit except plenum rated cables. Refer to Division 26 requirements for such type of cable.

D. Conduit and control wiring shall meet the requirements of Division 26.

E. Provide variable frequency drives as specified and scheduled.

F. All electric motors provided under this Division 23 shall be high efficiency motors.

1.03 RELATED DOCUMENTS

A. The following sections of the Specifications are included hereinafter.

Division 26-Electrical Systems

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 06 00 Vibration and Noise Isolation

23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

B. Refer to Division 26 drawings for specific information on project electrical characteristics (V-Ø-CY). Contractor shall verify electrical characteristics of all equipment with electrical documents and electrical systems installer prior to submitting shop drawings and ordering equipment.

1.04 QUALITY ASSURANCE

A. All electrical work and equipment provided under this Division 23 shall meet the requirements of NFPA 70 / National Electric Code (NEC), UL, NEMA and other applicable codes and standards.

B. All electrical work associated with equipment installed under this Division 23 of the Specifications shall be tested to be free of shorts and grounds. Work to be inspected and approved by authorities having jurisdiction; maintain record of such inspections on site.

C. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 23 00 00.

1.05 SHOP DRAWINGS

A. Submit complete shop drawings including but not limited to wiring diagrams, physical dimensions, access and service clearances and other required manufacturer's literature for all products and materials specified or referred to in this section.

B. Provide proof of compliance with requirements of Division 26 whenever reference is made to that Division.

C. Equipment shop drawings shall clearly indicate the type of motor that is being provided with the equipment. Refer to Paragraph Motors, this Section.

D. For additional Shop Drawing submission requirements refer to Specifications Division 01 and Section 23 00 00.

PART 2 PRODUCTS

2.01 MOTORS

A. Unless specifically noted otherwise in other sections of this specification, all motors and motor controllers furnished with equipment specified under this Division 23 shall meet the requirements specified in this section.

B. All motors shall be high efficiency built in accordance with the current applicable IEEE, ASA, and NEMA Standards. All general-purpose motors shall be open drip-proof for installation indoors or in protected locations. Totally enclosed fan cooled (TECF) motors shall be used in areas exposed to the weather or other environmental contamination. Motors shall be rated explosion proof when located in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on roof mounted fans and similar equipment exposed to the weather.

C. Unless indicated otherwise, motors shall be high efficiency NEMA Design B with a service factor of 1.15 with a total temperature rise of 90°C (Resistance measured) in 40°C. ambient when powered from the system voltage feeding the motor. Insulation shall be Class F. TEFC motors shall have a service factor of 1.00 with total temperature rise of 80°C. in the above conditions. Motors located in areas exceeding 40°C. ambient shall be factory rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Design N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 hp or less may be shaded pole induction motors.

D. Electrical characteristics of motors (voltage, phase, hertz) shall be as shown on Division 26 Construction Documents. Notify Architect / Engineer of any discrepancies found on plans.

E. If the installer proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect / Engineer of the change. If change is accepted, installer shall assume full responsibility for the coordination with other trades and pay all additional charges in connection with the change. Refer to substitutions section of Specifications Section 23 00 00.

F. All motors supplied on this project one (1) hp and larger shall have a power factor of not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with these standards, shall be switched with utilization equipment.

G. All motors that operate in conjunction with variable frequency drives shall be premium efficiency type with Class "F" insulation specifically designed and rated for that application. Manufacturer shall be Lincoln Electric inverter duty VTAC or approved equal.

2.02 INDIVIDUAL MOTOR CONTROLLERS

A. Furnish and install individual motor controllers as specified herein for all motors installed on equipment provided under this Division 23. Coordinate with Division 26 installer the required power supply. Exceptions are those motors controlled with VFD's, served from motor control centers, or those in equipment with factory-mounted motor controllers.

B. The motor controllers shall be mounted on a NEMA rated steel cabinet and with all terminals accessible for wiring directly from the front. No slate or ebony asbestos shall be permitted on any size controller from Size 00 through Size 8. All contacts shall be solid silver cadmium oxide alloy that will not require any filing, dressing, or cleaning throughout the life of the control equipment. Bare copper or silver-flashed type shall not be permitted. Operating coils shall be pressure molded and so designed that if accidentally connected to excessive voltage they will not expand, bubble, or melt. When a coil fails under over voltage conditions, the motor controller shall definitely drop out and not freeze the contacts in the "ON" position.

C. Provide combination style motor starters for all three phase single speed or two speed induction motors shown in the equipment schedules. The starters shall be fusible combination and provided with type RK-5 fuses in accordance with NEC 430-152 and as recommended by the supplier of the starter. Starter enclosures shall be NEMA I for indoor service, or NEMA 4X for equipment exposed to weather.

D. All starters will be provided with fused control transformers, line voltage/120v with fuses in each ungrounded conductor. The neutral side of the secondary shall be grounded.

E. Each starter will be provided with a cover mounted H-O-A selector switch with a Green Hi Lumen LED pilot light marked “motor run”. Full voltage incandescent lamps are not acceptable. All pilot lights will be wired to appropriate interlocks and not in parallel with the holding coil.

F. The starter shall be provided with an electronic overload relay, equal to Square D Model 9065 motor logic providing unbalanced voltage/voltage failure and class II ground fault protection with ambient compensation. The relay shall be factory set and sealed to prevent unauthorized tampering in the field.

G. Each starter shall be provided with two (2) normally open (N. O.) auxiliary contacts with field convertibility. Coordinate with installer of energy management system for additional requirements.

H. Each starter shall be provided with terminal block for field connections with matching wiring diagrams, including terminals for auxiliary contacts and alarm contacts, such as vibration alarms (cooling towers) and smoke alarms. All alarm contacts will be provided with factory installed, removable jumpers.

I. Terminal wiring may be factory installed or by a qualified factory trained supplier.

J. Acceptable manufacturers are: General Electric, Cutler-Hammer, Square D and Siemens.

2.03 VARIABLE FREQUENCY DRIVES

A. Provide adjustable frequency drive(s) (VFD) as indicated on equipment schedules. Adjustable frequency drive (s) shall convert three phase, 60 Hertz, utility power to adjustable voltage and frequency, three phase, AC power for stepless motor control from 10% to 120% of base speed. Unit(s) to have internal 115/AC control transformer.

B. Mount drive adjacent to the bypass controller, however, it must be mechanically and electrically isolated such that the drive may be disconnected and removed by a qualified service technician. The controller together with the bypass control panel with all options and modifications shall be mounted within a standard NEMA-1 general-purpose enclosure suitable for continuous operation up to a maximum ambient temperature of 104°F and a maximum ambient humidity of 95% (non-condensing). Drives exposed to the weather or dirty environment shall be NEMA Type 4X, watertight, with the required cooling to meet the ambient requirements. The complete unit shall be UL approved and labeled and meet applicable ANSI, IEEE and NEC Standards.

C. The drive shall be designed for quiet motor and controller operation.

D. Provide proper protection for semi-conductors. Drive shall be capable of starting into a rotating load without delay. Protective circuits shall cause instantaneous trip (IET) should any of the following faults occur:

1. 110% of drive maximum sine wave current rating is exceeded.

2. Output phase to phase and phase to ground (ground fault) short circuit condition.

3. High input line voltage.

4. Low input line voltage.

5. Loss of input phase.

6. External fault. This protective circuit will be wired to a terminal strip and will inhibit drive operation regardless of the selected drive mode.

E. The following adjustments shall be available in the controller and retained in non-volatile memory:

1. Maximum frequency (15 to 120 Hz) factory set at 60 Hz.

2. Minimum frequency (.00 to 120 Hz) factory set at .50 Hz.

3. Acceleration (.1 to 360 seconds) factory set at 30 sec.

4. Deceleration (.1 to 360 seconds) factory set at 30 sec.

5. Volts/Hertz ratio factory set for specified equipment voltage at 60 Hz. For voltage refer to equipment schedules on drawings.

6. Voltage offset or boost factory set at 100% torque.

7. Current limit (50% to 120% sine wave current rating) factory set at 120% current.

8. All adjustments will be digital. No potentiometers will be allowed.

F. The drive shall be capable of following a 4-20, mA; 0-10, VDC grounded or ungrounded signal. The control signal must be capable of direct or inverse operation by selection. Analog outputs will be provided for 0-10VDC and 2-10VDC both proportional to speed or load by selection and for the remote monitoring of the Variable Frequency Drive (VFD) speed.

G. The drive shall have an electric/electronic overload relay designed to protect one A-C motor from normal overload, single phasing or voltage imbalance, whether the drive is in normal or bypass mode.

H. Drive shall be furnished with door mounted control panel consisting of auto/off/manual selector switch, drive test/normal selector and a selector for bypass/drive mode. Manual speed control shall also be provided. In automatic mode, the controller to follow an external signal and respond to remote start-stop contact wired to terminal strip. While in auto mode the controller to attempt up to three (3) restarts after a power outage, drive fault or external fault. Up to eight faults will be retained in non-volatile memory, until cleared by the operator. Factory terminals shall be provided (with a removable jumper) for addition of smoke alarms, freeze stats or vibration detectors to stop the drive in any operating mode.

I. The drive shall have three (3) critical frequency avoidance bands.

J. The drive shall have a first fault LED panel that shall also indicate current, voltage or frequency.

K. The drive shall have an input line reactor, factory furnished and wired into the bypass control panel.

L. An input Disconnect shall be provided to open the ungrounded phases of the incoming A-C line. This disconnect shall be designed to mount inside the controller enclosure and include a mounting bracket and through-the-door interlocking handle with provisions for padlocking. Semi conductor fuses will be supplied in the bypass enclosure to provide drive short circuit protection with standard RK-5 fusing for the bypass mode.

M. Provide a manual bypass with three magnetic contactors and all the circuitry necessary to safely transfer the motor from the controller to the power line, or from the line to the controller while the motor is at zero speed. The bypass contactor will be electrically and mechanically interlocked to eliminate any possibility of power back feed into the drive controller from the AC line. The third contactor will remove power from the line side of the AFC when the mode selector in “Off” or in “Bypass” Mode. This third contactor will be closed when the “Mode” selector is in the “Drive” or “Test” positions. The motor will be protected by an electronic overload in drive mode, and by an equivalent overload in the “Bypass” mode providing voltage unbalance and single phase class 10 protection. The 115 VA-C relay control logic, allowing common start-stop commands in the "controller" mode and the "bypass" mode shall also be included within this enclosure.

N. Provide a start-up service including physical inspection of drive and connected wiring and final adjustments to meet specified performance requirements. This service to be provided by the manufacturer or a factory authorized person.

O. Variable frequency drives shall be coordinated with the motor they will be controlling to guarantee they are fully compatible.

P. Acceptable manufacturers are: Reliance Electric VTAC Design, Square D, A.C. Technology, Inc., Graham, Asea Brown Boveri (ABB), Cutler- Hammer and Allen Bradley.

2.04 DUCT MOUNTED SMOKE DETECTORS

A. Duct mounted smoke detectors shall be furnished and wired under Division 26 as indicated on the contract documents, as required by NFPA 90A and applicable Building Code.

B. Mechanical plans indicate the general location of duct detectors. Actual location shall be

determined in the field by the fire alarm installer in accordance with detector manufacturer's installation instructions. Mechanical installer shall install duct detectors under the supervision of the fire alarm installer.

C. Scope of project also includes removing and reinstalling duct detectors as part of the replacement of existing air conditioning equipment. Coordinate with fire alarm system installer the testing of detectors upon completion of work.

D. When, because of field limitations, detector manufacturer's recommended clearances cannot be obtained, the fire alarm installer shall simulate a smoke airflow test or a certified differential pressure test of each device. Provide a copy of the field test to the owner's representative certifying that the detector as installed is functional.

E. Smoke detector in the return air stream shall be located prior to mixing with outside air.

F. Access doors shall be installed in the ductwork to allow for visual inspection of the detector tubes. Refer to Section 23 00 00, Paragraph Access Doors.

PART 3 EXECUTION

3.01 GENERAL

A. All electrical work and equipment provided under this Division 23 shall meet the requirements of NFPA70 / National Electric Code (NEC), UL, NEMA and other applicable Codes and Standards.

B. Notify the Architect / Engineer in the event Division 26 installer, at the request of this installer, becomes responsible for furnishing and installing any of the equipment specified in this Section.

3.02 VARIABLE FREQUENCY DRIVES AND ASSOCIATED MOTORS

A. When variable frequency drives need to be installed remote from the motor they serve, contractor to verify the type of motor that is required. Based on the distance between motor and inverter, "Premium, High Efficiency" motors may be required in lieu of standard "inverter duty" motors.

B. Refer to other sections of the Specifications for specific requirements of electrical powered equipment furnished and installed under Division 23.

END OF SECTION 230500

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SECTION 23 06 00 – VIBRATION AND NOISE ISOLATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Equipment and systems provided under this Division 23 shall operate, under all load conditions, free of objectionable noises and vibration. Conditions considered objectionable by the Owner and Architect / Engineer shall be corrected in an approved manner at no cost to the contract.

B. Vibration control shall be by means of approved vibration eliminators as specified and recommended by the equipment manufacturer and the manufacturer of the eliminators.

C. Sound/noise control shall be by means of approved materials, installation techniques, etc., indicated herein, in other sections of the specifications and/or as recommended by the equipment and sound attenuation manufacturers.

E. Equipment provided with factory installed internal vibration isolation devices may not require additional isolation.

F. This project involves the renovation of spaces to be used for offices as well as data center. ASHRAE recommended sound level criteria for such environment are applicable.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC

23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. All equipment having moving parts shall be isolated from the building structure by means of vibration eliminator or isolation materials, unless otherwise noted.

B. All isolation Products/Materials shall be the same brand and shall be supplied from the same source. Manufacturer's recommendations shall be followed in the selection and installation of isolators/materials.

C. Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

Motor HP	Slab on Grade	Structurally Supported Heavy Construction Floors	Structurally Supported Lightweight Floors
Up to 5	50%	75%	90%
7-1/2 to 15	70%	85%	93%
20 to 40	80%	90%	95%
50 to 100	90%	95%	97.5%

D. Spring isolators shall be of the unhoused stable springs type.

1.05 SHOP DRAWINGS

A. Submit complete manufacturers data on all isolators and/or materials. Provide samples if requested. Provide certified laboratory test data if requested.

1.06 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are: Mason, Kinetics, Vibration Eliminator Co., and Amber/ Booth Co.

PART 2 PRODUCTS

2.01 DUCT SILENCER

A. General

1. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer. Silencers shall be Vibro-Acoustics (basis of design).

2. Alternate manufacturers must request and obtain written approval by the Engineer to bid the project at least 10 days prior to the bid due-date. As a condition of pre-approval, alternate manufacturers must submit to the Engineer a minimum of twenty (20) different HVAC silencer test reports. Each report shall be for a silencer tested in full accordance with the ASTM E-477-99 silencer test standard in an aero-acoustic test facility which is NVLAP accredited for the ASTM E-477-99 standard. Each test shall have been conducted within the last 12 month period. A copy of the laboratory's NVLAP accreditation certificate must be included with the submitted reports. Any changes to the specifications must be submitted and approved in writing by the Engineer at least 10 days prior to the bid due-date.

3. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.

B. Materials

1. Rectangular Silencers: All rectangular silencers, including models RMB, RFMB, RNM, EX-RMB, EX-RFMB, EX-RNM, RLP-MB, RLP-FMB, RLP-NM, SRMB, SRFMB, and SRNM shall be constructed with a 22 gauge galvanized steel outer casing and 26 gauge galvanized perforated steel.

2. Circular Silencers: All circular silencers, shall be constructed with a galvanized steel casing as noted below and 22 gauge galvanized perforated steel. All casing seams and joints shall be lockformed and sealed or stitch welded and sealed.

Casing Diameter	Casing Gauge
Less than 30"	20
30" to 54"	18
Over 54"	16

All circular silencers shall be constructed with a 22 gauge galvanized steel casing and 26 gauge galvanized perforated steel. All casing seams and joints shall be lockformed and sealed.

Connection Diameter	Casing Gauge
Less than 18"	22
18" to 30"	20
30" to 54"	18
Over 54"	16

3. Elbow Silencers: All elbow silencers, shall be constructed with an 18 gauge galvanized steel outer casing and 22 gauge galvanized perforated steel. All acoustical splitters shall be internally radiused and aerodynamically designed for efficient turning of the air. Half and full splitters are required as necessary to achieve the scheduled insertion loss. All elbow silencers with a turning cross-section dimension greater than 48" shall have at least two half splitters and one full splitter.

4. Transitional Silencers: All transitional rectangular silencers shall be constructed with a 22 gauge galvanized steel outer casing and 22 gauge galvanized perforated steel. Transitioning shall occur internal to the silencer such that the height of the gap or air passage is uniformly changing with the length of the splitters.

5. Acoustic Media:

   a. MoldBlock Media™ silencers and Film lined MoldBlock Media™ silencers:Media shall be MoldBlock Media™ containing 100% natural cotton fibers treated with an EPA registered, non-toxic borate solution, "flash dried" to actively inhibit the growth of mold, mildew, bacteria and fungi. Media shall not contain any formaldehydes, phenolic resins or Volatile Organic Compounds (VOC's) that can off-gas and/or cause health concerns. Media shall be 100% recyclable. Media shall comply with UL181 and NFPA 90A. MoldBlock Media™ shall be packed with a minimum of 15% compression during silencer assembly. Media shall not cause or accelerate corrosion of aluminum or steel. Glass fiber, fiberglass and rockwool will not be permitted as a substitute for MoldBlock Media™ .

   b. No-Media silencers:
   All No-Media silencers shall not contain absorptive media of any kind. Attenuation shall be achieved with controlled impedance membranes and broadly tuned resonators.

6. Media Protection:

   a. Film Lined silencers:
   The MoldBlock Media™ shall be completely wrapped with Tedlar film to help prevent shedding, erosion and impregnation. The wrapped acoustic media shall be separated from the perforated metal by a factory installed ½" thick acoustically transparent spacer. The spacer shall be flame retardant and erosion resistant. A mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.

7. Combustion Ratings:

   a. MoldBlock Media™ silencers:
   Silencer materials, including acoustic media shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723.

Flamespread Classification:	15
Smoke Development Rating:	10

   b. Film Lined silencers:
   Silencer materials, including acoustic media, Tedlar film and acoustical spacer shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723.

Flamespread Classification:	20
Smoke Development Rating:	45

8. HTL Casings: Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, breakout noise calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Breakout noise calculations shall be based on the sound power levels of the specified equipment.

9. Access Doors: Where indicated on the silencer schedule, silencers shall be supplied with an

access door(s) to permit fire damper service. Access doors shall be supplied as an integral part of the silencer by the silencer manufacturer. Where HTL walls are also supplied, the access doors shall not reduce the effectiveness of the HTL walls.

C. Construction

1. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in "Section B Materials", are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.

2. Casings shall be lockformed and sealed, except as noted in Section B Materials, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.

3. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.

D. Acoustic Performance

1. Silencer dynamic insertion loss shall not be less than that listed in the silencer schedule.

2. Silencer generated noise shall not be greater than that listed in the silencer schedule.
3. Acoustic performance shall include dynamic insertion loss and generated noise for forward flow (air and noise in same direction) or reverse flow (air and noise in opposite direction) in accordance with the project's air distribution system requirements.

4. All silencer ratings shall be determined in a duct-to-reverberant room test facility which provides for airflow in both directions through the test silencer in accordance with the ASTM E-477-99 test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.

E. Aerodynamic Performance

1. Silencer pressure drops shall not exceed those listed in the silencer schedule. Silencer pressure drop measurements shall be made in accordance with the ASTM E-477-99 test standard. Tests shall be conducted and reported on the identical units for which acoustical data is presented.

2. The manufacturer shall provide Computational Fluid Dynamics (CFD) aerodynamic analysis of the silencer as indicated in the silencer schedule. The analysis shall include the attached ductwork, a minimum of 5 equivalent duct diameters up and downstream of the silencer, as shown on the drawings, to determine silencer pressure drop, including system effects, at design airflow. The manufacturer must report and validate a converged solution domain of the CFD analysis to show the solution is independent of mesh refinement such that two models of different mesh refinement levels produce equivalent results, each with a maximum residual tolerance of 0.001. The minimum cell count shall be 200,000 and the validation model shall have a cell count at least 50% higher. The manufacturer must report the selection of CFD parameters, including mesh type, mesh size, boundary conditions, convergence criteria, and turbulence model. Each CFD analysis shall also include additional post-processed information including number of iterations, convergence status, and resulting y+ values.

F. Submittals

1. Provide acoustical system calculations for all duct systems with silencers to demonstrate that the resultant ductborne sound levels of the equipment as measured in the occupied spaces meet the specified criteria. In the absence of specified background sound level criteria, the guidelines as expressed in Table 34 of Chapter 47, "Sound and Vibration Control" of the *2003 ASHRAE Handbook - HVAC Applications*, shall be used.

2. The manufacturer shall supply certified test data for each scheduled silencer. The data shall include dynamic insertion loss, generated noise and pressure drop for forward or reverse flow, matching the project's air distribution system requirement. All ratings shall be conducted in the same facility and shall utilize the same silencer.

3. The manufacturer shall test the silencer(s) as indicated in the silencer schedule. The engineer shall be notified of the test date at least two weeks in advance and the test may be witnessed by the engineer. Test shall show compliance with the project criteria and is subject to engineer approval.

4. Test facilities and test reports shall be open to inspection upon request from the Engineer. Silencer performance must have been substantiated by laboratory testing according to ASTM E-477-99 and so certified when submitted for approval. The aero-acoustic laboratory must be NVLAP accredited for the ASTM E-477-99 test standard. A copy of the accreditation certificate must be included with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.

PART 3 EXECUTION

3.01 GENERAL

A. The mechanical equipment installer shall supervise the construction of foundations and supports for his equipment. They shall be constructed in such manner as to prevent the transmission of objectionable noise and/or excessive vibration.

B. Excessive vibration or objectionable noises created in any part of the building by the operation of any system and/or equipment furnished and/or installed under this Division 15 will not be permitted and shall be corrected at no cost to the contract.

C. Isolate the various system components and/or equipment from the building structure by such means as may be necessary to eliminate all excessive vibration and objectionable noises they generate. Design all foundations, supports, etc., with this end in view.

D. Provide sound attenuation materials or engineered products specifically selected for the equipment being treated such as compressors, chillers, fans, etc. Provide sound attenuation data.

3.02 ACCEPTANCE

A. When requested by the Architect / Engineer the supplier of the isolation equipment shall verify that they are properly installed. Provide a written report.

B. When requested by the Architect / Engineer the supplier of the sound attenuation materials or engineered products shall check the performance of the installation. Provide a written report.

END OF SECTION 230600

SECTION 23 08 00 – PAINTING AND IDENTIFICATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. All piping, ductwork and equipment provided under Division 23, which is exposed to view, to the weather and/or as indicated on the drawings and specifications shall be painted unless otherwise noted.

B. All galvanized metals that are to be field painted shall be properly prepared to accept specified paint. If paint peels, repeat treatment and repaint at no cost to the contract.

C. All piping and equipment shall be labeled and/or identified as herein specified.

D. All valves shall be tagged and valve charts provided as herein specified.

E. All equipment shall have factory standard finish. Field painting of equipment over standard finish shall be as directed by Architect / Engineer.

F. Field finish painting may be specified in another section of the Specifications. This installer shall leave his work clean and free from oil, dirt and grease. Apply primer ready to field painting, where required.

G. All unfinished ironwork installed under Division 23, which is exposed to view within the building or exposed to the weather, shall be painted as herein specified.

H. Provide permanent identification on equipment and piping systems. Coordinate with County Property Management and Building Services Departments the numbering sequence of equipment. County Standards take precedence over these specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation

23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

B. Refer to Paint section of the Specifications Division 09 for additional information regarding paints, finishes, preparation, etc.

1.04 SHOP DRAWINGS

A. Submit catalog data, color samples, and other requested data for following.

1. Paints

2. Treatment of galvanized metals

3. Markers

4. Labels

PART 2 PRODUCTS

2.01 PAINT

A. Rust inhibitor paint shall be red chromate base made up in a synthetic resin vehicle.

B. Finish paint where specified shall meet the requirements of the Paint Section of Division 09 of the specifications.

2.02 PAINT SCHEDULE

A. Painting schedule for equipment and piping:

Equipment and system components	Manufacturer’s standard color and finish
Fire protection and sprinkler piping	Red
Chilled water piping	White or Green
Heating hot water piping	Green
Condenser water piping	Green
High Pressure Steam piping	Yellow

Low Pressure Steam piping	Yellow
Condensate piping	Yellow
Gas, Fuel Oil, Gasoline piping	Yellow
Compressed Air piping	Yellow

B. Colors shall meet ANSI A13.1 Standard recommendations:

Red:	Fire Quenching Materials
Yellow:	Inherently Hazardous Materials
Green:	Inherently Low Hazard Liquid Materials
Blue:	Inherently Low Hazard Gaseous Materials

C. Color of letters applied to above colors shall be black on a yellow background.

2.03 PIPING IDENTIFICATION

A. All (plumbing) (and mechanical) (fire protection) piping, insulated and uninsulated shall be identified as herein specified.

B. Identify piping systems by either stenciling the name of the service or applying plastic pipe markers similar to Set Mark as manufactured by Seton.

C. Color of stenciling shall be the identifying color of the service as listed under paragraph 23 08 22 Paint Schedule.

D. Arrows indicating direction of flow shall be shown next to the pipe identification name.

E. Air, steam and high-pressure water lines shall have the system operating pressure and temperature clearly noted next to each identification mark.

F. ANSI Standards recommend that the size of the identification letters and the length of the color field be as follows:

Outside Diameter Of Pipe or Covering (in.)	Length of Color Field (in.)	Size of Letters (in.)
3/4 to 1-1/4 (19 to 32 mm)	8 (200 mm)	1/2 (13 mm)
1-1/2 to 2 (28 to 51 mm)	8 (200 mm)	3/4 (19 mm)
2-1/2 to 6 (64 to 150 mm)	12 (300 mm)	1-1/4 (32 mm)
8 to 10 (200 to 250 mm)	24 (600 mm)	2-1/2 (64 mm)
Over 10 (over 250 mm)	32 (800 mm)	3-1/2 (89 mm)

G. Install markings after painting or insulation of pipes has been completed.

H. For applications where halogen based identification products are used, such products cannot come in contact with stainless steel pipes. In such case, pipe markers with an all-acrylic face and back shall be used.

PART 3 EXECUTION

3.01 PAINTING GENERAL

A. Ironwork installed under this Division 23 of the Specifications exposed to view within the building, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as pipes, pipe hangers, structural supports, supports for equipment, black iron partitions or casings, tanks, etc., shall be painted with one (1) coat of rust inhibiting paint. Finish paint may be specified in another section of the Contract Documents, color as selected by Owner / Architect.

B. Ironwork installed under this Division 23 of the Specifications which is exposed to the weather, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as duct and pipe supports, vent pipes, etc., shall be painted with two (2) coats of rust inhibiting paint and one (1) coat of an acrylic base UV and mold resistant white paint. The Owner or the Architect / Engineer may select a different color of the finish paint.

C. All field finish painting to be as directed by the Architect and specified in another section of these specifications.

D. Painted galvanized metals from which paint peels shall be stripped, retreated and repainted at no cost to the contract.

E. Steel pipes subject to condensation and specified to be covered with insulation shall be painted with one (1) coat of rust inhibitor paint prior to applying insulation.

3.02 PIPE AND VALVE IDENTIFICATION

A. On exposed piping apply identification lettering and flow arrows on 30 foot centers of straight runs, at valve locations, at points where piping enters and leaves a partition, wall, floor or ceiling.

B. On concealed piping installed above non-removable ceilings apply markers on pipes near a valve or other devices that can be reached by means of access doors or panels. Identification markings shall be clearly visible from access doors and/or panels.

C. On concealed pipes installed above removable ceilings apply markers in the manner described for exposed piping.

D. Apply markers at exit and entrance point to each vessel, tank or piece of equipment.

E. Provide approved ceiling tile markers in areas with removable ceiling to indicate location of HVAC equipment, valves and/or other devices, concealed above ceiling.

F. Valves:

1. Attach to each valve a 2-inch round brass tag stamped with one (1) inch high numbers filled in with black enamel.

2. Securely fasten valve tag to valve spindle or handle with a brass chain.

3. Coordinate numbering sequence and / tags identification with County Property Management and Building Services Departments

G. Each trade providing work under this Division 23 shall furnish a typed list of all labeled valves, flow control/measurement devices and similar system components. List shall include tag number, system name, type of device, location, area or equipment served and any other information that will assist Owner's maintenance personnel. Copies shall be included with each maintenance manual.

H. Flow Charts: Each trade providing work under this Division 23 shall furnish a flow chart of his piping work indicating each item listed under paragraph G above. Copies shall be included with each maintenance manual. In addition a glass or plastic covered framed copy shall be furnished to the owner.

3.03 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include but not limited to: supply and exhaust fans, air conditioning and heating equipment, control cabinets, starters and power disconnects and others as directed by Architect / Engineer.

B. Identification numbers and names shown on the Contract Documents are for reference only. They shall be changed to meet Owner’s numbering sequence and standards. Contractor shall request a copy of such standards before proceeding with work under this Section.

C. Contractor shall mark record construction documents to reflect the labeling and numbering sequences when different from contract documents.

3.04 CONCEALED EQUIPMENT IDENTIFICATION

A. Provide approved ceiling tile markers in areas with removable ceilings to indicate location of HVAC equipment, valves and/or other devices, concealed above ceiling.

END OF SECTION 230800

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SECTION 23 09 00 – SERVICE ACCESS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. It is the intent of this section of the specifications that equipment installed under Division 23 shall be provided with proper access for testing, service, replacement and as required by Code.

B. Provide access doors or panels to reach equipment installed in concealed spaces.

C. Provide service clearances as recommended by equipment manufacturer.

D. Access doors/panels installed in fire rated assemblies shall meet requirements of assembly UL rating.

E. Provide door/panels to reach piping and ductwork system components installed in concealed spaces that need access for service or Test and Balance.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners

23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. GENERAL

1. It is the intent of the drawings and specifications to provide an installation that is operable and serviceable.

2. All work shall comply with applicable Codes and Standards at the time the project is bid.

3. Installation of equipment, products and materials shall meet manufacturer's recommendations.

4. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

B. DRAWINGS AND SPECIFICATIONS

1. Drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit. Refer to Specifications Section 23 00 00, Paragraph Drawings and Specifications.

2. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Notes or details on drawings which refer to an individual element of work and that may conflict with the specifications shall be brought up to the attention of the Architect / Engineer for clarification before any equipment or materials are purchased or work is installed. Failure to follow these guidelines may cause the contractor to replace / correct the work at no cost to the contract.

3. The drawings of necessity utilize notes, details, symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of such notes, details, symbols and diagrams that any elements of work necessary for a complete installation are excluded. Any discrepancies shall be brought to the attention of the Architect / Engineer for clarification before bid time and the purchasing and installation of any equipment or materials. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract.

4. Certain details, sections and enlarged plans appear on the drawings, which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not supersede field coordination for the indicated work among the various trades working in that area.

5. 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, reflected ceiling plans, location, type and number of plumbing fixtures, and any other similar fixed items. Any discrepancies shall be brought up to the attention of the Architect / Engineer for clarification.

6. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences, which occur between drawings and specifications. If such notification is received in adequate time prior to bid time additional data or clarifications will be issued by addendum to all bidders. Should conflict occur in or between the Drawings and Specifications, and not brought to the attention of the architect prior to bid time, the Contractor is deemed to have estimated the more expensive way of doing the work.

1.05 CODES AND STANDARDS

A. All work specified and installed under Division 23 shall comply with the Florida Building Code, 2007 and approved amendments.

B. Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

C. Installer shall include in the work, without extra cost to the contract the labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations.

D. Installer shall inform the Architect / Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

PART 2 MATERIALS

2.01 GENERAL

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number represent a standard of quality or performance on which the design of this project is based. Substitutions are not permitted unless a request for substitution, as described herein and in the Supplementary and General Conditions, is submitted.

2.02 ACCESS DOORS AND/OR PANELS

A. Access doors/panels are required for access to work installed under this Division 23 that is concealed behind walls and above ceilings. Work installed above lay-in tile ceilings is not considered concealed.

B. Work under Division 23 includes but is not limited to piping, air distribution and controls systems components such as air handling units, VAV boxes, electric heaters service valves, balancing dampers and valves, motorized dampers, etc.

C. Access doors/panels shall conform to the finish of adjacent construction as indicated on the Architectural construction documents. Access doors/panels shall be as specified in another section of the specifications and be provided by the contractor for general construction.

D. Access doors/panels installed in fire rated assemblies shall meet all the requirements of the assembly.

E. Each installer providing work under this section of the specifications shall be responsible for determining the size of each door/panel required for access to his work. Dimensions shall be determined in the field prior to ordering them.

F. All doors/panels shall be of the hinged type with easy to open locking devices. Provide locks when security or fire rated considerations so require.

G. Submit shop drawings for review by Architect / Engineer.

PART 3 EXECUTION

3.01 COORDINATION WITH OTHER TRADES

A. Coordinate work to be installed under Division 23 with other trades to avoid interferences and delays. Assist in working out space requirements to make a satisfactory installation. Notify the Architect/Engineer of any major conflicts that cannot be resolved through normal field coordination with other trades.

B. When work is installed before it is coordinated with the work of other trades, and as a result interferes with the other trades work, the installer responsible for causing the conflict shall make the necessary changes in his work to correct the condition at no cost to the contract.

3.02 ACCESS DOORS AND/OR PANELS

A. Each installer providing work under this Division 23 shall be responsible for coordinating with the project manager for the contractor for general construction the number, size and location of the access doors/panels required by his work. Whenever possible one single, larger door/panel shall be used when several items furnished by different trades are located in the same close area.

B. For air handling units, VAV boxes or similar equipment located above ceilings a minimum of two (2) doors/panels are required, one to access filters the other for the fan coil and control sections. Doors/panels shall be large enough to allow for equipment removal. For large units additional doors/panels may be required and shall be provided.

C. Doors/panels that are found to be of inadequate size to allow proper access to service equipment and other concealed devices shall be promptly replaced with larger doors/panels at no cost to the contract. When requested by Architect / Engineer, contractor shall demonstrate to the Owner how access can be accomplished.

D. Doors/panels that are found to be improperly located with relation to the equipment or concealed devices they serve, shall be relocated at no cost to the contract. Climbing above ceilings to reach concealed devices or equipment is not acceptable.

E. Access doors/panels are to be furnished and installed under another section the specification.

3.03 EQUIPMENT SERVICE

A. Provide service clearances around equipment installed under Division 23 as required by Code, the manufactures' installation instructions and for the removal of equipment.

B. Refer to Specification Section 23 73 00 for Shop Drawing requirements for Mechanical Rooms.

C. Coordinate with other trades so no conduit, pipes, ceiling hangers, etc. interfere with the required clearances. Notify project manager for the contractor for general construction when work by other trades needs to be relocated.

END OF SECTION 230900

SECTION 23 20 00 – PIPING GENERAL

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Provide, for each indicated piping system, all the labor, materials, equipment, apparatus, tools, temporary construction, transportation, permits, certifications, shop drawings, etc and all other items needed for a complete system which is safe and ready for operation.

B. Include required excavation and backfill.

C. Work under this section includes the following piping systems:

1. Chilled water supply and return
2. Condensate drains
3. Refrigerant Piping

D. Install valves, temperature and pressure wells and other control and flow measurement devices provided under other sections of the specifications. Follow manufacturer installation instructions.

1.03 INITIAL FILL

A. Install temporary piping and valves as may be required for the initial fill of (chilled) (hot) (condenser) (steam feed) water system. Upon completion of work turn valves off; remove handles and cap or plug connection.

B. Coordinate with plumbing installer the size and location of the water connection(s) for the initial fill. Plumbing installer shall provide the backflow prevention devices as required by Code.

C. Make provisions for the cleaning, flushing and testing of piping system as herein specified.

1.04 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter.

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.05 QUALITY ASSURANCE

A. Materials furnished and installed under this Section shall comply with the requirements and specifications of the applicable and current standards of the American Society for Testing and Materials (ASTM).

B. Welding

1. Pipe welding shall comply with the provisions of the latest issue of the ASME Boiler Construction Code or ASA Code for Pressure Piping. State requirements may supersede those Codes.

2. Before any pipe welds are performed, submit a copy of welding procedures specifications that apply to the piping work under this Section.

3. Submit, for each welder working on the project, a copy of his / her qualification certificate as required by the most recent issue of the Code having jurisdiction. Welder's certificates that are more than five (5) years old are not acceptable.

4. Repair or replace any welds that are not found to be in accordance with the welding codes and standards applicable to the work under this Section.

5. Welds shall, when directed by the Architect / Engineer, be subject to X-ray evaluation using the services of a certified test laboratory approved by the owner / engineer. Testing to be done at no cost to the contract. Additional random testing may be required in the event defective welds are detected.

C. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

1.06 SHOP DRAWINGS

A. Submit shop drawings for the following items

Dielectric fittings.
Piping materials and fittings.
Flexible pipe connectors.
Inserts.
Pipe hangers and supports.
Air vents.
Piping isolation materials.
Identify all non-US made products.
Insulation protection shields
Sleeves.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Copper pipe:

1. Copper piping and fittings aboveground shall be Type 'L' hard drawn copper.

2. Copper piping and fittings below ground shall be Type 'K' hard drawn copper.

3. Copper piping 3/8 inch outside diameter and smaller may be soft drawn.

B. Black Steel Pipe:

Black steel pipe shall be Schedule 40 seamless black mild steel pipe. Pipe shall conform to ANSI A 106 Standard Specification. Fittings shall be carbon steel grade B. Elbows shall be long radius.

C. Refer to Specifications Section 23 20 01.

2.02 VALVES

A. Furnish and install valves specified herein; shown on drawings and/or necessary for the control and service of piping systems and equipment. Refer to Specifications Section 23 20 01.

B. Valves shall be first quality, the product of an acceptable manufacturer, be installed with proper clearances for service and operation and be tight at the specified test pressure. U. S. made valves is preferred unless proof of equal quality is submitted with shop drawings.

C. Each valve shall have the manufacturer's name or brand, the figure or list number, the size and the guaranteed working pressure cast on the body and cast or stamped on the bonnet.

D. Except for special applications, all valves furnished for the project shall be the product of one manufacturer. Acceptable manufacturers are: Crane, Centerline, Jenkins, Milwaukee, Nibco or Victaulic. Where figure numbers of one manufacturer are indicated, equivalent figure numbers of an approved manufacturer may be substituted. Equivalence chart shall be provided with valve shop drawings.

E. Valves installed in insulated pipes shall have handles covered with insulation sections that can be easily removed and replaced.

F. Provide chain operators for all valves 4" and larger located eight (8) feet or more above the floor or operating platform. Distance to be measured from the valve centerline.

2.03 PIPING AND VALVE IDENTIFICATION

A. Refer to Specifications Section 23 08 00.

2.05 PIPE HANGERS AND SUPPORTS

A. Support piping inside the building directly from the building structure by means of adjustable wrought iron clevis type hangers. Hangers similar to Grinnell Company Fig. 65 shall be used for pipe sizes 1-1/2 inches and smaller. For pipe sizes 2 inches and larger use Grinnell Fig. 260. For copper tube use Grinnell Fig. No. CT-269.

B. When support from the building structure is not feasible and where indicated on plans provide pipe stands secured to the floor slab. Additional supports from floor are required under pipes at their point of connection to HVAC equipment. In no case the weight of pipes shall rest on the point of connection to the equipment.

C. Trapeze type hangers may be used to support multiple pipes installed at the same level and grade. Trapeze hangers shall be fabricated using pre-punched channels, coated or galvanized, as manufactured by Unistrut, B-Line or Grinnell. Pipes to be secured to channels using U bolts or Cush-O-Clamps furnished with the channels. Use all threaded galvanized steel rods, of the diameter required to support the weight of the pipes. Rods shall be attached directly to the building structure. Use double nuts on both sides of the channels to prevent movement.

C. When trapeze hangers, hanger straps and saddles are in direct contact with the pipe(s) being supported, they shall be of the same material as the pipe. Approved isolation materials shall be used between dissimilar metals. Submit isolation materials with piping shop drawings.

D. Hangers, supports, anchor and clips for copper piping shall be copper clad. When copper piping is carried on a steel trapeze hanger(s) with other piping, permanent isolation material such as Armaflex insulation shall be used to protect the copper from contact with those metals.

E. Hangers for insulated pipes shall be oversized to accommodate the insulation thickness.

F. Maximum spacing between pipe supports shall be as follows:

NOMINAL PIPE SIZE (INCH)	ROD SIZE (INCH)	MAX SPAN (FEET)	MAX LOAD PER HANGER (LBS)
3/4 & UNDER	3/8	5	150
1	3/8	7	250
1-1/4	3/8	7	250
1-1/2	3/8	9	250
2	3/8	10	610
2-1/2	1/2	11	1130
3	1/2	12	1130
4	5/8	14	1430
6	3/4	17	1940
8	7/8	19	2000
10	7/8	22	3300
12	7/8	23	4700
14	1	25	5800
16	1	27	7600
18	1	28	9600
20	1-1/4	30	12300
24	1-1/4	32	17800

G. Additional hanger supports shall be provided at each valve, fitting, change of direction, connections to equipment and dead ends of pipes longer than two feet.

H. Horizontal runs of PVC pipe shall be provided with supports every four feet.

I. For groove end pipes, follow manufacturer's recommendations. Submit sop drawings for Architect / Engineer's review.

2.06 INSULATION PROTECTION SHIELDS

A. Provide galvanized steel shields with flared ends for all pipe hangers supporting insulated pipes.

B. Shields shall cover not less than the bottom 180° of the insulation and meet the requirements listed below:

1/4 to 3 inch pipes	18 gauge x 12 inches long
4 and 6 inch pipes	16 gauge x 18 inches long

2.07 ANCHORS

A. Anchors shall be provided at the location(s) shown on the drawings and be of the strength required to assure proper anchoring at those points. Anchors shall be constructed of minimum 3" x 3" x 1/4" angle iron and may be welded or bolted to the pipe.

B. Each end shall be embedded in one (1) cu. ft. of concrete where below grade or bolted to the building structure.

C. Anchors at wall partitions shall be bolted to the partitions. Anchors in the building steel frame shall be fastened to the steel members. Attachments shall prevent movement in any direction.

2.08 DIELECTRIC FITTINGS

A. Provide, dielectric unions or isolation flanges at each point of connection between copper and ferrous pipes.

B. Dielectric threaded unions shall be as manufactured by EPCO Sales Company or Capitol.

C. Flanged connections shall have a dielectric gasket installed between flanges and plastic sleeves to isolate bolts from flanges.

2.09 INSERTS

A. Provide inserts in concrete forms prior to pouring concrete. Additional fasteners required after pouring shall be drilled and set in place with expansion bolts.

B. Obtain written approval from Structural Engineer before installing any inserts in a precast structure.

2.10 AIR VENTS

A. In piping systems, provide manually operated air vents at high points where there is a possibility of air accumulation. Also provide where indicated on drawings.

B. Vents shall be a spring key cock all bronze body, with level handle.

C. Acceptable air vent manufacturers are: Watson or McDaniel.

2.11 FLEXIBLE PIPE CONNECTORS

A. For pipe sizes are 1-1/2" and smaller provide metal hose connectors consisting of a corrugated inner metal hose wrapped with a wire protective braid.

B. Corrugated metal hose and braid shall be stainless steel.

C. Flexible metal hoses shall be provided with fittings suitable for connection to the indicated equipment and pipes.

D. Flexible metal hose connectors approved manufacturers are Metaflex, Flexonics, Anaconda Brass, Proco or Unisource.

E. For pipe sizes 2" and larger provide rubber flexible connectors of the single arch type molded rubber.

F. Connectors shall have flanges integral with the body. Each coupling shall be furnished with ASNI 125# end flanges and solid 3/8" thick galvanized steel retaining rings.

G. Connectors shall have flanges integral with the rubber body and be suitable for working pressures up to 150 psig.

H. Provide minimum of four (4) retaining rods for each flexible connector.

I. Acceptable rubber flexible connectors manufacturers are: Mercer Rubber Company, Metraflex, Flexonics and General Rubber.

J. On refrigerant piping systems only metal hose connectors are to be used regardless of pipe size. Connectors shall be approved and listed for that application.

PART 3 EXECUTION

3.01 PIPE AND VALVE IDENTIFICATION

A. Refer to Section 23 08 00.

3.03 PIPE DISTRIBUTION

A. Run all pipe parallel with and as close as possible to the nearest structural member. Run piping straight, plumb and grade in direction indicated on drawings. Set all piping true to line and grade.

B. Piping shall be laid out and installed with sufficient clearances to permit proper application of insulation. Relocate piping if a neat insulation job cannot be obtained.

C. In laying out the work, consult the Architect where there may be any question concerning routing of pipe where it may affect the final appearance of the work. Coordinate work with other trades working in the area.

D. Pipes shall not be hung from other pipes, ducts or ceiling grid. They shall be supported directly from the building structure. Installer shall be familiar with the building structure and provide additional steel members when necessary for the proper support of piping or any related equipment. All supports shall be from the building structure. On concrete structures, drill and set in place anchors for pipe hangers. The use of explosive powder driven anchors is prohibited.

E. In laying out the work, the contractor shall provide for proper access to valves, control devices, equipment and other system components at a later date. Pipes shall be routed to make access possible.

F. Provide additional hangers and / or stands for the proper support of valves, strainers, in-line pumps and any related equipment.

G. Equipment connections shall not carry the weight of pipes and accessories. Provide supports to the floor and/or building structure as required to relieve such weight.

H. No welding, drilling or cutting of building structural members shall be permitted without the

written approval of a Structural Engineer.

I. Set all equipment properly leveled and aligned with associated piping. Do not use the flexible joint connectors as a method of correcting misalignments or support of any equipment or pipe weight.

J. When using trapeze hangers, the maximum distance between hangers shall be determined by the diameter of the smallest pipe supported.

3.04 VALVES

A. Valves shall be installed where shown on plans, where necessary to facilitate the installation and service of sections of the piping system(s) and at the inlet and outlet connections to all fixtures and equipment.

B. Access to concealed valves shall be provided by means of access doors.

C. Valves in horizontal lines shall be installed in the upright position. Plan piping routing and installation to assure this condition is met. Valves installed upside down are not acceptable.

D. Flow and pressure control valves provided under other sections of the specifications shall be installed as per manufacturer's recommendations. Control valves must be installed in the upright position.

3.05 SLEEVES

A. Provide pipe sleeves where pipes pass through masonry walls, ceilings, roofs and floors. Sleeves shall be Schedule 40 PVC except penetrations of fire rated walls, floors or partitions where Schedule 40 steel sleeves shall be used. Sleeves installed in floors shall extend 1/2 inch above finished floors. Exceptions are sleeves in mechanical rooms and rooms with waterproof membrane, which shall extend 2 inches above finished floor.

B. Sleeves shall be sized to allow a minimum of clearance between pipe or pipe insulation and sleeve. Sleeves installed for piping subject to movement shall not restrict movement.

C. The space between sleeves and pipe shall be packed with oakum and sealed with a UL listed waterproof sealant. Also refer to the Architectural Section of the Contract Documents for other approved materials and methods.

D. Plastic sleeves shall be installed at all copper piping penetrations of metal studs. Sleeves shall be Greenlee type # 712C or approved equal.

E. Where piping must penetrate floor slabs, structural beams or masonry wall, contractor shall core bore a hole of the minimum size required to allow the pipe sleeve to be installed. The area between the hole and pipe sleeve shall be sealed with a UL listed, non-hardening, caulk. All core drilling shall be done under the direction of the structural engineer at indicated locations.

F. Pipe penetrations of fire or smoke rated walls and floors shall be sealed to maintain the integrity of construction. Refer to Paragraph "Fire Stopping" in Section 23 00 00 Mechanical – General. When applicable, requirements of the fire assembly UL listing shown on the Architectural plans must be followed and supersede any other requirements of these specifications.

G. Steel pipe sleeves in contact with concrete or masonry shall be protected with two (2) coats of asphalt-based paint, evenly applied over the pipes before they are set in place. Submit product data sheets for review by Architect / Engineer.

3.06 PIPE JOINTS

A. Clean all pipe and fittings before jointing. Ream the ends of pipes having screwed, welded or soldered joints to remove all burrs after cutting.

B. After threading and/or cutting, swab out the pipe to remove all foreign matter.

C. Grooved joints: Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. Refer to Specifications Section 23 20 06. Submit installation instructions with piping shop drawings.

D. Screwed joints: All threads must be clean and sharp. Pull joints up tight using an approved tape or joint compound or tape applied to male threads only.

E. Soldered joints: Make joints as recommended by the solder manufacturer.

F. Flared joints: Make joints as recommended by the fitting manufacturer.

G. Welded joints: Electric arc fusion or oxyacetylene welds, using proper welding rods. Only welders certified in accordance with acceptable welding standards shall perform welding.

H. Groove type welding rings with knock-off spaces shall be used for all butt joints in pipes ten inches (10") and above.

3.07 CONNECTIONS TO EQUIPMENT

A. On screwed and soldered piping systems provide unions at each valve and at each pipe connection to equipment.

B. On welded piping systems provide flanges at each valve and at each pipe connection to equipment.

C. Unions or flanges shall be provided, at no cost to the contract, at any system component that in the opinion of the Owner or Architect / Engineer may need service or replacement.

D. When required by equipment piping connections, provide groove end fittings.

3.08 FLEXIBLE PIPE CONNECTORS

A. Flexible pipe connectors shall be installed in accordance with the manufacturer's recommendations. Particular care should be taken to properly support all pipes so connectors do not carry the weight of the pipes. Joints should not be covered with insulation, so that flange bolts may be easily tightened if necessary.

B. Couplings shall be provided as shown on the contract documents and whenever they are required to prevent the transmission of noise and vibration between equipment provided under this Division and the piping connected to it.

C. Do not use the flexible connectors to correct pipe misalignments. Provide additional hangers/supports as needed.

D. Install retaining rods as per manufacturer's recommendations.

3.09 AIR VENTS

A. Provide air vents at high points in piping systems and where indicated on contract documents.

B. As built / record documents shall indicate location of air vents.

3.10 DRAINAGE

A. Install drain valves with hose connections at low points in piping systems to assure complete system drainage.

B. Drain valves shall also be provided at each coil, heat exchanger, strainer and other pieces of hydronic equipment where drainage for service will be required.

3.11 SEALING OF WALL, PARTITIONS AND FLOOR PENETRATIONS

A. Work under this section includes thorough and complete caulking on both sides of all penetrations through walls, partitions and floors whether such penetration occurs above or below dropped ceiling lines. Also refer to Paragraph “Sleeves”, this Section.

B. The installer of the precast work shall do the penetrations and patching of precast concrete.

C. Penetration of masonry work shall be done and patched by skilled masons.

D. All penetrations shall be cut or patched in a manner that the hole is uniformly 1/8 inch clear all around the item penetrating it (including insulation). Core drilling of concrete floor slabs and concrete beams shall be done at the locations and under the direction of the structural engineer. Obtain final approval of HCAA staff before proceeding with work.

E. All caulking work shall be done in strict compliance with requirements of Specifications Section Caulking and Sealants.

F. Any pipe penetration of a wall, ceiling, partition, floor or roof deck that vibrates shall be treated so no vibration is transmitted at point of penetration.

3.12 CLEANING AND TREATING OF PIPING

A. Include the internal cleaning and treating of following piping systems installed under this section. Refer to Specifications Section 23 60 00.

Chilled water supply and return piping

B. Systems shall be filled and flushed with a solution of a non-foaming chemical detergent, to remove all foreign matter. After final filling, the Ph of the water shall be 7.0 - 8.0.

D. When the fine mesh strainers are not adequate to remove the particles in suspension, cheesecloth shall be used in conjunction with the strainers.

E. This work shall be deemed complete when circulation has been established throughout all systems, and where water from these systems runs clean, free from all deposits. Submit a report to the Architect / Engineer stating that each piping system has been cleaned and treated.

F. When cleaning is completed, the contractor shall replace all fine mesh strainers (100 mesh) used during the cleaning process with standard strainers herein specified.

G. During cleaning and flushing of piping, a temporary bypass shall be provided around each water coil and control valve.

3.13 TEST OF PIPING SYSTEMS

A. The objective of these tests is to prove the adequacy, quality and safety of all piping systems and assure that operating pressures can be safely maintained.

B. All leaks detected during these tests shall be promptly corrected and piping systems shall then be retested.

C. Furnish necessary instruments, test equipment, water, power, fuel and personnel required for tests, and make provisions for removal of test equipment and draining of pipes after tests have been completed.

D. Contractor shall notify the Architect / Engineer at least 72 hours in advance of any test that will be ready for observation by the Architect or his designated representative. In the event the Engineer or his designated representative is unable to observe the piping under test, the contractor, when authorized by the Architect / Engineer shall proceed as follows:

Observe test and furnish a letter to the Architect / Engineer within 5 days of the test completion certifying that the test was performed.

Include the following information:

1. Type of system tested and name of contractor

2. Date and time of test

3. Test pressure and time held

4. Medium used for test (water, air, etc.)

5. Exact location and extent of system tested.

6. Duration of test.

E. Tests may be performed on partial sections of the system only if the section must be concealed to permit normal progress of the project. The installer shall overlap test sections by one joint for partial tests to insure that all joints are tested. Upon completion of the system, the entire system shall be given a final test and be certified by the contractor.

F. All tests shall be performed and certified by the contractor prior to any painting, insulating or concealment of the piping.

G. Systems shall be tested as indicated on applicable sections of these specifications and as described herein except where a local or other applicable Code has more stringent requirements, which shall then be followed.

H. Refer to the Specifications Section 23 95 00, Test and Balance, for additional HVAC test requirements.

I. Observations by a representative of the Authorities having jurisdiction do not supersede the requirements of this Specification.

END OF SECTION 232000

SECTION 23 21 00 - PIPING FOR HVAC SYSTEMS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE

A. Provide above ground chilled water supply and return piping as herein specified and shown on the contract documents.

B. Provide condensate drain lines from coils and / or equipment to final termination point as indicated on plans. Refer to Specifications Section 23 24 00

C. Provide refrigerant piping between condensing units and air handlers. Refer to Specifications Section 23 22 00.

D. Piping installer shall provide for each indicated piping system all necessary and required labor, transportation, permits, certifications, shop drawings, etc.

E. Furnish and install all required materials, equipment, apparatus, tools, temporary construction and all other items needed for a complete system, which is safe and ready for operation.

F. Install valves, temperature and pressure wells and other control and flow measuring devices provided under other sections of the specifications. Follow manufacturer's installation instructions.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping

23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are shown on the contract documents:

Valves
Multi purpose valves
Suction diffusers
Pipe materials and fittings
Air separator
Expansion tank

B. For additional Shop Drawing requirements refer to Specifications Section 23 00 00

1.05 QUALITY ASSURANCE

A. Refer to Specifications Section 23 00 00.

PART 2 MATERIALS

2.01 CHILLED WATER PIPING

A. Temperature range: 40°F. to 120°F.

B. Operating pressure: 125 psig maximum

C. Piping materials:

1. For line sizes up to 2 inches: Schedule 40 seamless black steel ASTM A53-A.

2. Sizes 2-1/2” through 10 inches: Schedule 40 seamless black steel ASTM A53-B ERW.

3. 12” and above Standard wall seamless black steel ASTM A53-B ERW.

D. Pipe connections:

1. For lines up to 2 inches: threaded

2. For lines 2-1/2 inches and larger: welded

E. Fittings

1. For lines 2 inches and smaller: 150 lbs. malleable iron threaded.

2. For lines 2-1/2 inches and larger: Schedule 40 welded

F. Unions: 150 lbs. malleable iron, screwed, bronze to iron set.

G. Flanges: All sizes, 150lbs. forged steel flat face ASTM A181, Grade 1.

1. For lines 2 inches and smaller: screwed-on type.

2. For lines 2-1/2 inches and larger: slip-on or welding neck.

H. Gaskets: 125 lbs., 1/16 inch cloth inserted rubber.

1. For lines 2 inches and smaller: full face with prepunched holes.

2. For lines 2-1/2 inches and larger: ring type.

2.02 VALVES

A. Gate valves

1. For lines 2 inches and smaller: 125 lbs. screwed bronze, wedge disc, rising stem, screwed bonnet. Acceptable manufacturers are: Crane No. 428 or Nibco No. T-111.

2. For lines 2-1/2 inches and larger: Flanged type with cast iron body, brass trim, brass seats rising stem and iron wheel 125 psi class. Acceptable flanged pattern manufacturers are: Crane 465-1/2 or Nibco F-617-0.

B. Ball Valves

1. Brass ball valves shall be full port. One-quarter (1/4) turn lever handle operated, hot forged brass. 100% full port. Valves shall have blowout proof stem and 2-piece body design. Gland follower and single O-ring stem design Teflon seats and stem packing.

2. Pressure rating: 600 WOG/150 WSP.

Temperature range:
g) 40ºF – 366ºF (1/4” – 2”)
h) 4ºF – 366ºF (2 ½” – 4”)

Quality assurance: Vales shall be CSA certified up to 125 PSIG (1/4” – 4”); UL listed – 1/4” – 2” and FM approved (1/4” – 2”).

C. Butterfly valves

1. Butterfly valves 2 through 12 inches shall be designed for a minimum working pressure rating of 200 psig at 150°F. Valves 14” and larger shall have a minimum working pressure of 150 psig.

2. For lines 2-1/2 through 6 inches: Cast iron body lug type, throttled plate in 10° positions, lever operated, replaceable EPDM seat, aluminum bronze disc stainless steel stem, bolt holes tapped from each side for standard studs, valves shall be rated for bi-directional dead-end service to full valve rating without a downstream flange attached. Acceptable manufacturers are: Crane No. 44BXZTJ10, Nibco No. LD2000-3, Centerline C106135-2, Centerline C106135-2 and Quadrant BFV-LDB4ECPH.

3. For lines 8 inches and larger: 125 lbs. cast iron body lug type gear operated. Replaceable

EPDM seat, aluminum bronze disc. Stainless steel stem, bolt holes tapped from each side for standard studs. Valves shall be rated for bi-directional dead-end service to full valve rating without a downstream flange attached. Acceptable manufacturers are: Crane No. 44BXZDG, Nibco No. LD2000-5, Centerline C106135-5and Quadrant BFV-LDB4ECGO.

D. Globe valves

1. For lines 2 inches and smaller: 125 lbs. screwed bonnet, bronze, composition disc. Crane No. 7 or Nibco No. T-211-Y.

F. Check valves

1. For lines 2 inches and smaller: 125 lbs. screwed, bronze silent check valve, bronze disc. Acceptable manufacturers are: Titan CV20-BZ or Mueller 303AP silent-non-slam check.

2. For lines 2-1/2 inches and larger:

Horizontal lines: 125 lbs. flanged iron body, bronze trim, globe style silent check. Acceptable manufacturers are: Nibco No. F-910, Titan CV50-DB or Mueller 105MAP Globe Check.

2.03 MULTI-PURPOSE VALVE

A. When indicated, provide multipurpose valves suitable for horizontal or vertical installation at the discharge of all pumps. Multipurpose valve shall be bronze fitted construction, complete with dual "O" ring seal, bubble tight shut-off plug type flow control, memory stops, pointer and saddle back seated stem and schrader valve metering connections. Acceptable manufacturers are: Titan FCI, TACO, Armstrong, Weinman and Mueller No. 721.

2.07 PIPE HANGERS AND SUPPORTS

A. Refer to Specifications Section 23 20 00.

2.08 INSULATION PROTECTION SHIELDS

A. Refer to Specifications Section 23 20 00.

2.09 STRAINERS

A. Water strainers shall be as follows:

1. Strainers 2 inch and smaller shall be rated for 250 psi, SWP or 400 psi, WOG. Strainer shall be cast iron body and have a straight threaded face cap with a gasket as approved for service. Screens shall be 20 mesh, 304 stainless steel. Acceptable manufacturers are: Titan YS12-CI, Mueller, Yarway or Sarco.

2. Strainers 2-1/2 inch and larger shall be flanged cast iron body (ASTM A-126-B) rated at 125psi SWP, 200 WOG. Screens shall be 1/16 perforated 304 stainless steel for pipe sizes through 4 inch and 1/8 perforated 304 stainless steel for pipe sizes 5 inch and above. Acceptable manufacturers are Titan YS58-CI, Yarway or Mueller.

B. For strainer mesh to be used during start up, cleaning and flushing of piping systems refer to Part 3

Execution, paragraph Strainers.

C. Strainers shall be provided in the inlet connections to each air handler and as shown on plans.

D. Strainers shall be arranged not to "trap" pipes. Unless otherwise indicated, strainers shall be line size. Installation shall allow blowing out accumulated dirt, and removal and replacement of a strainer screen without disconnecting strainer from the main piping. Verify clearance requirements under strainer before proceeding with installation.

E. Strainers shall have a removable cylindrical or conical screen. Strainers to have flanges or threaded ends with unions for connection to the piping system they serve.

F. For each strainer, provide a dirt blow off valve with hose connection. Valve shall be located 6" to 1'- 0" below strainer or as directed.

G. During initial cleaning, flushing and testing of piping systems install disposable fine mesh (100 mesh) screens at each strainer. Replace with specified strainer screen once the system has been deemed clean and water treatment is completed.

PART 3 EXECUTION

3.01 PIPE CONNECTIONS

A. Pipe connections to be level and aligned with equipment. Do not use the pipe flexible connectors as a method to correct misalignments. Provide additional pipe hangers or floor supports to assure weight of pipes is not carried by equipment.

B. Refer to Specifications Section 23 20 00.

3.02 TEST OF PIPING SYSTEM

A. Chilled water piping:

Test and prove tight at a hydrostatic pressure of 150 psig held for two (2) hours.

3.03 VALVES

A. Chilled water, heating hot water, condenser water piping systems.

1. For Shutoff Service use gate valves. Butterfly valves may be used for line sizes 2-1/2" and larger.

2. For Throttle/Balancing Service: Globe valves, plug valves or butterfly valves with memory plates may be used for line sizes 2-1/2" and larger.

3. Valves shall have shaft extension to facilitate insulation installation.

4. Butterfly valves shall have integral flanges, grooved joint ends or threaded lugs and be certified for bi-directional dead end service to full valve rating with the downstream flange removed.

3.04 OTHER COMPONENTS

A. Refer to Specifications Sections 23 20 00 and 23 23 00 for requirements concerning strainers, hangers, thermometers, pressure gauges, etc. and any other devices required for the system operation, testing, control and balancing.

B. For groove end or stainless steel piping systems see Specifications Section 23 20 06.

C. Refer to Controls Specifications Section 23 90 00 for requirements concerning the installation of valves and other control devices furnished under that Section.

3.05 INSULATION

A. Refer to Specifications Sections 23 08 00 and 23 65 00.

3.06 AIR SEPARATOR

A. Installer shall remove and clean strainer after 24 hours operation, after 30 days operation, and as required for the cleaning, testing and balancing of the piping system(s). Refer to other sections of the specifications.

3.07 TEST AND BALANCE

A. Refer to Specifications Section 23 95 00.

3.08 CLEANING / WATER TREATMENT

A. Refer to Specifications Section 23 60 00.

END OF SECTION 232100

SECTION 23 22 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting, or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. Provide for each refrigerant piping system to be installed under this contract all required labor, materials, transportation, permits, certifications, shop drawings, equipment, apparatus, tools, temporary construction and all other items needed for a complete system that is safe and ready for operation.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter and contractor shall review them for items related/applicable to this section.

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are shown or specified on the contract documents.

Pipe materials
Pipe fittings
Filter dryers
Moisture indicators
Lead free solders
Service valves

B. For additional Shop Drawing submission requirements refer to Specifications Division 01 and Section 23 00 00.

1.05 QUALITY ASSURANCE

A. Refrigerant pipes shall be sized as per recommendations of the air conditioning equipment manufacturer. Provide, upon request, copies of manufacturer's calculations, especially when distance between system components exceeds manufacturer's standard published data.

B. Pipes shall be refrigerant type copper factory sealed and filled with dry nitrogen. Installation of refrigerant pipes with open ends is not permitted. Provide a temporary solder cap on open ends of pipes and leave a gauge indicating pipes are under positive dry nitrogen pressure.

C. Verify operating pressure of selected refrigerant and follow the safe piping installation procedures required to meet the maximum operating pressures.

D. For additional Quality Assurance Requirements refer to Specifications Division 01 and Section 23 00 00.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING

A. Temperature range: 120°F maximum.

B. Operating pressure: 260 psig maximum.

C. Pipe material

1. Type – O: Soft copper pipe (annealed).

2. Type 1/2H or H: Hard copper pipe.

D. Fittings: 300 lbs. minimum, wrought copper, socket ends.

E. Traps to be return bends with couplings and extension tubes.

F. Solder: Silver solder. The use of acid is prohibited.

G. Filter/dryers

1. Filter/dryers shall meet the requirements of ARI Standard No. 710, latest edition.

2. Replaceable core type: Porous core molded of durable desiccant bonded by inert binder, end plant attached with nuts and bolts, not cap screws, tie rod attachment of core to end plate. UL listed steel temperature brazing alloy. All integral parts cadmium plated, outlet seal gasket to prevent bypassing.

H. Moisture indicators shall be brazed steel copper plated unit with a glass window, sealing gasket, aluminum compression ring, and chemically impregnated porous filter paper indicator. By-pass installations shall be provided on lines larger than 2-1/8 O.D.

PART 3 EXECUTION

3.01 REFRIGERANT PIPING INSTALLATION

A. Refrigerant pipes shall be flushed with dry nitrogen before soldering to purge any possible air accumulation and maintain while soldering to provide a continuous flow of dry nitrogen.

B. As installation proceeds, provide a temporary soldered cap on open ends of pipes and leave a gauge indicating pipes are under positive dry nitrogen pressure.

C. Provide all necessary valves, traps, filter/dryers, sight glass, etc. as required for a complete and ready to operate installation. Include accessible service fittings.

D. Above ground pipes inside buildings shall be supported from building structure as per requirements of Section 23 20 00. Use Cush-O-Clamps with rubber inserts for the support of refrigerant lines.

E. Above ground pipes exposed to the weather shall be supported on hot deep galvanized Unistrut type frames, bottom of pipes to be not less than 8” above concrete pad. Support frames shall be securely anchored to the concrete pad. Pipe insulation shall be further protected with an aluminum jacket; refer to Specifications Section 15500. System may be used to carry the electrical power conduit for the condensing units. When supported from walls, provide metal cover as shown on plans.

F. In the piping system, contractor shall avoid installing excessive number of elbows, turns and bends. Maintain straight runs of pipes. If conflicts are found with other trades, installer of refrigerant piping shall immediately notify the contractor for general construction to resolve the conflict. Failure to follow this procedure may result in the repiping of the system if found unsatisfactory to the Owner and / or Architect and Engineer, at no cost to the contract.

G. When underground, refrigerant pipes and associated control wires shall be encased in schedule 40 PVC conduits. Diameter of conduit shall be large enough to allow for the easy installation and removal of the refrigerant lines and control wires but not less than 4” diameter. Only one set of refrigerant pipes and associated control wiring is allowed in each conduit. When required, provide multiple parallel runs of conduits.

H. Provide long sweep elbows or junction boxes at the ends of conduit to facilitate pulling of refrigerant pipes and control wires.

I. The open ends of the conduit or boxes shall be sealed to keep water and vermin from entering the pipe. Ends of conduit and boxes shall extend a minimum of 6” above ground or concrete slab.

J. For units with multiple circuits, provide a separate conduit for each refrigerant circuit.

K. Suction piping shall be sloped back in direction of compressor without sagging, oil trapping on horizontal run of pipe.

L. Moisture indicators must be located at an exposed location where they can be readily visible.

3.02 TEST OF REFRIGERANT PIPING SYSTEM

A. Test refrigerant piping to 235 psig on the high side and 140 psig on the low side, using a mixture of dry nitrogen and the refrigerant to be used in the system.

B. Held pressure for a period of 24 hours, and check leaks with a halogen detector. On test failure, purge the gas mixture with dry nitrogen; make necessary repairs and repeat item A.

C. After pressure testing is successfully completed, thoroughly dehydrate refrigerant system by drawing a vacuum to 0.181 inches of mercury (500 pm of mercury of less) and holding this pressure for a period of 24 hours. Purge system with dry nitrogen during the dehydration process to aid in moisture removal and to obtain a better evacuation.

D. Verify that non-condensable gases, nitrogen gas or air are no longer inside the system and proceed with Item E.

E. After evacuation and dehydration, charge the system with the correct amount of refrigerant. Provide a written report indicating refrigerant high, suction and sub-cooling temperatures, submit to Owner/Architect for review.

F. In addition to the results described above, preliminary and final tests shall show that each system is free of electrical grounds, short circuits and other hazards.

3.03 INSULATION

A. Refer to Specification Sections 23 08 00 and 23 65 00.

END OF SECTION 232200

SECTION 23 23 00 – FLOW, PRESSURE AND TEMPERATURE MEASURING DEVICES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Provide, for each listed piping system(s), the flow measuring and/or control devices shown on drawings and specified herein.

B. Provide the labor, materials, equipment, apparatus, tools, temporary construction, transportation, permits, certifications, shop drawings, etc and all other items needed for a complete system(s) that is safe and ready for operation.

C. Work specified under this section includes the following piping systems:

1. Chilled and heating hot water supply and return.

D. Refer to Specification Section 23 90 00 for characterized control valves when such valves are specified.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter.

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners

23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. Materials furnished and installed under this Section shall be new and comply with the requirements and specifications of the applicable and current standards of the American Society for Testing and Materials (ASTM).

B. Welding: Refer to Specifications Section 23 20 00.

C. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

1.05 SHOP DRAWINGS

A. Submit shop drawings for the following items:

Flow Venturi
Circuit Setters
Pressure Gauges
Thermometers
Flow Control Valves
P.T. Plugs

PART 2 PRODUCTS

2.01 THERMOMETERS

A. Thermometers shall be of the separable socket, adjustable angle type, and minimum nine (9) inches long.

B. Thermometers shall be cast aluminum construction with metallic enamel finish and clear acrylic plastic window lens. Stem shall be brass and all fittings and wells shall be brass. Wells shall have extension neck for installation in insulated pipes.

C. Filling fluid shall be red appearing mercury easily readable against a white background. Temperatures shall be noted in black embossed figures.

D. Stem length shall be in accordance with companion thermometer well but not less than 3-1/2" long.

E. Install so that at least 75% of stem length is in the moving fluid stream. This may require increasing length over the 3-1/2" specified above.

F. Range of thermometer shall be selected so that normal operating temperature is at approximately the center of the scale and the highest possible temperature does not exceed full scale.

G. Acceptable thermometer manufacturers are: Weiss, Trerice, Dwyer and Miljoco.

2.02 THERMOMETER WELLS

A. Provide brass thermometer wells with cap and chain. Wells installed in insulated pipes shall have extended necks.

2.03 PRESSURE GAUGES

A. Pressure gauges shall be minimum 4-1/2" diameter, cast aluminum structure with black finish. Clean glass window shall be mounted on a chrome plated closed type ring.

B. Gages shall be easily readable and have a white dial with black embossed figures, micrometer-type pointer with black finish.

C. Sensing element shall be a Bourdon type tube, silver brazed to tip, 1/4" brass unit. Movement shall be rotary-type, stainless steel with Delrin sector and phosphor bronze bushing. Accuracy shall be 1/2 of one percent of scale range. Wells installed in insulated pipes shall have extension necks.

D. Scale range upper limit shall be not less than 150%, and not greater than 200% of system operating pressure.

E. Acceptable pressure gauge manufacturers are: Weiss, Trerice, Dwyer, Miljoco and Winters 300 series.

2.04 P.T. PLUGS

A. Where shown on plans, and in lieu of thermometers and pressure gauges test openings for the insertion of portable pressure and temperature test gauges may be provided.

B. Test connections shall consist of a threaded reducing tee or welded coupling to receive a test plug consisting of two rubber self-closing valves and threaded cap. Wells shall have extension neck for installation in insulated pipes.

C. Deliver to the owner a test kit including portable thermometer and pressure gauges. Test kit shall cover all the system(s) pressure and temperature ranges.

D. Acceptable manufactures of PT plugs are: Peterson Equipment Co. or Sissco.

2.05 FLOW VENTURI

A. Provide where indicated on drawings flow venturi(s) as herein specified:

B. The accuracy of each flow venturi shall be within 2 percent of the actual flow rate.

C. The flow venturi measurement system shall be selected so that the designed flow rate shall have a pressure differential of 9 to 40 inches of water. The permanent pressure loss shall not be more than 10% of the differential pressure at the designed flow rate.

D. Venturi 1/2" through 2" shall be brass with threaded end connections. Sizes 2-1/2" through 8" shall be cast iron nickel-plated insert type held between self-centering 150# A.S.A. steel weld neck raised face flanges.

E. Provide a portable master meter of the dry type with a range of 0 to 50 inches of water differential pressure. Meter to have a 6" diameter dial mounted in an aluminum carrying case complete with equalizing and bleed valves, vent hose and two (2) 10 foot lengths of hose. Hoses shall be rated at 250 psi at 250°F with quick disconnect connections. Provide installation and operating instructions and flow capacity curves. The master meter shall become the property of the owner. Instruct owner on the operation of the meter.

F. Acceptable manufacturers are: Robertson Manufacturing Corporation, BARCO, Griswold Control or Gerund.

2.06 CIRCUIT SETTERS

A. Furnish and install factory calibrated water flow balancing valve(s) with provisions for connecting to a portable differential pressure meter. Meter to register degree of valve opening. Valves design shall allow for the replacement / field adjustment of the control mechanism to meet actual field conditions.

B. Each balancing valve body to be bronze construction with internal seals to prevent leakage around measuring element.

C. Each circuit setter shall be rated for 125 lbs. working pressure at 250°F.

D. Deliver to the owner one (1) portable differential pressure meter compatible with the installed circuit setter(s). Include all necessary hoses with quick connectors, flow and pressure curves.

E. Acceptable circuit setter manufacturers are: Bell & Gossett, Taco, Gerand Flow Design and Mepco.

2.07 FLOW CONTROL VALVES

A. Provide automatic, pressure-compensating, flow control valves as specified herein. Small sizes (0.5 to 3") valves shall have threaded connections. Sizes 3” and above shall have flanged connections. Valves shall be rated at 300 psi and 250°F.

B. Threaded valves body shall be brass with build-in union(s). Flanged valves shall have cast iron or steel bodies. The flow control cartridge assembly shall be stainless steel. Provide one free exchange of cartridges if recommended by the test and balance agency. Valve body to have inlet and outlet pressure taps for verification of performance.

C. Valve body shall indicate direction of flow and be permanently marked with the valve flow rate and PSID control range. Provide strainer upstream of valve inlet.

D. Manufacturer shall warrant that the entire system shall automatically be controlled to remain in balance to within ± 5% of desired flow rates.

E. When requested by Architect / Engineer, manufacturer shall supply certified independent laboratory tests verifying accuracy of performance of flow control valves.

F. Provide a portable meter kit complete with 4-1/2" dial pressure gauge (range of -15.7 to 150psi); end connections; ten foot long hoses with quick connectors; carrying case and flow / pressure rate chart. Instruct owner in the operation of the meter.

G. Identification tags shall be provided for all valves. Tags shall be indelibly marked with flow rate, model number and zone identification. Tags shall be 3" x 3" aluminum with bronze chain.

H. Acceptable manufacturers are: Autoflow Griswold, Taco Accu-FLo and Hayes.

2.08 PRESSURE INDEPENDENT CHARACTERIZED CONTROL VALVES

A. These valves are specified and furnished in Specification Section 23 90 00.

B. Install valves as per manufacturer’s instructions.

PART 3 EXECUTION

3.01 THERMOMETERS

A. Thermometers shall be installed at the locations shown in the contract documents.

B. Set thermometers so they can be easily read free of obstructions.

3.02 PRESSURE GAUGES

A. Pressure gauges shall be installed at the locations shown on the contract documents.

B. Set gauges so they can be easily read free of obstructions.

3.03 CONTROL VALVES

A. Flow control devices shall be installed where shown on plans and where necessary to facilitate flow measuring and/or control in the piping system(s).

B. Access to concealed valves shall be provided by means of access doors. Refer to Specifications Section 23 00 00.

C. Valves shall be installed in the upright position. Plan piping routing and installation to assure this condition is met.

D. Calibrated Balancing Valves and Automatic Flow-Control Valves are not required where self-contained pressure independent control valves are installed. Contractor to install pressure independent control valves furnished under Specifications Section 23 90 00.

END OF SECTION 232300

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SECTION 23 24 00 - CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE

A. Provide for each indicated condensate drain piping system all necessary and required labor materials, transportation, permits, certifications, shop drawings, temporary construction and all other items needed for a complete system which is safe and ready for operation.

B. This is an existing building, therefore contractor must visit site and become familiar with conditions affecting his work.

C. Condensate drain lines inside buildings including mechanical rooms shall be copper: lines shall be insulated; refer to Specifications Section 23 65 00.

D. Schedule 40 PVC condensate drain lines may be used underground or exposed outside building.

E. The use of PVC pipes in return air plenums or exposed to air-conditioned spaces is prohibited.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter and contractor shall review them for items related/applicable to this section.

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units

23 75 01 Variable Volume Temperature (VVT) System
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are shown on the contract documents.

Pipe materials and fittings
Details of pipe supports above roof
Pipe hangers

B. For additional Shop Drawing submission requirements refer to Specifications Section 23 00 00.

PART 2 PRODUCTS

2.01 CONDENSATE DRAIN PIPING

A. Piping material:

1. Copper:

a. Pipe: type L, hard temper copper tube.

b. Fittings: 125 lbs. minimum wrought or cast copper, socket ends. Traps to be return ends with coupling and extension tubes.

c. Joints: 95/5 solder. The use of acid is prohibited.

PART 3 EXECUTION

3.01 CONDENSATE PIPING INSTALLATION

A. Provide P-traps at the condensate drain line connections to air handling equipment with cooling coils. Slope horizontal drain lines toward the point of final discharge. Minimum slope shall be 1/8”/foot.

B. Provide P traps at each point f connection to equipment. Traps shall be sized to meet the system operating pressure.

C. Insulate condensate drain lines inside buildings as specified in Specifications Section 23 65 00.

D. Individual condensate drain lines to be one diameter larger than the equipment drain connection but not less than 3/4”.

E. Provide removable cleanout plugs at the top of each trap and at each change of direction.

F. Drainpipes inside building shall be supported from building structure as per paragraph Hangers in Specifications Section 23 20 00.

G. Drainpipes exposed above building roof shall be supported at same spacing noted in paragraph Hangers, Specifications Section 23 20 00. Horizontal lines shall maintain the slope specified in

this Section to the point of discharge and terminate at nearest roof drain or downspout. Type of acceptable supports shall be coordinated with roofing contractor or holder of roof bond. Submit details for review by Architect / Engineer. Pipes shall be secured to roof supports as required by Florida Building Code - Wind Classification for the area.

3.03 INSULATION

A. Refer to Specifications Sections 23 08 00 and 23 65 00.

3.04 TERMINATION

A. Drain lines shall terminate at locations shown on drawings. Pipe installer shall visit site to become familiar with existing conditions.

B. Drain lines connecting to storm leaders shall be made with adequate safeguards to prevent rainwater from back flowing into condensate drain lines. Coordinate with Civil Engineering plans and site utilities contractor.

C. Drain lines terminating near buildings shall end a minimum of 12” away from the building foundations. Drain lines terminating above grade shall be provided with a minimum 18” long splash block.

D. When French Drains are used, they shall comply with requirements of Florida Building Code 2007 - Mechanical.

E. Drain lines shall not discharge on sidewalks, driveways and similar traffic surfaces.

F. Drain lines may terminate at a structure that is part of the site drainage system shown on the Civil Engineering documents. Installer of this work shall coordinate routing and connection of drain piping with site utilities contractor. Requirements of site utilities contract documents and contractor shall take precedence over these specifications.

G. On sites where high water table or drainage conditions may affect the performance of the condensate drainage system, contractor shall submit alternative drainage options for review by Architect / Engineer.

H. When indicated on drawings, condensate drain lines may terminate at a water collection tank.

END OF SECTION 2324 00

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SECTION 23 40 00 – AIR HANDLING MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE

A. The work under this section includes furnishing all labor, materials, tools, appliances and equipment, and performing all operations necessary for the complete installation of the heating, ventilating and air conditioning air handling equipment as shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. Each piece of equipment shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to it. Information printed on stick-on type paper or film is not acceptable.

B. Capacities shall be not less than those indicated on plans. Any deviations shall be brought to the attention of the Engineer prior to bid time.

C. Provide certified sound and/or fan data as hereinafter specified and upon request from the Engineer.

D. All insulation used on equipment shall meet NFPA-90A flame spread and smoke generation requirements.

E. The coil and filter sections shall be completely sealed to prevent air bypass around coil and filters.

F. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

G. Accepted substitution and listed manufacturers, other than those used as the basis of design, may have different requirements regarding the characteristics (dimensions, weight, etc.), quantity or arrangement of items such as foundations, supports, ductwork and piping connections, electrical characteristics and power demand and any other equipment or accessories that are standard or required for the proper installation and operation of their product. Manufacturer of accepted substitution and listed manufacturers, other than those used as the basis of design are responsible to disclose such differences to the Bidders/Contractors so that they can include additional costs to cover them in their bid. Subsequently, successful Bidder/Contractor shall furnish those items at no additional costs to the contract. The additional costs shall include all changes and additions to his work and the work of others, including design professionals affected by the substitution or deviation.

H. Equipment specified in this Section of the Specifications shall have ISO 9001 Certification.

I. Certify air-handling units in accordance with AHRI 430.

J. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI 410 standard.

K. Units shall be manufactured to conform to UL 1995 Standard and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to unit.

1.05 REFERENCE STANDARDS

A. AHRI 410 - Standard for Forced Circulation Air-Cooling and Air Heating Coils.

B. AHRI 430 - Standard for Central Station Air Handling Units.

C. AHRI 260 - Standard for Sound Rating of Ducted Air Moving and Conditioning Equipment.

D. Air Handling Units shall conform to AMCA 210 for fan performance ratings.

E. Damper performance will comply with AMCA 500.

F. Airflow Monitoring Stations will be rated in accordance with AMCA 611-95 and bear a Certified Ratings Seal for Airflow Measurement Performance.

G. ANSI/AFBMA 9 Load Ratings and Fatigue Life for Ball Bearings.

H. ASTMB 117 - Standard Practice for Operating Salt Spray Apparatus.

I. Motors covered by the Federal Energy Policy Act (EPACT) will meet EPACT requirements.

J. Unit casing radiated sound ratings will be reported in accordance with ISO 9614 Parts 1 & 2 and ANSI S12.12.

K. Motors to comply with NEMA MG1 - Motors and Generators.

L. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.

M. SMACNA - HVAC Duct Construction Standards.

N. UL 181 - Factory-Made Air Ducts and Connectors.

O. UL 1995 - Heating and Cooling Equipment.

1.06 SUBMITTALS

A. Submit requested shop drawing information for the following equipment:

Fan Coil Units
Central Station Air Handlers
Water Source Heat Pumps
Roof Mounted Air Handlers
UVC Emitters
Multi-Plenum Fan Handling Units

B. Product Data

1. Manufacture's literature shall indicate dimensions, weight, capacities, ratings, fan performance, metal gages and finishes of materials, electrical characteristic and connections requirements.

2. Provide data for filter media, filter performance, filter assembly and frames.

3. Provide computer generated fan curves with specific operating point clearly plotted.

4. When multiple models are shown in same catalog, clearly identify the information applicable to the product being submitted, otherwise submittal will be rejected.

C. Installation and Maintenance

1. Submit manufacturer's installation instructions.

2. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists and wiring diagrams.

3. Refer to Specifications Section 23.02.00

PART 2 PRODUCTS

2.02 CENTRAL STATION AIR HANDLING EQUIPMENT

A. Furnish and install draw thru central station air handling unit(s) of size, type and performance as indicated on the unit schedule and as herein specified. Units shall be AHRI certified per Standard 430. Basic components shall include but not limited to:

1. Combination filter/mixing box section.
2. Blender section.
3. Access section.
4. Cooling coil section.
5. Diffuser section.
6. Attenuator section.
7. Base rail with minimum height as scheduled.

B. Cabinets including all accessories shall be galvanized steel double wall construction.

1. All sections shall be provided with hinged access doors with quick opening latches; minimum of two latches per door.
2. Insulation shall be 2" thick, 1 1/2 lb. Density.
3. All exposed edges of insulation shall be sealed and protected with a galvanized sheet metal nosing.
4. Fan sections only shall have a perforated internal liner for sound attenuation. Insulation shall be neoprene coated.
5. Casing shall be fabricated with channel posts and panels. Base rail shall have a galvanized steel finish. Assemble sections with gaskets between each frame member and unit panel.
6. Module to module assembly shall be accomplished with an overlapping, internal splice joint that is sealed with gaskets on both mating modules to meet indoor air quality standards.
7. Casing leak rate shall not exceed 0.5 CFM per square foot of cabinet area at 5” static pressure in order to meet efficiency and indoor air quality standards.

C. Fans

1. Fan wheels shall be constructed of hot dipped galvanized steel and shall be plenum or plug DWDI type with galvanized steel scroll housing.

2. Provide factory installed spring vibration isolation under the fan and motor base.

3. Units provided with internal isolators shall be provided with 6” base rails. Motors to be high efficiency open drip proof.

4. Fans shall be selected for the indicated total system static pressure, for the indicated application and be dynamically balanced before and after installation in the fan cabinet section.

5. Fan shaft shall be solid with fan wheels keyed to the shaft.

6. Maximum fan RPM shall be below the first critical speed.

7. Bearings shall be self-aligning, grease lubricated, ball or roller type with a minimum life of 200,000 hours. All bearings shall be equipped with lubrication fittings. Grease fittings shall extend to the exterior drive side of the cabinet.

8. Belt driven fans shall be provided with adjustable sheave on the motor to allow changes in the fan speed and an increase of up to 30% in the RPM's. Provide second set of fixed sheaves for installation after Test and Balance is accepted.

9. Motors to be high efficiency open drip proof. Motors for variable air volume systems shall be compatible with the unit variable frequency drive.

D. Variable Frequency Drives

1. Units serving VAV boxes shall be provided with variable frequency drives.

E. Fan / Motor Mounting

1. Install fan and motor on a steel base. Factory mount motor on slide base that can be pulled outside of unit if removal is required.

2. Provide access to motor, drive, and bearings through hinged access door.

3. Fan and motor assembly to be mounted on spring vibration isolators inside cabinet.

F. Blow-through coil sections shall be designed with air diffuser plates to assure proper air distribution across the face of the coil and prevent water carryover. Hot and cold deck partitions shall be insulated.

G. Drain Pan

1. Drain pan to be double pan galvanized steel construction with the inner pan covered by a heavy coat of mastic. Provide minimum 1 ½” thick thermal insulation from the exterior casing.

2. Drain pans shall be stainless steel construction. Drain stub out shall be of stainless steel. Provide thermal insulation from the exterior casing to prevent condensation.

3. Drain pans shall be sloped for positive drainage and no water retention.

I. Coils

1. Cooling coil section shall include specified coil and insulated drain pan. Where multiple stacked cooling coils are used intermediate drain pans shall be provided between each coil level.

1. Coil headers be completely enclosed within the insulated casing with only gasketed pipe connections extending 5” beyond the cabinet.

2. Coil performance data shall be certified in accordance with Air Conditioning Heating and Refrigeration Institute (AHRI Standard 410).

4. Chilled water coils shall be seamless copper. All joints shall be brazed.

5. Secondary surface shall consist of aluminum mechanically expanded plate type fins with full drawn collars to provide a continuous surface cover over the entire tube. Vent connections shall be provided at the highest point of the coil(s)and drain connections at the lowest point and extend beyond unit casing.

6. Headers shall be seamless copper tubing. Coil connections shall be carbon steel.

7. Coil supports and tube sheets shall be constructed of stainless steel.

8. Water coils shall be tested with 315 pounds air pressure under warm water and guaranteed for 150 psig working pressures.

10. Steam coils shall be seamless (copper) (cupronickel) (almiralty) tubes. Coils shall be pitched in the unit to insure positive condensate drainage. Headers shall be seamless copper tubing.

11. Secondary surface-shall consist of (aluminum) (copper) mechanically expanded fins with full drawn collars to provide a continuous surface cover over the entire tube.

J. Filters

1. Furnish angular filter sections complete with filters as specified herein or scheduled on the plans. Filter sections shall have hinged access door on both ends.

2. Furnish combination filter and mixing box with dampers where shown on plans. Dampers shall be opposed acting.

3. Mixing box only shall be furnished where shown on plans. Low Leak Mixing Box Dampers shall be airfoil type tested in accordance with AMCA Standard 500. Face and Bypass Dampers shall be opposed acting.

4. Pre-filters shall be MERV 8, 2” pleated throwaway.

5. Provide size hinged access door in all return air plenum boxes. In limited spaces provide removable type access door.

K. Acceptable manufacturers of air handling equipment are: McQuay, Trane, Carrier, or York (Johnson Controls).

PART 3 EXECUTION

3.01 EXAMINATION OF FIELD CONDITIONS

A. Contractor shall verify that spaces are ready to receive work. Existing conditions may require the relocation of existing components such a ceiling hangers, conduits, ductwork, etc. Coordinate with other trades.

B. Verify that required utilities are available, in proper location accessible and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

A. Each piece of equipment shall be installed in accordance with the manufacturer recommendations and to conform to the contract documents.

B. Units shall be installed level, with trapping provided in accordance with manufacturer's requirements. Visually inspect to ensure proper drainage of condensate.

C. Each piece of equipment shall be installed to be free of noise and vibration. Provide isolators as per manufacturer's recommendations and/or as herein specified.

D. Provide 1” thick rubber pads under the entire metal surface intended to rest on a concrete housekeeping pad.

E. Equipment suspended from the building structure shall be provided with the required restraints to prevent swaying or lateral movement during start up and normal operation.

F. Access panels shall be provided for all equipment installed in concealed spaces. Panels shall be field located to provide maximum accessibility to coils, motors, filters, and other components that require routine service. Access panels shall meet the requirements of Specifications Section 23 00 00 of the Manual.

G. Provide extended lubrication tubes and fittings for service of bearings located in concealed or difficult to reach sections of apparatus or mechanical rooms. Provide additional extensions as directed by Architect / Engineer.

H. Duct turns located near a fan discharge shall always be in the direction of fan rotation. Equipment installer shall coordinate arrangement of fan section with equipment supplier to assure this condition is met.

I. Locate units where indicated, level and shim units, and anchor to structure in accordance with requirements of Florida Building Code.

J. Provide units with shut-off valve on supply and balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing.

3.03 DELIVERY, STORAGE AND HANDLING

A. Deliver equipment to the site in manufacturer's original packaging. Clearly mark each item with the proper identification number. Store in accordance with the requirements of Specifications Section 23 00 00.

B. Provide protective covers during construction.

C. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

D. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs to allow for field rigging and final placement of section.

E. Deliver units to site with fan motors, sheaves, and belts completely assembled and mounted in units. If these components are not completely assembled, contractor shall be responsible for all expenses associated with installation, testing, and vibration balancing of fan(s).

F. Store units in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

3.04 START UP AND OPERATING REQUIREMENTS

A. Provide factory approved/trained supervision during start-up of equipment.

B. Do not operate air handling equipment for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

C. Refer to Specifications Section 23 00 00 – Paragraph – Operation of Air Conditioning Equipment During Construction.

3.05 TEST AND BALANCE

A. Coordinate with the Test and Balance Specifications Section 23 95 00.

B. In all fan systems, the air quantities shown on the Drawings may be varied as required to secure a maximum temperature variation of ±2º within each controlled space, but the total air quantity indicated for each zone must be obtained. It shall be the obligation of this Equipment Installer to replace fan drives and/or motors (without cost to the contract) to attain the specified air volume.

C. Replace filters, as required, during Test and Balance and have a final clean set at end of Test and Balance.

3.06 CLEANING

A. Clean work and mechanical spaces.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and the inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials available from manufacturer.

D. Install new clean filters after completion of Test and Balance.

E. If air conditioning equipment is used during construction, comply with requirements of Specifications Section 23 00 00 – Paragraph – Operation of Air Conditioning Units During Construction.

3.07 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacture used as the basis of design.

B. For all other listed manufacturers, shop drawing data shall indicate equal or better performance characteristics as the specified equipment.

3.08 WARRANTY

A. The original equipment purchaser shall provide, at no additional cost, a standard warranty that covers a period of one year from time of acceptance by the Owner. Refer to Specifications Section 23 00 00.

B. This warrants that all products are free from defects in material and workmanship and meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

END OF SECTION 234000

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SECTION 23 60 00 - WATER TREATMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE

A. Work under this project requires connecting new chilled water lines to an existing system. Contractor shall coordinate the work under this Section of the Specifications with the water treatment company presently serving this facility.

B. The work under this section includes furnishing the labor, materials, equipment, and performing all work necessary for the complete installation and operation of the water treatment equipment system(s) shown on these contract documents. Provide required equipment, chemicals and service for specified warranty period. Provide required tests and reports.

D. Provide complete water treatment system(s) for the following:

Closed Recirculating Water Systems

E. Installer of piping system shall be responsible for the flushing and cleaning of piping systems under the direction of the water treatment company. Water Treatment Company shall provide required chemicals.

F. Provide one (1) year's supply of the recommended formulations to eliminate scale and corrosion in the closed recirculating water systems. Provide a year's supply of the necessary biocides to keep systems free of microbiological growth and fouling.

G. A water management program shall begin at system start-up. The program is to consist of initial water analysis, start-up assistance and training of operating personnel, and monthly field service and consultation. A complete service analysis report will be filed during each service call. A qualified, full-time representative of the water treatment company shall perform all services.

The Water Treatment Company shall supply operation manuals for each system supplied by them. Refer to Specifications Sections 23 01 00 and 23 02 00.

H. All treated cooling towers and evaporative condensers shall be cleaned at the end of every four-month period. Cleanings shall include a high-pressure wash-down with a physical and chemical flushing. Equipment shall be left in a clean, debris free condition.

I. At the end of the one (1) year service period, the Owner's representative should open the heads of all treated, centrally located condensing equipment and the water treatment company will inspect. After the condition of the equipment is determined, the procedures that are agreed upon as necessary shall be performed. Equipment tubes shall be left in a clean, debris free condition.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 75 01 Variable Volume Temperature (VVT) System
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. The water treatment company shall be local, state and federal certified to provide the services required under this Specifications Section. Provide copy of certification to Owner and Architect / Engineer.

B. Company shall have a local office in the Tampa Bay Area and must have been providing water treatment services for at least five (5) years. Provide list of references upon request from Owner or Architect / Engineer.

C. Chemical products shall meet applicable local, state and federal requirements for personal and environmental safety. Dosage and applications shall follow such guidelines.

D. Copies of the product(s) safety data sheets shall be included with the shop drawing submittal and be included in the Operations and Maintenance Manuals.

E. Each piece of equipment shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to it.

F. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

1.05 INSTALLATION STANDARDS

A. All electrical equipment will be UL listed and shall meet the minimum standards as established by the National Electrical Manufacturer's Association (NEMA). Equipment installed outdoors shall be in weatherproof enclosures.

B. The water treatment company shall provide final installation of all equipment supplied by them for undivided responsibility. The mechanical installer shall provide in the recirculating lines, all necessary taps, nipples, and valves. The electrical installer shall provide the required power supply for operation of the water treatment equipment. The mechanical installer shall coordinate these functions with both the water treatment company and the electrical installer.

1.06 WARRANTY

A. The water treatment company shall warrant that during the one-year period covered, a qualified service technician will perform monthly service calls. Service calls will include a test of each water system treated, adjustment of equipment, repair or replacement of defective materials and equipment at no additional cost to the Owner. A written report will be submitted to the Owner and the contractor indicating the test results, any services performed, and the present conditions in each system. A single water treatment company for undivided responsibility shall supply all formulations, service, equipment, and installation.

B. The warranty period shall begin on the start-up date when the chemical treatment is first added to the system waters and will end one year after the date of final acceptance by owner.

C. Submit a price, which shall not be a part of this contract but an Owner's option, for extending the water treatment service and products supplied for one (1) year from date of guarantee expiration. Warranty on all water treatment equipment supplied by the water treatment company under these specifications shall be extended to cover this additional year.

1.07 ACCEPTABLE WATER TREATMENT COMPANIES

A. The water treatment company shall maintain a local place of business within 50 miles of the project.

B. Contractor to submit name of company he plans to use for review by Owner and Architect / Engineer. For existing installations, if Owner already has a company under contract, that company shall be used.

C. Acceptable water treatment companies are: Moseley Associates, MOGUL and MITCO Water Laboratories.

1.08 SHOP DRAWINGS

Chemical Treatment Pumps
Water Treatment Formulations
Controller
Accessories

PART 2 PRODUCTS

2.01 CLOSED RECIRCULATING WATER SYSTEMS - EQUIPMENT

A. Utilize existing water treatment equipment.

2.02 CLOSED RECIRCULATING WATER SYSTEMS - CHEMICALS

A. Provide a nitrite based corrosion inhibitor for the period of the service program.

B. Provide a mild alkaline, general flush chemical recommended for use in cleaning and flushing of closed recirculating water systems.

C. Provide a general-purpose micro biocide in combination with a dispersant to eliminate microbiological growth from the closed recirculating water systems.

D. All formulations shall be contained so as to be safe to handle and shall be complemented (in the system) by appropriate inhibitors so as to not attack system components in any way. Chromate formulations are not acceptable.

1. All formulations shall be provided in liquid form for direct feed from the shipping containers.

2. All discharges shall be within limits established by the local, state, and federal EPA regulations.

2.05 TESTING EQUIPMENT

A. For closed Recirculating Water Systems provide a test kit to monitor the inhibitor level.

B. For open Recirculating Water Systems provide test kits to monitor the inhibitor levels, Ph, P and M alkalinity, chlorides, hardness, and TDS.

2.06 CLEANING AND FLUSHING

A. Water treatment company to provide formulations for the cleaning and flushing of the water systems listed in this Section. Also refer to Specifications Section 23 20 00.

B. Mechanical systems installer shall provide specified temporary fine mesh screens in all strainers. Periodically remove and clean screens during the cleaning and flushing process. Replace with permanent specified screens upon completion of this work.

C. The mechanical systems installer under the supervision of the water treatment company shall do the cleaning and flushing of all piping systems.

D. All equipment and associated piping to be treated shall be flushed out with precleaning chemicals to remove deposits such as pipe dope, oils, loose rust, mill scale, and other foreign matter. Add recommended chemicals and circulate for 24-48 hours. Drain, fill, and flush water systems until no foreign debris is seen and chemical tests indicate no trace of the precleaning chemicals.

E. Acidic formulations are not acceptable for purposes of system flushing.

F. Water Treatment Company to provide owner and Architect / Engineer with a written certificate indicating the piping systems have been properly cleaned.

PART 3 EXECUTION

3.01 START-UP

A. Prior to system start-up, but after the system has been completely cleaned and flushed; all systems shall be treated with the necessary dosages of treatment formulations to passivate the system.

B. None of the equipment installed under this Division 23 of the Specifications that is connected to a water circulating system shall be operated without first receiving the proper dosages of water treatment formulations.

C. The water treatment company technicians shall be responsible for all adjustments to the water treatment equipment.

D. Provide report to Owner and Architect / Engineer.

3.02 SYSTEM FLUSHING

A. The mechanical systems installer under the supervision of the water treatment company shall do the cleaning and flushing of all systems. The Water Treatment Company shall render a report of completion to the Owner, Architect / Engineer.

B. All equipment and associated piping to be treated shall be flushed out with precleaning chemicals to remove deposition such as pipe dope, oils, loose rust, mill scale, and other foreign matter. Add recommended chemicals and circulate for 24-48 hours.

C. Maintain a concentration of 1,000 ppm of phosphate during the cleanup period. Drain, fill, and flush water systems until no foreign debris is seen, ph is less than 8 and chemical tests indicate no trace of the precleaning chemicals.

D. The water treatment company shall verify that all required piping bypasses around coils, control valves and connection to existing piping system are in place before commencing work.

END OF SECTION 236000

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SECTION 23 65 00 – INSULATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting, or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. All ducts, pipes and equipment specified under this Division 23 of the Specifications and/or indicated on the drawings that transmits or receives heat, will form condensation, or is subject to freezing shall be insulated unless it is specifically stated otherwise.

B. Ductwork systems to be insulated:

1. Supply and return air ducts including backside of air devices. Except exposed ducts in air-conditioned spaces shall be double wall internally lined. Refer to Specifications Section 23 73 00.

2. Ducts carrying outside air.

3. Ducts that are part of an energy recovery system.

6. Exposed ducts in air-conditioned spaces shall be double wall internally lined.

7. Other ducts as specified herein or shown on the plans.

8. Double wall factory insulated round and oval ducts are not required to be externally field insulated.

C. Insulation shall not be installed until after the pressure testing of the ducts has been successfully completed. Refer to Specifications Sections 23 73 00 and 23 95 00 of the Specifications.

D. Piping systems to be insulated:

1. Condensate and cold equipment drains.

2. Chilled water supply and return lines including air separators and expansion tanks.

9. Refrigerant piping.

E. Insulation shall not be installed until after the pressure testing of the piping systems has been successfully completed. Refer to Specifications Section 23 20 00, 23 20 01 and 23 22 00.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. Insulation materials shall conform to the requirements of NFPA 90A and shall have composite fire and smoke hazard ratings as tested in accordance with ASTM E-84, NFPA 255, or UL 723 not exceeding: Flame Spread 25, Smoke Developed 50.

B. Accessories such as adhesive, mastic, cement, facing, tapes and cloth for fittings, shall have the same component ratings as listed above. All tapes shall comply with UL 181.

C. Products or their shipping cartons shall bear a label indicating that flame and smoke rating do not exceed above requirements.

D. Any treatment of jackets or facings to impart flame and smoke safely shall be permanent. The use of water-soluble treatment is prohibited.

E. Insulation shall be installed in accordance with manufacturer's instructions. Notify Architect / Engineer of any discrepancy between manufacturer’s instructions and this specification. Most stringent requirements should be followed.

F. All insulation materials shall be certified to be asbestos free.

G. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

1.06 ACCEPTABLE MANUFACTURERS

A. Acceptable insulation product manufacturers are: Owens Corning Fiberglas Corp., Armstrong, Pittsburgh Corning, Knauf, and Childers Products Company and others listed hereinafter in this Section of the specifications.

1.07 SHOP DRAWINGS

A. Submit shop drawings for all insulating materials in accordance with the requirements of the General Conditions and Specifications Division 01 and Section 23 00 00.

B. Shop drawings shall list the Specification Section and Paragraph applicable to each product.

C. Include description of manufacturer's recommended application and/or installation procedures.

D. For additional Shop Drawing submission requirements refer to Specifications Section 23 00 00.

PART 2 PRODUCTS

2.01 CONCEALED DUCTWORK

A. All supply and return air ducts, unless otherwise shown on drawings, shall be externally insulated with blanket type insulation. Insulation shall have an installed minimum R-value of 6.0.

B. Insulation shall be glass fiber type with reinforced foil faced, flame resistant Kraft vapor barrier. Insulation shall be equal to Owens Corning Fiberglas All Service Faced Duct Wrap Insulation.

C. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of two inches (2").

D. Insulation shall be secured to ductwork with Benjamin Foster 85-20 adhesive. Use minimum of four inches (4") wide strips of adhesive at not less than twelve inches (12") on centers.

E. For rectangular ducts over 24" wide, provide additional fasteners on the bottom of the duct. Secure insulation with mechanical fasteners and suitable speed washers or clips firmly embedded into insulation at no more than 18" on centers in all directions.

F. All lap seams and clips shall be taped with three-inch (3") wide U.L. listed, Class 1 foil faced tape. Tape shall be recommended by the insulation manufacturer and be included in the shop drawing submittal for the insulation.

1. Pressure sensitive tapes shall have a maximum flame spread and smoke developed of 25/50 as per NFPA 90A.

2. Acceptable tapes are: Avery Rubber Base FasTape 0802 or Compac Industries #120 2 Mil Aluminum Foil Tape.

G. Finish exposed cuts of insulation by applying a presized glass cloth jacket over the vapor barrier. Secure with Benjamin Foster 85-20 adhesive.

H. Additional or more stringent manufacturers recommendations shall take precedence and be followed.

2.02 EXPOSED DUCTWORK – RECTANGULAR

A. All exposed rectangular ducts shall be insulated with one and a half inches (1-1/2") thick rigid board insulation.

B. Insulation shall be 6 lbs. per cubic foot density glass fiber with maximum K factor of .24 at 75°F mean temperature and fire retardant vapor barrier aluminum facing. Insulation shall be similar to Owens-Corning Fiberglass Type 705.

C. Insulation shall be secured with Benjamin-Foster 85-20 adhesive and impaled over welded or stickpins applied to duct surfaces on 12" centers in all directions.

D. Use a minimum of two rows of fasteners on each side of duct. Secure insulation with suitable speed washers or clips firmly embedded into insulation.

E. All joints shall be tight. All joints, clips and breaks in the vapor barrier shall be sealed with 3" wide strips of foil tape. UL 181 shall be stamped on the face of the tape.

F. All corners shall be made up with aluminum roll-on corner beads.

G. All exposed round and oval ducts shall be insulated as hereinbefore specified for concealed ductwork except when ducts are factory insulated double wall construction and no external insulation is required.

H. Exception to this specification are those exposed ducts that are specified to be externally painted; those ducts to be double wall construction. Refer to the contract documents.

2.03 OUTSIDE AIR DUCTS

A. All concealed or exposed ducts and equipment casings containing all or a percentage of outside air shall be externally insulated.

B. Insulation material, thickness, and finish shall be same as hereinbefore specified for concealed and/or exposed ducts.

2.04 EXHAUST AIR DUCTS

A. Exhaust air ducts in ventilated attic spaces or other areas where condensation may occur shall be externally insulated with blanket or board insulation as herein specified for concealed and/or exposed supply and return air ducts.

2.05 INSULATION FOR OUTDOOR DUCTS

A. Ducts installed outdoor whether acoustically lined or not, shall be externally insulated with two (2) layers of one inch (1 ") thick Armaflex® sheet or roll insulation and then finished with a weatherproofing coating; similar to WB Armaflex® Finish.

B. Insulation shall have a thermal conductivity of 0.27 at 75ºF mean temperature; a water vapor permeability of 0.08 perm-in and a water absorption of 0.2% by volume (ASTM C209).

C. Secure insulation with full coverage of Armaflex® 520 adhesive applied to the clean metal surface and the backside of the insulation. Follow manufacturer’s instructions.

D. All joints shall be staggered sealed and tight. Follow manufacturer’s installation instructions.

E. Apply WB Armaflex® Finish system consisting of a uniform coat of Childers Chil-Spray® WB CP-56 Adhesive, followed by a 10 x 10 Leno weave glass mesh. Apply WB Armaflex® Finish over the mesh at a rate of not less than 400 square feet per gallon. Apply the second coat of WB Armaflex® Finish at a rate of not less than 400 square feet per gallon. Follow manufacturer’s instructions to allow for proper curing time between applications.

2.07 CHILLED WATER SUPPLY AND RETURN

A. All chilled water supply and return lines shall be insulated using sectional glass foam having a conductivity no greater than 0.29 at 75°F and a permeability of 0.00 perm.

B. For pipes located in interior areas wall thickness for glass foam insulation shall be 1-1/2" for pipes up to 3" diameter; 2" for pipes 4" and 5" diameter and 2 1/2" for pipes 6" diameter and larger. Insulation jacket shall be UL rated, laminated, white Kraft and aluminum foil with self-sealing lap. Mastic Finish – PITTCOTE® 404 coating reinforced with PC Fabric 79 available from Pittsburgh Corning corporation. Sealant – PITTSEAL® 44N Sealant by Pittsburgh Corning Corporation.

C. For exterior piping; piping in non-conditioned mechanical rooms and other high humidity areas wall thickness for glass foam insulation shall be 2" for pipes up to 3" diameter and 3" for pipes 4" diameter and larger. All exterior piping shall have a weatherproof jacket consisting of 0.016 thick aluminum jacket secured with 1/2-aluminum bands at not greater than 12" on center. Mastic Finish – PITTCOTE® 404 coating reinforced with PC Fabric 79 available from Pittsburgh Corning corporation. Sealant – PITTSEAL® 44N Sealant by Pittsburgh Corning Corporation.

D. Acceptable manufacturer of glass foam insulation is: Pittsburgh Corning "Foamglas".

E. Pipe sizes 1" and smaller may be insulated using flexible expanded elastomeric plastic tubing with a conductivity no greater than 0.253 at 75°F and a maximum vapor barrier transmission of 0.02 perm.

1. Wall thickness shall be 3/4 inch for all pipe sizes.

2. When outdoors, all exposed insulation shall be finished with two coats of a white UV resistant finish paint recommended by the insulation manufacturer.

3. Acceptable manufacturers are: Armstrong Armaflex AP and Rubatex.

2.10 CONDENSATE DRAIN

A. All condensate drains except exterior shall be insulated as follows:

1. Insulate with flexible expanded elastomeric plastic tubing with a conductivity no greater than 0.253 at 75°F and a maximum vapor barrier transmission of 0.02 perm. All seams and joints shall be glued with Armaflex 520 adhesive – no substitutions.

2. Wall thickness shall be 3/4 inch. For all pipe sizes.

3. Acceptable manufacturers are Armstrong Armaflex AP and Rubatex.

B. When outdoors, all exposed insulation shall be finished with two coats of UV resistant white Armstrong Armaflex finish paint.

2.12 REFRIGERANT SUCTION

A. All refrigerant suction lines shall be insulated with not less than 3/4 inch thick flexible expanded elastomeric plastic tubing as manufactured by Armstrong Armaflex®. Insulation to have a K factor of .253 at 75°F mean temperature with a maximum vapor barrier transmission of 0.10 perm. Rubatex is also an acceptable manufacturer.

B. Flexible expanded elastomeric plastic tubing shall be applied preferably by slipping over the ends of pipe or as an alternate by slitting the tubing and applying it around the pipe. Seal all joints and seams with vapor barrier adhesive.

C. Fittings, valves and accessories shall be insulated with oversized tubing or sheets, which overlap a minimum of one inch (1") over adjoining piping.

D. When outdoors, all exposed insulation shall be finished with two coats of UV resistant white Armstrong Armaflex® finish paint unless covered with an aluminum jacket.

2.19 ALUMINUM JACKET

A. Protect all insulated water pipes installed in mechanical room and under-floor with an aluminum jacket cover as herein specified.

B. Use .016-gauge aluminum jacket. The jacket laps and butt strips shall be secured with adhesive and three (3) bands per section.

C. Jacket shall be continuous and include all elbows and fittings. Use preformed covers for elbows and tees.

PART 3 EXECUTION

3.01 GENERAL

A. Insulation shall be applied on clean dry surfaces. Insulation shall start only after pressure testing of duct and pipes has been successfully completed and copies of test reports have been sent to the Architect / Engineer. Failure to follow these procedures may cause the insulation installer to remove and replace insulation at no cost to the contract. Flexible connections shall remain uninsulated until after systems have been started and tested for leaks.

B. Insulation shall be continuous through wall and ceiling openings, sleeves and hangers. Exception will be penetrations of fire rated walls, floors, etc. where requirements of fire stopping materials, Section 23 00 00 Mechanical-General shall apply. Also refer to details on drawings.

C. Insulation shall be applied to piping with all joints tightly fitted to eliminate voids. All joints must be sealed full depth with sealant.

D. Provide galvanized sheet metal shields between pipe insulation and hangers. Shields shall be as specified in Specifications Section 23 20 00.

E. On lines 2 inch and larger, insulated with fiberglass or other soft insulation material, provide an insert of Foamglas insulation between pipe and insulation shield to carry the weight of pipe without crushing insulation. Cover insert with jacket to match adjacent insulation. For cold services, provide vapor barrier.

F. On trapeze hangers, hold down straps shall be 2-piece similar to B-Line Figure B 437. Straps shall not crush insulation and allow for installation of shield between insulation and trapeze.

G. Vapor Barriers: Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous unbroken vapor seal.

H. Hangers, supports, anchors, etc., which must be secured directly to cold services shall be insulated and vapor sealed to prevent condensation.

I. Reinsulate any pipes, hangers, valves and fittings that show signs of condensation.

J. The use of gray duct tape or similar tapes to seal or secure insulation in place is prohibited.

K. Insulation shall not be applied over code stamps, nameplates, inspections stamps and the like.

L. All piping subject to freezing shall be insulated with twice the insulation thickness specified herein for exposed chilled water pipes.

M. All steel pipes shall be painted with rust inhibitor paint prior to applying insulation.

3.03 VALVES, FLANGES AND FITTINGS

A. Insulate with same material and thickness as adjoining pipe, using premolded fittings or mitered segments of pipe insulation. Exposed valve handles subject to condensation shall be completely covered with removable sections of pipe insulation.

B. When using mitered segments of pipe insulation, contractor shall use thicker pipe insulation to assure that the insulation left after all cuttings are made meets minimum thickness specified for the pipe system.

C. Insulate flanges with sectional pipe insulation extending a minimum of 1" beyond the ends of the bolts. Bolt area shall be filled with mineral wool cement.

D. Vapor barrier for cold services shall consist of a layer of open weave glass fabric embedded between two 1/16" thick coats of Benjamin Foster 30-35. Lap glass fabric at least 2" on adjoining insulation.

E. Finish for cold services shall be as hereinbefore specified for the pipe system.

F. For hot services finish with open weave glass fabric adhered and coated with Benjamin Foster 30-36 applied over a coat of finishing cement. Lap glass fabric at least 2" on adjoining insulation.

3.04 EXPOSED INSULATION ON EQUIPMENT-FINISHES

A. All exposed insulation on equipment inside mechanical rooms shall be finished with a white glass cloth. Exposed vapor barriers shall be treated as glass cloth type.

B. All exposed insulation on equipment exposed to the weather shall be finished with a weatherproof jacket consisting of 45-pound asphalt impregnated felts sealed and banded on.

C. Exception to two preceding paragraphs is equipment field insulated with Armaflex® type insulation, which shall be given two (2) coats of WB Armaflex® Finish.

D. Equipment which is factory insulated and painted may remain as furnished unless field painting is required by the Specifications.

E. All exposed field applied insulation on equipment shall be given a finish coat of paint to match manufacturers standard equipment color.

END OF SECTION – 236500

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SECTION 23 73 00 - AIR DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Section. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Section.

1.02 SCOPE

A. Work under this section shall include providing the following:

1. Outside air ducts of galvanized sheet metal construction.

2. Galvanized sheet metal supply and return air ducts, round, oval or rectangular from air handling unit(s) to each terminal air device or flexible duct as shown on plans. Duct construction shall meet system design pressure.

3. Double wall, internally insulated supply and return air ducts at the AHU's for sound attenuation. Internal duct liner to be perforated. Length of lined duct to be as shown on plans. Duct construction shall meet system design pressure.

4. Internally insulated supply and return air ducts at the AHU's for sound attenuation. Length of lined duct to be as shown on plans.

5. Fiberglass duct board for transfer air ducts.

6. Terminal air distribution devices including but not limited to diffusers, grilles, registers and all special air flow control and directing devices. Provide frame for ceiling construction type shown on architectural reflected ceiling plans.

7. Hangers and supports for all duct systems and duct mounted equipment. Provide supplementary steel angles or hangers as required by building structure.

8. When indicated provide security rated air devices, supply and exhaust.

9. Air volume control devices, reheat coils, heating coils, fire dampers, smoke dampers, sound attenuators, balancing dampers and flexible connections to all air moving equipment. Attach to the handle of each balancing damper a two-foot long strip of a bright color tape to facilitate location by Test and Balance technician.

10. Exhaust air systems including inlet air grilles; galvanized sheet metal ducts and fans.

11. Install duct mounted devices being provided under other Sections of the contract documents, such as control dampers, temperature control devices, smoke detectors, etc. Assist in the coordination of such work. Meet and fully comply with manufacturers installation instructions.

12. Labor to pressure test air distribution systems prior to application of insulation. Work shall be done in cooperation with Test and Balance Agency. Refer to Specifications Section 23 95 00 and SMACNA Standards.

13. Labor to operate air distribution systems and make adjustments to achieve complete test and balance in cooperation with work performed under Test and Balance Section 23 95 00 of this specification. Provide dampers, duct extensions and air devices as needed to achieve final comfort conditions as directed by Test and Balance Agency.

14. Assist in the development of coordination drawings for ceiling spaces. Locate air distribution devices and duct systems sharing ceiling space.

15. Access doors in ductwork for access to fire dampers, controls, smoke detectors and as hereinafter specified or indicated on drawings. Demonstrate to owner that such devices can be reached and serviced from the doors as installed. Refer to Specifications Section 23 00 00 Access Doors and Panels.

16. Ductwork indicated on drawings is schematic and shall not be scaled. Duct installer may make changes in duct sizes and/or location as necessary to conform to space conditions without additional cost to the contract. Duct dimensions shown on plans are clear inside dimensions. All field changes shall be noted on as-built record drawings kept at the site.

17. Prepare for field painting all ductwork, related hangers, air devices, etc. as required by the contract documents. Apply primer and/or treatment as specified. Refer to Specifications Section 23 08 00.

18. Stair pressurization system including galvanized sheet metal ducts, dampers and terminal devices.

19. Atrium exhaust system including galvanized sheet metal ducts, damper, fan(s) and terminal devices.

20. When indicated on drawings, reuse existing ductwork and air devices. All new work associated with existing ductwork shall match existing materials, operating pressure and installation.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment

23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. The following codes and standards are to be considered a part of this specification to establish quality of materials and labor.

2010 Florida Building Code.

NFPA 90A-09	Installation of Air Conditioning and Ventilation Systems.
NFPA 90B-09	Installation of Warm Air Heating and Air Conditioning Systems.
SMACNA	HVAC Duct Construction Standards, Metal and Flexible. Third Edition- 2005
SMACNA	Fibrous Glass Duct Construction Standards.- 2003
SMACNA	Fire, Smoke and Radiation Damper Guide.- 2002
SMACNA	HVAC Air Duct Leakage Test Manual.- 2012
SMACNA	HVAC System Duct Design - 2006
UL-181	Air Duct Materials and Air Conditioning.

B. Reference made to the "Manual" shall mean SMACNA Standards as published by The Sheet Metal and Air Conditioning Contractors National Association, Inc. latest edition.

Tables, descriptions and drawings in the Manual show methods of fabrication of items such as ductwork, dampers, louvers and air intakes. These methods shall be followed unless manufactured products are specified for these items.

C. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 23 00 00.

D. Pressure testing of duct systems in accordance with SMACNA Standards is a requirement of these specifications. Refer to Section 23 95 00, Test and Balance for coordination of tests. Submit reports to Architect / Engineer as soon as tests are completed.

1.05 SHOP DRAWINGS

A. Prepare and submit shop drawings for all ductwork and air distribution system components and materials in accordance with the requirements of the General conditions and the manner described therein.

B. Shop drawings shall indicate Specification Section and Paragraph applicable to product. For each duct section indicate operating pressure.

C. Include description of manufacturer’s recommended application and installation procedures if different from these specifications.

D. Fabrication and Erection Drawings

1. Contractor is responsible for the preparation and submission of Fabrication and Erection Ductwork Drawings. Drawings shall be 1/4" scale layouts of all duct systems. Drawings shall indicate dimensions and elevations of complete systems.

   Include dimensions and location of other building systems such as structural members, light fixtures, plumbing lines, pipe mains, cable trays, etc. that may interfere with the installation of ducts. Coordinate work with other installers.

2. Drawings shall include sectional views of congested areas and complete mechanical room layouts of air handling equipment and duct connections. Show flexible connections to equipment and typical hanger details.

3. Drawings shall reflect the dimensions of the equipment being installed under this Division 23. Indicate manufacturer's requirements and clearances for servicing the equipment.

4. For equipment attached to ducts indicate methods of support.

5. For ducts running between trusses, bar joists and other structural members, contractor shall verify clearances before fabricating or ordering ducts. Adjust duct dimensions as required. Coordinate with Architect, Structural Engineer and building structural frame installer in the event that changes to the structural system are required for the installation of ducts and/or equipment.

E. Submit catalog cuts and specification sheets for the following items whenever they are indicated on the contract documents.

Fire Dampers
Smoke Dampers
Flexible Duct
Manufactured Round and Oval Ducts
Acoustical Flexible Duct Liner
Flexible Connections
Duct Construction Standards
Manual Balancing Dampers
Motorized Dampers (May be provided under Specifications Section 23 90 00)
Turning Vanes
Operating and Maintenance Data
Guarantees
Pressure Sensitive Tape
Constant Volume Control
Duct Sealing Materials
Grilles, Registers and Diffusers

F. Submit installation instructions and certified test data for the following devices:

Fire Dampers
Smoke Dampers
Combination Smoke and Fire Dampers
Treatment of galvanized metals to be painted

G. For additional Shop Drawing submission requirements refer to Specifications Division 01 and Section 23 00 00.

PART 2 PRODUCTS

2.01 MATERIALS GENERAL

A. Ductwork

1. Galvanized Steel G-60 Coated Conforming To ASTM A653 and A924 Standards.

2. Fiberglass Duct Board

3. Stainless Steel ASTM-A167

4. Flexible Duct

5. Aluminum ASTM-B209

B. Duct Sealer

1. Water based duct sealant with built-in fiber reinforcement. Provide UV inhibitors for outdoor use.

2. Hardcast VERSA-GRIP 181 or approved equal.

3. Flame spread 25 or lower in dry state.

4. Smoke development 50 or lower in dry state.

5. Products shall be UL 181 A-M listed / UL 181 B-M listed.

6. Refer to Chapter 1-Specifications for Standard Duct Sealing Requirements, of the SMACNA Manual.

2.02 SHEET METAL DUCT SYSTEM

A. Sheet metal ductwork includes but is not limited to:

1. Supply, exhaust, return, and outside air ducts as shown on plans.

2. Construct duct systems in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible, (2005) hereinafter referred to as the "Manual." Tables and figures referenced in these specifications are listed in the 2005 Third Edition of the Manual.

3. Use the Manual Duct Construction Tables for metal gage, reinforcing type, spacing, and method of fabrication. Indicate on shop drawings.

4. Seal all joints as per Chapter 1, Specifications of the Manual. All transverse joints and fitting connections shall be sealed. All "Snap lock" seams to be sealed. Longitudinal seam on the perimeter to be sealed. All screw penetrations shall be sealed. Use sealant as specified herein under Duct Sealer.

Manufactured ducts with factory applied sealants and / or gaskets such as Ductmate Green Duct System do not need to have joints and fittings sealed on site.

5. Duct connections to supply air devices may be flexible ducts where shown on plans; refer to Flexible Ducts section of this specification. Duct connections to exhaust and return air devices to be hard sheet metal ducts.

6. Ductwork shall be fabricated in accordance with Table 1-2 Pressure Classification.

B. Rectangular Ducts shall be fabricated in accordance with the requirements of Chapter 2 of the Manual.

C. Round and oval ductwork shall be constructed in accordance with the requirements of Chapter Three of the Manual. Ducts shall be used whenever the ducts are exposed to view and as shown on the contract documents.

1. Single wall round and oval ducts shall be spiral seam construction or constructed in Accordance with Section 3.1 of Chapter 3 of the Manual. When indicated on the contract documents, smooth longitudinal seam round ducts may be provided.

2. Flat oval Ducts shall be fabricated as per section 3.3 of Chapter 3 of the manual.

3. Use fabricated flanges and collars for the joining of flat oval and round ducts. Flanges and collars as fabricated by Ductmate are acceptable.

4. Round and oval ducts, may be the product of an acceptable manufacturer such as: United McGill, SEMCO, Hamlin Sheet Metal and Lindab.

D. Double wall acoustically lined supply and return air ducts shall be provided whenever indicated on the contract documents. Refer to Chapter 8 of the Manual.

1. Internal galvanized sheet metal liner shall be of the perforated type unless otherwise noted in the contract documents.

2. Perforations in the liner walls shall be 3/32 inch in diameter with an overall open area of 23 percent.

3. Provide certified data on acoustical performance of double wall ductwork upon request.

E. Hangers and Supports

1. Hangers and supports shall be provided in accordance with Chapter 5 of the Manual.

2. Hanger attachment to structure shall be as shown by Fig. 5-1 through Fig. 5-5.

3. Hanger size and spacing shall be as shown by tables 5-1 through 5-3.

4. No explosive powder driven anchors shall be used on concrete structures to support ducts.

F. Fittings and Other Construction

1. Fittings and other construction shall be fabricated in accordance with Chapter 4 of the Manual.

2. Supply, return and exhaust air ducts shall be installed with fittings, dampers, etc. as indicated on Figure 4-1.

3. Radius elbows shall be constructed with a centerline radius of 1.5 times the duct width. Where a smaller radius or square elbows are used provide turning vanes to produce a pressure drop less than that of an elbow with an 1.5 radius. For Rectangular elbows see Figure 4-2 of the Manual.

4. Offsets and Transitions shall be constructed with no side at a greater angle than 30 degrees from duct centerline on contracting flow, and 22.5 degrees maximum on diverging flow. See Fig. 4-7 of the Manual.

5. Connections to diffusers and registers shall be made with collars secured to duct and air devices. Branch ducts shall be fabricated in accordance with Table 2-15 of the Manual.

6. For Divided Flow Branches see Figure 4-5 of the Manual.

7. Branch connections shall be constructed as shown by Figure 4.6 of the Manual.

8. For large Duct support see Figure 5-7 of the Manual.

9. For Riser supports see Figures 5-8 and 5-10 of the Manual.

10. For support from walls see Figure 5-9 of the Manual.

G. Volume Control Dampers

1. Volume control dampers shall be installed on all branch lines; as shown on details on drawings and on Figure 4-1 of the Manual.

2. Dampers shall be fabricated as shown by Figures 7-4 and 7-5 of the Manual. On multi-blade dampers, blades shall be a maximum of 6” wide. For Double Wall Ducts see Figure 8-11 of the Manual.

3. Attach a two-foot long bright color ribbon to each damper handle to facilitate the visual location by the test and balance technician.

H. Turning and Splitter Vanes

1. Turning vanes shall be provided in all square elbows. Splitter vanes shall be provided in all duct offsets larger than 15° and radius elbows.

2. Turning vanes shall be constructed as shown by Figures 4-2, 4-3 and 4-4 of the Manual.

3. Vanes shall be double thickness "airfoil" design, except in ducts 10" or less in depth where single thickness vanes with trailing edges may be used. When elbow inlet-outlet dimensions are not equal provide 1.5-radius elbow.

4. Deleting turning vanes from an elbow is not allowed.

5. Runners with missing vanes are not acceptable.

2.03 OUTDOORS DUCTWORK SYSTEM AND EXTERIOR COMPONENTS

A. Refer to Chapter 6 of the Manual for Exterior Components; installation of Louvers, equipment and exposed duct supports.

B. All ducts exposed to the weather shall be double wall construction, internally insulated and be galvanized sheet metal construction. Duct construction standards shall be in accordance with Chapter 6 of the Manual. All seams and joints shall be sealed watertight.

C. Rectangular goosenecks shall be fabricated in accordance with Figure 6-5 of the Manual. For intake and exhaust ventilators see Figures 6-6, and 6-7 of the Manual.

D. Ducts shall be externally insulated as per Specifications Section 23 65 00.

2.04 ACCESS DOORS – DUCT MOUNTED

A. On ductwork use the largest door size that can be installed up to size 24"x 24" maximum to permit the inspection and servicing of duct mounted devices. Doors shall be as per Figures 7-2 and 7-3 of the Manual.

B. Insulated doors shall be hollow metal type with insulation of same thickness as for adjacent ductwork. Provide gaskets between frame and ducts to assure there are no air leaks. For Double wall Ducts see Figure 8-15 of the Manual.

C. Since the purpose of the access doors/panels is to facilitate access to concealed equipment and other devices, the size of each door/panel shall be determined in the field prior to ordering them. Access door for fire damper service shall allow servicing the damper and fusible link with both hands. Demonstrate to owner that doors as installed provide adequate and safe access to each device or equipment it serves.

D. All doors/panels shall be of the hinged type with easy to open locking devices, unless safety or fire rated assembly considerations require otherwise.

E. Doors/panels that are found by the Architect / Engineer or Owner to be of inadequate size to allow proper access to equipment and other concealed devices shall be promptly replaced at no cost to the contract.

F. Doors/panels that are found by the Architect / Engineer or Owner to be improperly located with relation to the equipment or concealed devices they serve, shall be relocated at no cost to the contract.

G. Refer to Section 23 00 00 for requirements related to ceiling / wall access doors for access to concealed equipment and or devices installed under this Section of the Specifications.

2.05 DAMPER OPERATORS

A. Single blade manual volume damper operators shall be provided with quadrant regulator, damper position indicator and locking device.

B. Multi-leafs volume dampers operators shall be self-locking regulator with damper position indicator.

C. On externally insulated ducts, standoff brackets on all damper handle shafts to be 2” minimum from duct surface.

D. Acceptable manufacturers are: Vent fabrics and Durodyne.

2.06 VIBRATION ISOLATION

A. The intake duct to each fan and the discharge fan duct from each fan shall be broken by a minimum two inch space. Provide a flexible connection of coated 30 oz. glass fabric at least 6" long, which will be inserted in this gap and securely attached to the ductwork so as to make an air-tight connection. These flexible connections shall be slack and shall not be painted. Refer to Figures 7-8, 7-9 and 7-10 of the Manual.

B. Prefabricated insulated flexible duct connector similar to Insulfab may be used in lieu of field-fabricated connector.

C. Where vibration occurs in ductwork while the system is in operation, the installer shall provide such additional stiffening members as are necessary to overcome this vibration. All ductwork where vibration occurs shall be isolated at points of contact with the building by felt pads neatly and securely held in place.

D. Ducts fabricated with fiberglass duct board are exempt from these requirements.

2.07 FLEXIBLE DUCTS

A. Flexible ducts shall be provided where indicated on drawings. Ducts must comply with the latest NFPA Bulletin 90A or 90 B and be listed as Class 1 Air Duct, Standard 181.

B. Flexible ducts whose internal surface exposed to the air flow is treated with an EPA approved antimicrobial are preferred.

C. Liner shall be a trilaminate of aluminum foil, fiberglass and aluminized polyester, all mechanically locked without adhesives.

E. Ducts shall be factory insulated with glass fiber insulation having an installed “R” value of 6; (vinyl) (aluminum) foil vapor barrier jacket; a flame spread rating of 25, and smoke density factor of 50.

F. Radius forming brace that eliminates flex duct kinks and restrictions may be installed at all air devices. Brace to be similar to Titus FlexRight.

G. Ducts shall be rated for 12 inches water gage static pressure applications.

H. The maximum length of flexible ducts to air devices shall be limited to six (6) feet and to one (1) foot to variable volume boxes or similar airflow control devices. Provide externally insulated or double wall round sheet metal ducts of same internal diameter whenever a longer run of duct is required.

I. The maximum length of flexible ducts to air devices shall be limited to four (4) feet or a maximum of 105% of the distance between the two (2) sheet metal connections, whichever is less and shall be limited to one (1) foot to variable volume boxes or similar volume control devices. Provide externally insulated round sheet metal ducts of same internal diameter whenever a longer run of duct is required.

J. Acceptable flexible duct manufacturers are: Flex Master, Genflex, J P Lamborn AMBlue and Thermaflex.

2.08 TAKE-OFF FITTINGS

A. Prefabricated take-off fittings shall be provided at the point of connection of all duct branches and flexible ducts. Also see Figure 4-6 Branch Connections.

B. Fittings shall be 45° entry tap type. They shall be galvanized steel, welded construction, designed to meet system pressures. Fittings shall have integral dampers with lockable handle to indicate position on damper quadrant. On insulated ducts provide damper extension.

C. Damper components shall be factory assembled, using spring loaded, retractable bearing and positive locking regulator damper hardware.

D. When flexible or round sheet metal duct diameter equals or exceeds available duct dimensions at point of connection to main or branch ducts, use eccentric take-off fittings similar to Flexmaster Type STO, Sheet Metal Connectors, Inc. Series H.E.T., or Crown Series 3300. For other applications refer to Crown Models 305, 306, 308 and 309.

E. Straight tap fittings are not acceptable.

F. The use of bell mouth or spin-in type fittings for small size round ducts is subject to Engineer’s review and approval prior to bid time.

2.09 REGISTERS, GRILLES AND CEILING DIFFUSERS

A. By "register" is meant a face together with the box and dampers. By "grille" is meant the face only. All dampers in supply air registers shall be opposed blade type.

B. All air distribution devices shall be the product of the same manufacturer unless otherwise noted.

C. Maximum permissible sound level of all air supply, return or exhaust air devices shall not exceed those of the air devices used as the basis of design. Air devices producing objectionable sound levels shall be replaced at no cost to the contract.

D. Ceiling supply diffusers shall have dampers, distribution grids and, where necessary, approved type baffles. Provide square to round adapters when required for connection to round flexible ducts.

E. The size and airflow capacities of air distribution devices are indicated on the drawings.

F. Select each air distribution device to meet the indicated sound level criteria, air velocities and distribution pattern for every area.

G. Where a transfer air duct is specified a register shall be installed at the inlet side and a grille at the outlet side. Refer to details on the drawings for various configurations.

H. Light Troffer diffusers shall be galvanized steel construction with side inlet connection. Diffuser shall attach quickly and easily to the fluorescent light fixture. Diffusers shall be field insulated. Coordinate with light fixture supplier before ordering diffusers. Diffusers may be single or double (saddle) as indicated on plans.

I. The mounting height of wall registers, linear diffusers and/or grilles measured from the floor and its exact location shall be coordinated with the Architect. The bottom elevation of all air handling devices installed on exposed ducts shall be as directed by the Architect.

J. Provide frames as required for the installation of the air devices on the ceiling or wall construction indicated on the architectural and reflected ceiling plans. See Figures 7-6 and 7-7 of the Manual.

K. Do not support air devices connected to flexible ducts from ceiling tiles. Provide additional supports from building structure attached directly to the ceiling grid.

L. Acceptable manufacturers are: Titus, Carnes, Metalaire and Price.

2.10 FIRE DAMPERS

A. Fire dampers shall be installed where shown on drawings and as required by the authorities having jurisdiction. Dampers shall be UL labeled and tested in accordance with ASTM E-152 and NFPA 252.

B. All dampers shall have the blades out of air stream. Fusible links shall be rated for 165ºF unless otherwise noted.

C. Horizontally mounted dampers in vertical ducts shall be spring-loaded for horizontal installation.

D. Dampers shall be installed as per instructions provided by the damper manufacturer that comply with their listing and as shown in the SMACNA Fire Damper and Heat Guide.

E. Acceptable manufacturers are: Nailor, Prefco, Greenheck, Ruskin, Advanced Air and Air Balance.

2.15 OUTSIDE AIR FLOW MEASURING STATION

A. Provide dedicated airflow measuring station(s) to control the operation of motorized outside air dampers. Stations to be installed at locations shown in the contract documents. Coordinate with installer of Energy Management System, Specifications Section 23 90 00.

B. Controller outputs shall be true analog output signals. Pulse width modulation outputs are not acceptable. The CU's shall include the capability to control via simple proportional (P) control, proportional plus integral (PL), proportional plus integral plus derivative (PID), and on-off. The airflow control programs shall be standard factory tested programs that must be fully coordinated with the project control's installer; refer to Section 23 90 00 and control diagrams in the contract documents.

C. Station(s) shall measure airflow by the Pitot tube traverse method. Each station shall consist of a network of static and total pressure sensors, positioned to produce an equalized velocity pressure. The measured velocity pressure when converted to air flow (CFM) shall have an accuracy within 2 percent of the full scale throughout the velocity range from 700 to 4000 fpm. Refer to Specifications Section 23 95 00 for coordination with Test and Balance Agency.

D. Station(s) installation shall meet the manufacturer's minimum requirements and shall not amplify the sound level within the duct. The maximum resistance to air flow shall to exceed 0.3 times the velocity head for the duct stations and 0.6 times the velocity head for the fan stations. The station(s) shall be suitable for continuous operation up to a temperature of 250ºF.

E. Airflow measuring stations casing shall be 16-gauge sheet metal with an aluminum finish. The air straightening section to have an open face of not less than 97 percent and a total and static pressure sensing manifold made of copper. All inter connecting tubing shall be internal to the unit with the exception of one total pressure and one static pressure meter connection.

F. Basis of Design is Air Monitor. Option: Combination damper/air monitor similar to Ruskin Model I AW50 is acceptable.

2.16 MOTORIZED OUTSIDE AIR INTAKE DAMPER

A. Provide at indicated outside air intake ducts a motorized low leakage damper to control the amount of outside air as scheduled on contract documents.

B. Damper(s) shall consist of an aluminum frame designed to provide maximum area for lowest pressure drop performance. The damper blades shall be heavy gauge aluminum airfoil type with neoprene blade edge seals. Jamb seals shall be flexible metal compression type. Linkage shall be concealed out of the air stream and located within the damper frame to reduce pressure drop and noise.

C, Damper motors shall be low voltage or DDC as required by the air conditioning system control's installer. Damper motors by BELIMO are preferred; submit other manufacturers for review prior to bid time.

D. Outside air dampers to be controlled through either a dedicated time clock or a control program depending on the air conditioning system control's and sequence of operations. Refer to Section 23 90 00 and contract documents. When indicated for VAV systems, provide an Air Monitor to modulate outside air damper.

E. Dampers shall be AMCA tested for leakage. Submit test data with shop drawing.

F. Submit shop drawings for review.

PART 3 EXECUTION

3.00 COORDINATION

A. Installation of ductwork may commence as soon as building roof installation is completed and no water intrusion is expected. Ducts subject to water intrusions shall be covered with plastic sheeting. Ducts that are found to be holding water, show signs of corrosion or develop mold shall be promptly replaced at no cost to the contract; cleaning is not an option. Contractor shall be responsible for any testing and cleaning of such ducts if so directed by the Owner and the Architect / Engineer.

B. Contractor's failure to commence duct installation in a timely manner may result in changes to duct routing, dimensions and configuration due to conflicts with the work of other trades. Contractor is responsible for all costs associated with those changes including engineering costs incurred by the Design Professional and the resubmittal of contract documents to the authority having jurisdiction.

C. Ducts to be installed inside trusses (wood or steel) shall preferably be round, single or double wall construction. No ducts shall be fabricated before sheet metal duct installer coordinates clearances with manufacturer of trusses and contractor for general construction. VAV boxes, duct heaters, fans and similar equipment may not be installed inside truss space unless trusses are modified to allow service and removal space as required by Code.

D. Ducts exposed to view within the building shall be double wall round or oval construction and be painted. Refer to Specifications Section 23 08 00 for requirements regarding field painting of exposed ducts.

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install all system components such as air devices, dampers, boxes, electric duct heaters, etc. in accordance with manufacturer's installation instructions. Maintain clearances required by Code for access to electrical components.

B. Install duct mounted devices furnished by owner and other trades, such as smoke detectors, control dampers, instrumentation, etc. Comply with manufacturers installation instructions.

C. Ductwork, diffusers, registers, grilles and other components of the air distribution system shall not be supported by the ceiling or from its suspension system.

D. Air handling equipment and fans shall not support the weight of the ductwork and its accessories. Provide additional supports to the floor and/or building structure to relieve such weight.

E. Set air handling equipment level and aligned with associated ductwork. Do not use the flexible connectors as a method to correct misalignments. Provide additional duct hangers / supports as needed.

F. Provide suitable duct transition(s) and required straight length of ducts for proper installation of electric duct heaters. Transitions must be gradual (15º) and not acute. Follow duct heater installation instructions.

G. Coordinate location of air distribution devices, wall caps, roof caps and louvers with electrical, architectural fire protection and plumbing work. The bottom elevation of exposed ducts shall be coordinated with lights and the Architect.

H. All damper motors or actuators shall be fully accessible. Provide extension shafts if required. Provide access doors on ducts to observe operation of motorized dampers. Test and balance report to include verification of damper operation.

I. Surface of ducts and accessories that need to be field painted must be left clean, free of oil and grease and properly prepared to accept paint. Failure to properly prepare duct surface may cause paint to peel and this installer will be responsible for repainting at no additional cost to the contract. Refer to Specifications Section 23 08 00.

J. Paint inside of ducts visible through air distribution devices with one coat of flat black paint.

3.02 DUCTWORK INSTALLATION

A. Install ductwork in accordance with applicable recommendations of SMACNA Manual and as herein specified.

B. Provide hangers, reinforcing and supports in accordance with applicable sections of the SMACNA Manual.

C. Unless otherwise noted duct dimensions shown on drawings are clear inside dimensions. Overall dimensions of installed ducts shall reflect allowances for acoustical lining, etc.

D. Contractor may change duct dimensions to meet field conditions. Verify clearances allowed by roof trusses, bar joists and other structural elements before fabricating ducts. Record changes on as-built record documents. Maximum allowed width to height ratio shall be 4 to 1.

E. Drawings do not show all transitions and offsets which may be required to meet field conditions. Provide them as required for a complete system.

F. Conceal all ductwork in finished spaces unless otherwise indicated.

G. Duct turns located near a fan discharge shall always be in the direction of fan rotation. Coordinate fan section with equipment supplier to assure this condition is met. Improperly selected fan configurations shall be replaced or rotated in the field at no cost to the contract.

H. Assemble rectangular, round and flat-oval ductwork as follows:

1. Use approved duct sealer applied to joints, couplings, etc. surfaces must be clean, free of moisture, and contamination and foreign matter follow manufacturer's instructions. Follow sealer manufacturer recommendations.

2. Isolate dissimilar metals with elastomeric sealant tape or fiber gaskets, and gaskets and washers for bolts.

3. When using pre-sealed manufactured ducts; follow duct manufacturer installation instructions. Keep copy of instructions at the construction site.

I. Make all duct connections from hoods, openings, etc.

J. Blank-off with 20-gauge galvanized sheet metal all unused portions of louvers. If visible through louver, sheet metal plate shall be painted; color to be flat black. Blank-off plates shall be insulated to prevent condensation.

3.03 FLEXIBLE DUCTS

A. Flexible duct installation shall follow requirements Section 3.5 of Chapter 3 of the Manual.

B. In order not to exceed the maximum length of flexible duct allowed by this specification, installer shall provide the necessary length of equivalent diameter round sheet metal duct required for the installation.

C. Duct shall be installed with an inside bending radius equal to its inside diameter. Provide minimum of one hanger for short sections of duct less than 5 feet.

D. All flexible duct terminations to be secured with galvanized metal bolted draw band. Secure with a minimum of three sheet metal screws after band is tight. Seal cut ends of insulation with approved tape.

E. Terminal devices connected by flexible ducts shall be supported independently of the flexible duct.

3.04 TAKE-OFF FITTINGS

A. Install components in accordance with manufacturer's installation instructions.

B. Provide a bead of duct sealer compound around duct opening before installation of fittings.

C. Fittings shall not be installed back-to-back or adjacent to each other. Provide a minimum of four feet (4') between branch take offs.

3.05 PERFORMANCE LEAK TESTS

A. All ducts regardless of operating pressures shall be leak tested as per SMACNA HVAC Air Duct Leakage Test Manual. Tests shall be conducted under the supervision of the project's Test and Balance Agency, refer to Specifications Section 23 95 00. The tabulated test results shall be submitted to the Architect / Engineer.

B. Duct Testing – Pressure testing of all ducts shall meet the requirements of the Duct Leakage Class 12 for rectangular metal and oval ducts and Duct Leakage Class 6 for round metal ducts. Use the "Leakage Factor F" values for a nominal 3" W.G. duct pressure.

Exceptions:

1. VAV systems supply air ducts: Test supply air ducts from AHU's to point of connection to VAV box. (Box not included.) Downstream of boxes, ducts to be sealed (Class B) but do not need to be pressure tested.

2. Ducts operating above 3" S.P. are identified on plans. Use Seal Class "A" and Leakage Class "6" for rectangular ducts and Class "3" for round ducts.

When calculating leakage as an allowable percentage of leakage, comply with Appendix "A" of the SMACNA Leakage Test Manual.

B. Air flow leakage limits:

1. For square and rectangular ducts up to 2" w.g. operating static pressure ESP – 2% leakage.

2. For ducts above 2"w.g. ESP – 1.6% leakage.

3. For round or oval duct up to 2"w.g. operating pressure ESP – 1% leakage.

4. For round or oval ducts above 2"w.g. ESP – 1.6% leakage.

C. When required to facilitate progress of work, sections of ductwork may be tested. Each section shall overlap previous one by at least one duct joint. Do a final test when ductwork system installation is completed.

D. Use portable pressure blower to supply air for tests.

E. Coordinate with duct insulator. Insulation of ducts cannot proceed until pressure test has been satisfactorily completed.

3.06 DUCT HANGERS AND SUPPORTS

A. All ducts shall be hung and supported in accordance with Chapter 5 of the Manual. Spacing between hangers shall not exceed the maximum values shown on indicated tables.

B. Provide additional hangers as necessary for the proper support of inline fans, fan power boxes, duct heaters, variable volume boxes, control dampers and similar equipment.

C. Installer shall be familiar with building structure and provide additional steel members as required for the proper support of ducts, fan power or VAV boxes in-line fans, duct heaters or and similar equipment.

D. Welding or cutting of building structural members is prohibited unless contractor has the written approval of a structural engineer.

E. All supports shall be from the building structure. Supports connected to a metal deck system are not acceptable unless approved by a structural engineer. On concrete structures, drill and set in place expansion anchors for duct hangers such as Red Head or Tapcons. The use of impact or explosive powder driven anchors is not acceptable.

F. Provide additional hangers on both sides of ducts penetrating fire rated walls. Hangers shall be located within 18" of wall. No ductwork shall be supported from any fire rated wall.

F. On insulated ducts, hangers attached directly to the ducts shall be covered by insulation.

3.07 FIRE AND SMOKE DAMPERS

A. Penetrations of fire rated assemblies shall be protected as indicated in Specifications Section 23 00 00 and as shown on drawings. Fire rated assemblies are indicated on the Architectural drawings.

B. Install fire, smoke and combination fire/smoke dampers in strict accordance with manufacturers published instructions. Installation shall meet requirements of the UL test and listing. Also refer to Figure 8.1 of the Manual.

C. The perimeter of smoke damper sleeves angles shall be sealed with an approved, listed caulking that meets the requirements of the assembly.

3.08 DUCT OPENINGS

A. Provide 20 gauge galvanized sheet steel flange section attached to duct so that no exposed cut section of wall or ceiling is visible after ductwork is in place. Where ducts are externally insulated attach metal flanges after insulation is applied.

B. Coordinate the location and size of all floor, wall and roof openings with other trades.

3.09 DRAFT STOPS

A. Install draft stops to seal openings in floors around the ductwork. Draft stops shall be fabricated of 16 gauge galvanized sheet steel, neatly and securely fastened to the ductwork and building construction.

B. Pack opening between duct and opening with fire safing insulation before angle frame is installed on both sides of opening.

3.11 CLEANING

A. As installation of ductwork progresses, remove temporary interior braces put in place during erection.

B. All scraps of metal and insulation and other debris shall be removed from interior of ducts.

C. Remove all grease and dust from exterior of ducts prior to installation of insulation.

D. Paint inside of ducts visible through air distribution devices with one coat of flat black paint.

E. At completion of work prior to final acceptance, clean interior of all work installed under this section.

F. Provide temporary covers wherever open ends of ducts are going to be exposed during extended period of time during construction. Provide disposable filter media (MERV 8 efficiency) over return air and exhaust outlets when air conditioning system is used during construction.

G. Refer to Specifications Section 23 00 00 for protection and cleaning requirements applicable to the use of air conditioning systems during construction.

3.12 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and recommended by manufacturer for the proper maintenance or removal of equipment.

B. Coordinate ductwork installation with other trades to prevent conflicts with conduit, pipes, ceiling hangers, etc.

C. Notify contractor for general construction when work by other trades needs to be relocated.

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SECTION 23 75 00 – AIR TERMINAL UNITS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting, or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract

1.02 SCOPE

A. Work under this section shall include providing the following:

1. Indicated variable volume boxes with electric heaters.

2. Indicated fan power variable volume boxes with electric heaters.

3. Indicated dual duct variable volume boxes.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. The following codes and standards are to be considered a part of this specification to establish

quality of materials and labor.

NFPA 90A	Installation of Air Conditioning and Ventilation Systems.
SMACNA	HVAC Duct Construction Standards, Metal and Flexible.
SMACNA	Fibrous Glass Duct Construction Standards.
ARI	STANDRD 880 - Boxes shall be certified and stamped.
ASHRAE	Standard 36
UL	181

B. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

C. Boxes shall be UL listed and ARI-880 certified.

D. A central energy management system is specified; therefore the box manufacturer shall coordinate control requirements with BAS installer. VAV box manufacturer shall receive and mount the temperature control's actuator and direct digital controller for each VAV box. Cost of installing controls shall be included with cost of boxes. Control assembly shall be factory tested.

1.05 SHOP DRAWINGS

A. Submit catalog cuts and specification sheets for the following items whenever they are indicated on the contract documents.

Fan Power Variable Air Volume Boxes (FVAV)
Variable Volume Boxes with or without Electric Heaters Pressure Independent (PIP/E)
Variable Volume Box with Electric Heaters Pressure Dependent (PDP)
Dual Duct Variable Volume Box

PART 2 PRODUCTS

2.01 VARIABLE VOLUME BOX (PIP/E)

A. Provide medium velocity pressure independent terminal boxes of the single duct type. When indicated and scheduled on plans provide integral UL listed electric heater as indicated on plans. Boxes performance and capacities to be as shown on plans and as herein specified. Boxes to have single point power connection and internal low voltage power transformer.

B. Boxes to consist of fully insulated corrosion resistant all aluminum or galvanized sheet metal double wall casings; sound attenuators filled with mineral wool; and self-balancing air volume regulator. Insulation shall meet smoke and fire ratings as specified in NFPA 90A and UL 181.

C. Boxes to have inlet and outlet collars for connection to duct systems. Provide accessible calibrated dials to permit accurate field adjustment of maximum air volume.

D. A hinged, quick-opening, service panel shall give access to the regulator. Leakage through casing shall not exceed 3% of design volume when operating with 6" WC system pressure upstream and 1" WC system pressure downstream of the volume regulator.

E. Volume regulators shall be of the electronic type with instantaneous compensation for system

static pressure fluctuations, completely independent of the volume setting mechanism. Regulators shall be furnished by the Energy Management System contractor and installed by the box manufacturer. Cost of installation shall be included in box price.

F. The regulator shall be guaranteed, by actual airflow test, to maintain ±5% of constant set-point volume under all conditions of varying inlet static pressures between minimum and 2" WC. Temperature regulation shall be provided by external 4 to 20 milliampere signal.

G. The box manufacturer shall furnish certified sound power levels for both discharge sound and casing radiated sound, tested in accordance with ASHRAE Standard 36.

H. The tests shall be conducted in an approved ADC sound facility. The data shall include the second through sixth octave bands for all box sized and inlet static pressures of WC for medium pressure units. All attenuation factors shall be clearly defined.

I. The boxes operation and controls shall be coordinated with and approved by the installer of the automatic temperature control system to assure proper system control and operation. Provide required temperature sensors to detect supply air temperature and allow boxes to automatically change from cooling to heating mode of operation and vice versa.

J. Acceptable manufacturers are: Titus, Carnes, Metal Aire, Enviro Tech. and Trane.

PART 3 EXECUTION

3.01 GENERAL

A. Install boxes in accordance with manufacturer's installation instructions. Hangers shall not interfere with access to control panels, electric heaters and other box components. Provide extended supports as required.

B. Boxes shall not support the weight of ductwork and accessories. Provide additional supports to the building structure as required to relieve such weight.

C. Set all equipment properly leveled and aligned with associated ductwork. Do not use the flexible connectors as a method of correcting misalignments or support of any equipment or duct weight.

D. All damper motors or actuators shall be mounted to be fully accessible. Provide extension shafts if required.

E. When required by box manufacturer for access to box components and or test and balance work, contractor to provide necessary access door in ducts or boxes.

3.02 EQUIPMENT DEMONSTRATION

A. Prior to final acceptance, test, and operate in presence of engineer and representative of owner each box and its accessories.

B. If test shows defects, replace defective work or material.

C. Repeat tests until defects are eliminated.

3.03 EQUIPMENT AND PRODUCT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other listed manufacturers, shop drawing data shall indicate equal or better performance characteristics as the specified equipment and/or product.

3.04 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and recommended by box manufacturer for the proper maintenance or removal of equipment.

B. Coordinate with other trades so no conduit, pipes, ceiling hangers, etc. interfere with the required clearances.

C. Notify contractor for general construction when work by other trades interferes with box clearances and needs to be relocated.

END OF SECTION – 237500

SECTION 23 83 00 – COMPUTER ROOM AIR CONDITIONERS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting, or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE

A. The work under this section shall include furnishing all labor, materials, tools, appliances and equipment, and performing all operations necessary for the complete installation of computer room type air conditioning equipment as shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 90 00 Direct Digital Controls
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. Each piece of equipment shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to it.

B. Capacities shall be not less than those indicated on plans.

C. Provide certified sound and/or fan data as hereinafter specified and upon request from the Architect / Engineer.

D. All insulation used on equipment shall meet NFPA-90A flame spread and smoke generation requirements.

E. In each air conditioning unit, the coil and filter sections shall be completely sealed to prevent air bypass around coil and filters.

F. Units shall be UL or ETL listed.

G. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

H. Basis of design is Data Aire. Other acceptable manufacturers are: Liebert and Airflow.

1.05 SHOP DRAWINGS

Computer Room Air Conditioning Unit
Condensing unit

PART 2 PRODUCTS

2.01 COMPUTER ROOM AIR CONDITIONING UNIT (DX)

A. Provide computer room air conditioning unit(s) of size, type and performance as indicated on the unit schedule and as herein specified. Units shall be ARI certified per Standard 430.

B. The computer room air conditioning unit shall be self-contained factory assembled unit. The system shall have a total specified cooling capacity and a total specified high sensible cooling capacity. Electrical power shall be as specified in Section 16000 of the Project Manual.

C. The units shall be run tested prior to shipment and designed for the following air pattern: Down discharge.

The units shall be designed for draw through air arrangement to insure even air distribution over the entire face of the coil.

D. Unit frame shall be constructed of welded tubular steel and coated with a heavy corrosion inhibiting finish. All internal parts shall be of high-grade steel and shall be coated and sealed for protection against corrosion. The unit shall have complete front and side access by means doors with heavy-duty hinges. The doors shall be lined with one-inch thick, 1 1/2-pound density fiberglass insulation with a neoprene coating. Each door shall be provided with quickly removable latches for easy access and a polyurethane gasket to prevent air leakage.

E. Bypass air shall be provided around the cooling coil to preclude saturated air from being distributed to other equipment in the controlled space. The cooling coil shall sit in a stainless steel drain pan. Drain pan shall meet IAQ Standards for minimum or no water retention.

F. Evaporator Section – DX

1. The unit evaporator section shall include the cooling coil, compressors, humidifier, reheat coil, filters, and controls.

2. The cooling coil shall be in a cross-circuited or interlaced "A" frame arrangement to allow maximum coil surface. The large faced coil area shall be copper tube with corrugated aluminum fins. Maximum face velocity shall not exceed 500 feet per minute.

3. The expansion valves shall be of the adjustable thermostatic type with external equalization.

4. The compressors shall be hermetic scroll or semi-hermetic type, with overload protection on all three power lines, internal thermostat for winding protection, anti-slug device, crankcase heater, sight-glass, and low pressure override timer for positive starting at low temperatures. The filter drier shall be of the flare fitting type for non-torch servicing. The circuit shall contain high and low pressure safety switches. The high and low-pressure safety switches shall be installed with shraeder type fittings with valve core.

G. The evaporator fan blower shall be a belt driven centrifugal type, double width, double inlet, statically and dynamically balanced at the factory as a complete assembly. The blower wheel shall be supported on a heavy steel shaft having self-aligning ball bearings with a minimum life span of 100,000 hours. The fan motor shall be set on an adjustable slide base. The drive motor shall be 1750 rpm. The drive package shall be belt driven and variable pitch sheave sized for 200% of the fan motor horsepower. The blower shall be located to evenly draw air over the coil to insure even air distribution and maximum coil performance.

H. The filter section shall be an integral part of the unit.

1. The pre filters shall be two-inch (2") deep pleated design, MERV 8.

I. The reheat coil shall be of the finned enclosed, sheath type, fabricated of stainless steel core sheath with plated fins to withstand moist conditions. The reheat shall be installed on the air discharge side of the cooling coil and shall have not less than three (3) stages.

J. The unit shall be provided with steam generator type humidifier. The steam generating humidifier shall be of the self-contained disposable cylinder type with electronic controls. The capacity shall be adjustable from 10 to 30 pounds per hour. The humidifier shall discharge pure steam with no material dust carry-over and have a self-regulating automatic flush cycle. Cylinders shall be disposable not requiring cleaning or maintenance. The humidifier fill level, water conductivity and flush rate shall automatically adapt, both in frequency and duration, to variations in the incoming water.

K. Control Panel

1. The unit shall be furnished with a microprocessor based control panel. The panel shall include unit-switching functions and display normal functions, malfunctions, and service diagnostics on a 2 row, 80 character, back-lit liquid crystal display (LCD) in a clear vernacular format. The panel shall allow recall and display of the high and low

temperature for the last 24 hours, high and low humidity for the last 24 hours, current percent of capacity and average percent of capacity for the last hour of operation for cool 1, cool 2, reheat, humidification, and dehumidification, component runtimes for fan motor, reheat, humidification, and dehumidification. Programming shall have multilevel password access to prevent unauthorized access.

2. Programming shall be accomplished entirely from the front of the unit without the need to access, set, or program switches inside the unit (front door of unit does not need to be opened). Programmable functions shall be entered on non-volatile EEPROM to insure program retention should power fail. The historical database shall be maintained by battery back-up. Multiple messages shall be displayed by automatically scrolling from each message to the next.

3. Alarm conditions, in addition to being displayed, shall enunciate an audible alarm. A summary alarm relay shall be available for remote alarms.

4. Additional test or service terminal shall not be required for any functions.

5. The control shall include temperature anticipation, moisture level humidity control and automatic flush cycles.

6. An alarm condition shall continue to be displayed until the malfunction is corrected. Multiple alarms shall be displayed sequentially in order of occurrence and only those alarms, which have not been acknowledged, shall continue to sound an audible alarm. The Data Alarm Processor-II panel shall perform an automatic self-test on system start-up. A user accessible diagnostic program shall aid in system component trouble shooting by displaying on the unit LCD screen the name of the controlled item, output relay number, terminal plug and pin number for each controlled item.

7. The following automatic control functions shall be included:

Selectable Control Type	Start Time Delay
Temperature Anticipation	Sequential Load Activation
Humidity Anticipation	Dehumidification Lockout
Compressor Short Cycle	Automatic Reheat Element Rotation
Automatic or Manual Restart	

8. The following conditions, data and normal functions shall be monitored and displayed:

Temperature Setpoint	Humidity Setpoint
Current Temperature	Current Humidity
Cooling 1, 2, 3, 4*	Dehumidification
Reheat	Current % of Capacity Utilized
Humidification	Current Discharge Temperature*

9. The following switching and control functions shall be included:

System On/Off Switch	Menu Selection Button
Menu Exit Button	Select Button
Alarm Silence Button	Program Set Button
Manual Override for:	
Blower; Cool 1, 2; Heat 1; Humidification	

10. The following historical data shall be available:

High Temperature Last 24 Hours	Low Temperature Last 24 Hours
High Humidity Last 24 Hours	Low Humidity Last 24 Hours
Alarm History (Last Ten Alarms)	Equipment Runtimes
Average % of Capacity	

11. The following alarm functions shall be monitored and displayed when they occur in addition to enunciating an audible alarm:

High Temperature Warning	Low Temperature Warning
High Humidity Warning	Low Humidity Warning
Compressor 1 High Pressure	Compressor 2 High Pressure
Compressor 1 Low pressure	Compressor 2 Low Pressure
Under Floor Water Detected	No Air Flow
Dirty Filter	Humidifier Failure
Manual Override	Compressor Short Cycle
Low Voltage Warning	Power Failure Restart
Temperature Sensor Failure	Humidity Sensor Failure
Maintenance Required	Person to Contact on Alarm*
Custom Message*	Local Alarm*
Firestat Tripped	Smoke Detected*
Discharge Air Sensor Failure*	Fan Motor Overload*

12. The following functions shall be programmable:

Temperature Setpoint (65-85° F, 18.3-29.4° C)	Humidity Setpoint (30-70% RH)
Temperature Deadband (± 1-5° F/C)	Humidity Deadband (1-15% RH)
High Temperature Alarm Limit	High Humidity Alarm Limit
Low Temperature Alarm Limit	Low Humidity Alarm Limit
Mode & Stage Response Time	Compressor Lead/Lag Sequence
Reset Equipment Runtimes	Audio Alarm Mode
Manual Diagnostics	Compressor Short Cycle Alarm
Compressor Supplements to Energy Saver*	Define Password

Humidifier Autoflush Timer	Firestat Temperature Alarm Limit
Scheduled Maintenance	Temperature Scale
Control Logic	Calibrate Temperature Sensor
Calibrate Humidity Sensor	Water Valve Mode
Low Discharge Temperature Alarm Limit*	Message for Optional Alarm Limit*
Delay for Optional Alarms	Remote Alarm 1, 2, 3 Selection*
Person to Contact on Alarm	Automatic Self-Test
Humidity Anticipation	Dehumidification Mode
Power Problem or Restart Mode	Calibrate Discharge Air Sensor*
Reheat Stages	Humidifier

13. * Some of the programmable selections, displays, or alarms may require additional components or sensors.

M. Units with tandem hermetic scroll compressors shall have two-step modulation for stage control. Each circuit shall contain two scroll compressors. Modulation shall allow one or both compressors (per circuit) to run depending upon the load of the system, resulting in part-load efficiency equal to full load efficiency.

N. Units shall be provided with hot gas bypass. The hot gas bypass valve shall be installed between the compressor discharge line and the leaving side of the expansion valve through a side outlet distributor. The system with the evaporator under full load shall maintain pressure on the leaving side of the hot gas bypass valve to keep the valve port closed. Should the load on the evaporator decrease to the point where the coil is below the desired setting, the pressure on the discharge of the hot gas bypass shall put pressure on the diaphragm overcoming the spring pressure of the seat allowing some hot gas to mix with the normal liquid discharge of the expansion valve raising the evaporator pressure.

2.02 COMPUTER ROOM AIR CONDITIONING UNIT (CHILLED WATER)

A. Provide computer room air conditioning unit(s) of size, type and performance as indicated on the unit schedule and as herein specified. Units shall be ARI certified per Standard 430.

B. The computer room air conditioning unit shall be self-contained factory assembled unit. The system shall have a total specified cooling capacity and a total specified high sensible cooling capacity. Electrical power shall be as specified in Division 26 of the Project Manual.

C. The units shall be run tested prior to shipment and designed for the following air pattern: Top Discharge with Plenum.

The units shall be designed for draw through air arrangement to insure even air distribution over the entire face of the coil.

D. Unit frame shall be constructed of welded tubular steel and coated with a heavy corrosion inhibiting finish. All internal parts shall be of high-grade steel and shall be coated and sealed for protection against corrosion. The unit shall have complete front and side access by means doors with heavy-duty hinges. The doors shall be lined with one-inch thick, 1 1/2-pound density fiberglass insulation with a neoprene coating. Each door shall be provided with quickly removable latches for easy access and a polyurethane gasket to prevent air leakage.

E. Bypass air shall be provided around the cooling coil to preclude saturated air from being distributed to other equipment in the controlled space. The cooling coil shall sit in a stainless steel drain pan. Drain pan shall meet IAQ Standards for minimum or no water retention.

F. Evaporator Section – Chilled Water

The chilled water coil shall be in an "A" frame arrangement to allow maximum coil surface in a small cabinet. The large faced coil shall be constructed with ½" O.D. copper tube with 12 fins per inch of corrugated aluminum. Chilled water flow shall be controlled by a 3-way modulating valve for accurate and economical temperature control and dehumidification. Air bypass shall be provided to prevent saturated air from being introduced into the conditioned space.

G. The evaporator fan blower shall be a belt driven centrifugal type, double width, double inlet, statically and dynamically balanced at the factory as a complete assembly. The blower wheel shall be supported on a heavy steel shaft having self-aligning ball bearings with a minimum life span of 100,000 hours. The fan motor shall be set on an adjustable slide base. The drive motor shall be 1750 rpm. The drive package shall be belt driven and variable pitch sheave sized for 200% of the fan motor horsepower. The blower shall be located to evenly draw air over the coil to insure even air distribution and maximum coil performance.

H. The filter section shall be an integral part of the unit.

1. The pre filters shall be two-inch (2") deep pleated design, MERV 8.

2. The final filters shall be four-inch(4") MERV 11.

I. The reheat coil shall be of the finned enclosed, sheath type, fabricated of stainless steel core sheath with plated fins to withstand moist conditions. The reheat shall be installed on the air discharge side of the cooling coil and shall have not less than three (3) stages.

J. The unit shall be provided with steam generator type humidifier. The steam generating humidifier shall be of the self-contained disposable cylinder type with electronic controls. The capacity shall be adjustable from 10 to 30 pounds per hour. The humidifier shall discharge pure steam with no material dust carry-over and have a self-regulating automatic flush cycle. Cylinders shall be disposable not requiring cleaning or maintenance. The humidifier fill level, water conductivity and flush rate shall automatically adapt, both in frequency and duration, to variations in the incoming water.

K. For units installed on a raised floor, refer to water detection paragraph this section.

L. Control Panel

1. The unit shall be furnished with a microprocessor based control panel. The panel shall include unit-switching functions and display normal functions, malfunctions, and service diagnostics on a 2 row, 80 character, back-lit liquid crystal display (LCD) in a clear vernacular format. The panel shall allow recall and display of the high and low temperature for the last 24 hours, high and low humidity for the last 24 hours, current percent of capacity and average percent of capacity for the last hour of operation for cool 1, cool 2, reheat, humidification, and dehumidification, component runtimes for fan motor, reheat, humidification, and dehumidification. Programming shall have multilevel password access to prevent unauthorized access.

2. Programming shall be accomplished entirely from the front of the unit without the need to access, set, or program switches inside the unit (front door of unit does not need to be opened). Programmable functions shall be entered on non-volatile EEPROM to insure program retention should power fail. The historical database shall be maintained by battery back-up. Multiple messages shall be displayed by automatically scrolling from each message to the next.

3. Alarm conditions, in addition to being displayed, shall enunciate an audible alarm. A summary alarm relay shall be available for remote alarms.

4. Additional test or service terminal shall not be required for any functions.

5. The control shall include temperature anticipation, moisture level humidity control and automatic flush cycles.

6. An alarm condition shall continue to be displayed until the malfunction is corrected. Multiple alarms shall be displayed sequentially in order of occurrence and only those alarms, which have not been acknowledged, shall continue to sound an audible alarm. The Data Alarm Processor-II panel shall perform an automatic self-test on system start-up. A user accessible diagnostic program shall aid in system component trouble shooting by displaying on the unit LCD screen the name of the controlled item, output relay number, terminal plug and pin number for each controlled item.

7. The following automatic control functions shall be included:

Selectable Control Type	Start Time Delay
Temperature Anticipation	Sequential Load Activation
Humidity Anticipation	Dehumidification Lockout
Compressor Short Cycle	Automatic Reheat Element Rotation
Automatic or Manual Restart	Energy Saver (glycol Operation)*
Auxiliary Chilled Water Operation	Hot Water Coil Flush Cycle*
Chilled Water Coil Flush Cycle*	Energy Saver Coil Flush Cycle*

8. The following conditions, data and normal functions shall be monitored and displayed:

Temperature Setpoint	Humidity Setpoint
Current Temperature	Current Humidity
Cooling 1, 2, 3, 4*	Dehumidification
Reheat	Current % of Capacity Utilized
Humidification	Current Discharge Temperature*

9. The following switching and control functions shall be included:

System On/Off Switch	Menu Selection Button
Menu Exit Button	Select Button
Alarm Silence Button	Program Set Button
Manual Override for:	
Blower; Cool 1, 2; Heat 1; Humidification	

10. The following historical data shall be available:

High Temperature Last 24 Hours	Low Temperature Last 24 Hours
High Humidity Last 24 Hours	Low Humidity Last 24 Hours
Alarm History (Last Ten Alarms)	Equipment Runtimes
Average % of Capacity	

11. The following alarm functions shall be monitored and displayed when they occur in addition to enunciating an audible alarm:

High Temperature Warning	Low Temperature Warning
High Humidity Warning	Low Humidity Warning
Under Floor Water Detected	No Air Flow
Dirty Filter	Humidifier Failure
Manual Override	Local Alarm*
Low Voltage Warning	Power Failure Restart
Temperature Sensor Failure	Humidity Sensor Failure
Maintenance Required	Person to Contact on Alarm*
Custom Message*	No Water Flow*
Firestat Tripped	Smoke Detected*
Discharge Air Sensor Failure*	Fan Motor Overload*

12. The following functions shall be programmable:

Temperature Setpoint (65-85° F, 18.3-29.4° C)	Humidity Setpoint (30-70% RH)
Temperature Deadband (± 1-5° F/C)	Humidity Deadband (1-15% RH)
High Temperature Alarm Limit	High Humidity Alarm Limit
Low Temperature Alarm Limit	Low Humidity Alarm Limit
Mode & Stage Response Time	Audio Alarm Mode
Reset Equipment Runtimes	Define Password
Manual Diagnostics	Firestat Temperature Alarm Limit
Humidifier Autoflush Timer	Temperature Scale
Scheduled Maintenance	Calibrate Temperature Sensor
Control Logic	Water Valve Mode
Calibrate Humidity Sensor	Message for Optional Alarm Limit*
Low Discharge Temperature Alarm Limit*	Remote Alarm 1, 2, 3 Selection*
Delay for Optional Alarms	Automatic Self-Test
Person to Contact on Alarm	Dehumidification Mode
Humidity Anticipation	Calibrate Discharge Air Sensor*
Power Problem or Restart Mode	Humidifier
Reheat Stages	

13. * Some of the programmable selections, displays, or alarms may require additional components or sensors.

2.03 REMOTE TEMPERATURE & HUMIDITY SENSORS

A. Units shall be provided with remote temperature and humidity sensors. Sensors shall be provided in a plastic case for remote mounting. 25 feet of shielded cable shall be provided for field wiring.

2.04 DISCONNECT

A. The unit shall include a non-automatic disconnect switch mounted in the high voltage section of the electrical panel. The operating mechanism shall prevent access to the high voltage electrical components until switched to the "OFF" position. The operating mechanism shall protrude through the decorative door.

2.05 SMOKE DETECTOR

A. Each unit shall be provided with a smoke detector. The smoke detector shall be mounted with the sensing element in the return air stream.

B. When the smoke detector is activated, it shall immediately shut down the unit.

2.06 CONDENSATE PUMP

A. Units shall be provided with condensate pumps. Shipped loose for field installation and shall include sump, motor, and head (40 GPH @ 20 feet with check valve).

2.07 UPFLOW PLENUM

A. Units with top (upflow) discharge shall be provided with plenum. The plenum shall have a front discharge air grille and be fully insulated with one inch (1") thick, 1 1/2 pound density fiberglass insulation neoprene coated.

B. The plenum height shall be 18 inches and shall be painted to match the unit color.

2.08 FLOORSTAND

A. Units shall be provided with floorstands and vibration isolation pads. The floorstand shall be a complete welded base engineered to support the operating unit. The floorstand height shall be ___ inches and adjustable ± 2 inches.

2.09 EXTENDED COMPRESSOR WARRANTY

A. An addition to the manufacturer's standard compressor warranty, the compressors shall be provided with an extended warranty for a period of four (4) years. The warranty shall be for the replacement of compressors only (labor not included). Provide start up supervision by factory trained service technicians and owner instruction training of proper operation.

2.10 AIR COOLED CONDENSER

A. Provide a low profile, slow speed, direct drive propeller fan type air-cooled condenser.

B. The condenser shall be constructed of galvanized steel with a powder coated finish. The condenser shall be a copper tube coil with corrugated aluminum fins for maximum heat transfer.

C. The condenser shall have fan speed control with transducers to modulate the speed of the first condenser fan motor and provide positive start-up and operation at ambient temperatures to -20° F. Additional condenser fan motors are to be controlled by ambient thermostats.

D. All controls including the fan speed controller shall be factory mounted in the air cooled condenser in an integral factory wired and tested control panel.

E. The air-cooled condenser and the indoor unit shall be the products of the same manufacturer.

2.11 WATER DETECTION

A. Provide 25 Feet of Water Detection cable sensors under the raised floor. When this cable detects the presence of water, it shall alarm at the unit.

B. Units shall be provided with one (1) water sensor. The solid-state water sensor shall be mounted under the unit to sense the presence of water. The sensor shall be connected to the microprocessor panel and activate an audible alarm. The water detector shall become an integral part of the microprocessor panel and shall display "WATER DETECTED UNDER FLOOR AREA" message when the sensor is activated.

PART 3 EXECUTION

3.01 INSTALLATION OF COMPUTER-ROOM AIR CONDITIONING UNITS

A. Install computer room air conditioning units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

B. Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to the electrical installer.

C. Piping Connections: Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping installer.

D. Field Quality Control: Manufacturer's factory authorized representative shall start up units in accordance with manufacturer's start up instructions. Test controls and demonstrate compliance with requirements, submit a report to the Architect / Engineer.

END OF SECTION 238300

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SECTION 23 90 00 – DIRECT DIGITAL CONTROLS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting, or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. Provide a complete and functional Energy Management System (EMS) as specified in this section and shown on the contract documents.

B. Provide a Microsoft Windows XP Professional operator's terminal, based on a distributed logic control system. Software shall support Windows Active X interface. Software shall follow Microsoft Windows API guidelines.

C. The Building Automation System (BAS) shall provide a peer-to-peer networked, stand-alone, distributed control system for building mechanical and electrical systems.

D. The BAS shall be designed to operate mechanical and electrical system under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to operate independently.

E. Provide equipment cabinets, panels and data communication network cables including all associated hardware.

H. F. The BAS supplier shall secure and pay for all permits, inspections, and certifications required for his work and arrange for necessary approvals by the governing authorities.

G. Assist Test and Balance Agency with the performance of their work. See Specifications Section 23 95 00.

1.03 QUALITY ASSURANCE

A. Controls installer shall have a minimum of five (5) years experience in the manufacturing and installation of direct digital control systems. Provide proof of such experience upon request. Installer's shall have a local office fully staffed to support the design, installation and maintenance services required by these specifications.

B. All control conduit and wiring shall meet the requirements of Division 26 for materials and installation.

C. The system shall be a standard product of the manufacturer who will guarantee ongoing parts availability and factory trained field support for five (5) years after system acceptance by the Owner. The components shall not require customizing other than setting jumpers and switches, adding hardware modules or software programming to perform required functions.

D. All BAS standalone controllers, distributed control modules, and communication interfaces shall comply with FCC Regulations, Part 15 for Class A computing devices with respect to radiation and conduction of radio-frequency electromagnetic energy.

E. The system shall be a true distributed processing system. The intelligent field panels shall perform all the software control functions.

F. Upon completion of work, and prior to acceptance by Owner, provide certificate stating that the control system has been tested and adjusted for proper operation.

G. For additional Quality Assurance requirements refer to Specifications Section 23 00 00.

1.04 REFERENCE STANDARDS

A. The latest edition of the following standards and codes, in effect or of bid date, shall govern the design and selection of equipment and materials supplied for this project:

1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). Handbooks (Fundamentals, Applications, Systems and Equipment.)

2. Uniform Building Code (UBC), including local amendments.

3. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.

4. National Electrical Code (NEC).

5. FCC Part 15, Class A

6. EMC Directive 89/336/EEC

B. Also refer to Specifications Section 23 00 00 for additional Codes and Standards.

1.05 ABBREVIATIONS

A. The following abbreviations may be used throughout these specifications and drawings. Additional applicable abbreviations and symbols may be found through the construction documents.

1. AHU - Air Handling Unit
2. EMS - Energy Management System
3. O.A. - Outside Air
4. VAV - Variable Air Volume Box
5. CHWS - Chilled Water Supply
6. CHWR - Chilled Water Return
7. EAT - Entering Air Temperature
8. LAT - Leaving Air Temperature
9. V-# - Valve - Number
10. NO - Normally Open

11. NC - Normally Closed
12. EWT - Entering Water Temperature
13. LWT - Leaving Water Temperature
14. DDC - Direct Digital Controller
15. TUX - Terminal Unit Controller
16. CPU - Central Processing Unit
17. DWC - Digital Wall Controller
18. TS - Temperature Sensor
19. FM - Flow Meter
20. DPS - Differential Pressure Sensor
21. DPT - Differential Pressure Transmitter

1.06 RELATED DOCUMENTS

A. Work covered under other sections of the specifications related to work under this section includes but is not limited to the following:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 76 00 Variable Volume Temperature (VVT) System
23 83 00 Computer Room Air Conditioners
23 95 00 Test and Balance

Division 26 Electrical

B. This installer shall review and become familiar with all work under the above Sections as it relates to work under this Section. Report to the Architect / Engineer any deviations from plans and specifications that will affect the performance of his work.

1.07 SYSTEM DESCRIPTION

A. General Requirements

1. System shall be a distributed logic control system complete with Direct Digital Control (DDC) and Direct Analog Control (DAC) software. System shall be totally based on ANSI/ASHRAE Standard 135, BACnet.

2. System to control all mechanical equipment, including unitary equipment such as VAV boxes, and all air handlers and computer room air conditioners, and any other listed equipment using native BACnet-compliant components.

3. Logic controllers for terminal units, air handlers, central mechanical equipment, and Microsoft Windows-based operator's terminal(s) shall be fully programmable and communicate and share data. Programming tools shall be provided as part of operator workstation for every controller supplied for the project.

B. Basic System Features

1. Zone-by-zone direct digital logic control of space temperature, scheduling, optimum start, equipment alarms reporting, and override timers for after-hours usage. A zone is the area served by one HVAC logic controller unit, such as a VAV box.

2. The EMCS application program shall be written to communicate specifically utilizing BACnet protocols. Software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Software shall support Windows Active X interface. Software shall follow Microsoft Windows API guidelines.

3. Operator's terminal software shall contain an easy-to-operate configuration of system-wide BACnet controllers, including management and display of the controller programming. This system shall provide the capability to configure controller binary and analog inputs/outputs.

4. Operator's terminal operating system shall be capable of utilizing third-party Windows-based programs for spreadsheet analysis; graphing, charting, custom report generation, and graphics design packages. Graphics generation shall be done using standard Windows graphics packages.

5. When specified, at least one operator's terminal shall be equipped to act as a system server. This system server shall store copies of loadable software for all field components and shall be capable of automatic or manual reloading of such software into the field components as required. The system server shall also gather and archive system-operating data, such as trend logs, energy logs, and other historical operating data.

6. Supply complete energy management firmware, including global control strategies and logging routines for use with total control systems. Energy management firmware shall be resident in field hardware and shall not be dependent on the operator's terminal for operation. Operator's terminal firmware is to be used for access to field-based energy management control software only.

7. Provide priority password security system. Each user shall have an individual password for access to the system functions required for individual job performance.

8. Equipment monitoring and alarm functions, including information for diagnosing equipment problems shall be included with the system.

9. The complete system, including, but not limited to terminal unit controllers, global controllers and operator's terminals shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in global controller memory shall be battery-backed up for a minimum of one (1) year. Logic controllers for all air handlers and all unitary equipment shall utilize EEPROM for all variable data storage. Batteries on unitary controllers are not allowed.

10. System design shall be modular.

11. Provide software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal.

12. System shall be capable of equipment runtime totalization of fans, heaters, boilers, etc. and capable of alarm generation and alarm dial out to remote sites.

13. Room sensors shall be provided with a backlit liquid crystal display. Display shall simultaneously show the set point, room and global humidity. Provide simple, limited, push button control of temperature set points and after hours/unoccupied override.

14. All DDC hardware and software shall be designed and manufactured by U.S. corporations. All hardware shall be Listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916 with integral labels showing rating.

15. All hardware shall be in compliance with FCC Part 15, Subpart J, Class A.

1.08 SUBMITTALS

A. Submit shop drawings and product data in accordance with the requirements of this Specifications Section and Specifications Section 23 00 00. All information shall be indexed, labeled and submitted in 3-ring binders.

B. Drawings

1. Engineered drawings to include point-to-point wiring diagrams, and bill of materials for each system in each area indicating piping, electrical connections, identification of controls conductors. Provide a complete written description of the sequence of operation pertaining to the diagram.

2. Include in sequence the symbol elements from the diagram, such as space temperature sensors, PE and EP switches. Submit the number and type of conductors required for each device.

3. Drawings shall be submitted in the standard 11" x 17" size (ANSI B).

4. Provide required number of complete sets (copies) of submittal drawings.

5. Drawings shall be available via e-mail or on CD-ROM.

C. System Documentation

1. Furnish manufacturer's detailed information for each piece of equipment used, identify each item. Furnish catalog sheets for each item used in control diagrams; identify specific model and accessories.

2. Provide the following information for each item and device: Proper system label, indication of coordination with submitted catalog information, proper settings and adjustments of instruments, physical dimensions of devices and accessories, and the normal condition of device, such as normally open or closed dampers, valves, and relays.

3. System configuration diagrams in simplified block format.

4. All input/output object listings and an alarm point summary listing.

5. Electrical drawings to show internal and external connection points, terminal block layouts, and terminal identification.

D. Operations/Maintenance Manuals

1. Provide manufacturer's instructions and drawings for installation, maintenance, troubleshooting instructions and operation of all purchased items.

2. Refer to Specifications Section 23 02 00.

E. Submit automatic control damper information including amount of leakage, airflow characteristics, and construction of all components.

F. Submit automatic control valve information.

1.09 WARRANTY

A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one (1) year from acceptance by the Owner. This warranty shall apply equally to both hardware and software. For additional warranty requirements refer to Section 23 00 00.

B. A prepaid Warranty Service Agreement shall be turned over to the Owner at the time of the acceptance test. Agreement shall include the terms and conditions stated herein.

1. Provide preventive maintenance at quarterly intervals.

2. Upon satisfactory completion of the work, control company technician shall fill a log of tasks performed at each site visit. The Owner in accordance with the Warranty Service Agreement shall sign log. The log shall be retained on site.

3. A software upgrade program shall be implemented on the anniversary of the warranty period. The upgrade shall provide all enhancements offered by the manufacturer for programs in the accepted system.

4. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. Service personnel in the direct employ of the controls installer shall perform service work. The service technicians shall be factory trained and certified by the controls manufacturer.

5. The maximum acceptable response time to provide this service at the site shall be 24 hours.

1.10 ACCEPTABLE INSTALLERS

A. Installers acceptable to provide the work under this section are listed hereinafter. Others that want to be considered shall submit complete request for acceptance prior to bid time. Refer to the prior approval section of the General Conditions of the contract and Specifications Section 23 00 00.

B. The request for acceptance shall list the title of each paragraph of these specifications with a notation of compliance, partial compliance or with full explanation for non-compliance. If compliance is by a means or method other than what is specified, describe in detail the functional equivalent proposed.

C. Existing system and basis of design is Automated Logic.

PART 2 PRODUCTS

2.01 OPERATOR'S TERMINAL

A. PC Hardware

1. Provide a PC with the following minimum specifications:

a) Microsoft Windows Compatible
b) 2 GHz Intel Pentium Processor
c) 512 MB RAM
d) 24 Bit Graphic Resolution Card
e) 10/100 Ethernet Card
f) 40 GB Hard Drive
g) One 44 MB Disk Drive
h) 24x speed CD Read/Write Drive
i) 17" SVGA Monitor
j) Inkjet Printer
k) 56kbps Modem
l) 600 KVA UPS
m) Factory installed Microsoft Windows XP Professional operating system

B. Displays

1. Operator's terminal shall display the data associated with project as shown on contract documents and/or object type list supplied by installer. Operator's terminal software shall accept Windows BITMAP (*.bmp) format the graphic files provided by control system installer for display purposes. Operator's terminal shall display all data using three-dimensional graphic representations of mechanical equipment.

2. System shall be capable of displaying graphic files, text, and dynamic object data together on each display. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. Control's system installer shall dynamically update the information on any display without any action by the user. Terminal shall allow user to change all field-resident EMCS functions associated with the project, such as set points, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.

3. All displays shall be generated and customized to fit the project as specified. Canned displays shall not be acceptable. Displays shall use Standard English for labeling and readout.

4. Binary objects shall be displayed as ACTIVE/INACTIVE/NULL or with customized text. Also, allow binary objects to be displayed as individual change-of-state bitmap objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three bitmap files for display when the point is ON, OFF or in Alarm. For binary outputs, toggle the object's commanded status when the bitmap is selected with the system digitizer (mouse). Similarly, allow the terminal operator to toggle the object's status by selecting (with the mouse) a picture of a switch or light, for example, which then displays a different picture (such as an "ON" switch or lighted lamp). Additionally, allow binary objects to be displayed as an animated graphic.

5. Animated graphic objects shall be displayed as a sequence of multiple bitmaps to simulate motion. For example: when a pump is in the OFF condition, display a stationary picture of the pump. When the operator selects the pump picture with the mouse, the represented object's status is toggled and the picture of the pump's impeller rotates in a time-based animation. The operator shall be able to click on an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change bitmap file assignment and also create new and original bitmaps online. System shall be supplied with a library of standard bitmaps, which may be used unaltered or modified by the operator.

6. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual bitmap items on the display screen as an overlay to the system graphic. Each analog input object may be assigned to a minimum of five bitmap files, each with high/low limits for automatic selection and display of the bitmaps. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling set point. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Selection for display type shall be individual for each object. Selecting either the "increase" or "decrease" arrow in the analog object spinner box without using the keypad may change analog object values. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trend logs.

7. Analog objects may also be assigned to an area of a system graphic, where the color of the defined area would change based on the analog object's value. For example, an area of a floor-plan graphic served by a single control zone would change color with respect to the temperature of the zone or its deviation from set point. All editing and area assignment shall be created or modified online using simple icon tools.

8. A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label push buttons may be mixed on the same display to allow sub-displays to exist for each item. A separate security level may be assigned to each display and system object.

9. Displays may be modified on site or via remote communications.

10. Display resolution shall be limited by the CRT hardware and Windows™ software driver only. As a minimum, operator's terminal shall provide display resolution of 1024x768 @ 256 colors (XVGA).

11. Entire system may operate without dependency on the operator's terminal.

C. Password Protection

1. Provide security system that prevents unauthorized use unless operator is logged on. This includes displays as outlined above.

2. Each operator's terminal shall provide security for 200 users minimum. Each user shall have an individual User ID, User Name and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). Each system user shall be allowed individual assignment of only those control functions and menu items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Each user shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include separate and distinct security levels for assignment to users.

D. Alarm Indication

1. Operator's terminal shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s), currently running (such as a word processor). Printout of alarms shall be sent to the assigned terminal and port.

2. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment and identification of operator acknowledging alarm.

3. Alarm messages shall be in user-definable text (English language) and shall be entered either at the operator's terminal or via remote communication.

E. Trendlog Information

1. System shall periodically gather historically recorded selected samples of object data stored in the field equipment (global controllers, field controllers) and archive the information on the operator's terminal (server) hard disk. Archived files shall be appended with new sample data, allowing samples to be accumulated over several years. Samples may be viewed at the operator's terminal in a trendlog. Logged data shall be stored in database format. Operator shall be able to scroll through all trendlog data. System shall automatically open archive files as needed to display archived data when operator scrolls through the data vertically. All trendlog information shall be displayed in standard engineering units.

2. Include software that is capable of graphing the trend logged object data. Software shall create two-axis (x, y) graphs that display up to eight object types at the same time in different colors. Graphs shall show object type value relative to time.

3. Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be accessed directly from any and all graphics on which objects is displayed.

F. Energy Log Information

1. System shall be capable of periodically gathering energy log data stored in the field equipment and archive the information on the operator terminal's hard disk. Archive files shall be appended with the new data, allowing data to be accumulated over several years. System shall automatically open archive files as needed to display archived data when operator scrolls through the data. Display all energy log information in standard engineering units.

2. All data shall be stored in data base file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.

3. Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged as well as any flow and temperature sensors may be used for BTU monitoring. All operations shall be password protected.

4. System shall display archived data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format the user shall be able to select a specific period of data to view or select all collected data. Consumption data for selected period shall be totaled over the selected period.

G. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc.

2. System shall include the automatic detection of devices connected anywhere on the BACnet network by scanning of the entire network. This function shall display device instance, network identification, model number and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computers hard drive for archiving purposes. If needed, this file shall be downloaded to the appropriate controller.

H. Programming Tools

1. Operator’s terminal shall include programming tools for all controllers. Controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks.

2. User shall be able to pick graphical function block from menu and place on screen. Programming tools shall place lines connecting appropriate function blocks together automatically. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

3. Programming tools shall include a test mode. Function blocks shall be animated to show status of data inputs and outputs. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

4. Programming tools shall also include a database manager of logic files and associated graphics. Operator shall be able to select unit type, input/output configuration and any other items that completely define unit. Database function shall select preprogrammed logic and graphics for downloading to device(s) and for use as display graphics.

I. Terminal Hardware

Provide operator's terminals at locations noted on the plans. Operator's terminal shall include the following as a minimum:

Compatible PC (computer)
Pentium 4 1.8 GHz (or higher).
128 MB RAM (or higher).
Minimum of (1) one floppy disk drive (1.44 MB, 3.5").
1 CD-ROM drive.
Hard disk drive with a minimum of 40 GB free space
Microsoft Windows™ 2000 Pro or Windows XP Pro
XVGA monitor (1024x768 x 256 min.) and driver.
Mouse compatible with Windows□.
AGP video card with 32 MB RAM
Keyboard
Modem, 56Kb Minimum (External)
Color printer (Inkjet or Laser)
Ethernet Communications capable of 10Mbps/100 Mbps

2.02 GLOBAL CONTROLLER (BTI)

A. General

1. Global Controller (GC) shall provide battery-backed real-time (hardware) clock functions. All Field Panels, Local Controllers or other addressable devices communicating on a sub LAN must utilize Peer-to-Peer communications and not require a GC/LAN device to pass information between the devices on the LAN. Systems that do not meet this requirement are not allowed.

2. Global controller shall be capable of deciding global strategies for the system based on information from any objects in the system regardless if the object is directly monitored by the controller or by another controller.

3. Global controller shall have a minimum of 4 MB battery-backed static RAM along with 64K of EPROM. Battery shall retain static RAM memory and clock functions for a minimum of one (1) year. Battery shall be a field-replaceable (non-rechargeable) lithium type.

4. Programming shall be object-oriented using control program blocks. Documentation in flowchart form for all programming shall be provided as part of the final system as-built documentation. Samples of flowchart documentation shall be included in submittals. All flowcharts shall be generated and automatically downloaded to controller.

5. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's terminal, field computer, or modem.

B. BACnet Conformance

1. Global Controller shall as a minimum support Point-to-Point (PTP), MS/TP, Ethernet and ARCNET BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be a BACnet conformance Class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

   a) Clock Functional Group
   b) Event Initiation Functional Group
   c) Files Functional Group
   d) Reinitialize Functional Group
   e) Device Communications Functional Group

C. Remote Communications

1. Provide all functions that will allow remote communications via modem to the Hillsborough County Facilities off-site locations. Include modem along with all cabling necessary for installation.

2. Upgrade Owners existing software for off-site computer that will allow operator to view and change all information associated with this system on color graphic displays. Operator shall be able to change all parameters in this section from off-site location including all programming of global controllers and all programmable logic controllers including all terminal unit controllers.

3. Global controller shall have capability to call out alarm conditions automatically. Alarm message and site description shall be sent to off-site computer or serial printer. If desired, controller may also send encoded message to digital pager. If an alphanumeric pager is in use by the operator, global controller shall be capable of sending a text or numeric string of alarm description. All global controllers connected to the local LAN shall be capable of calling out alarm messages through one or more shared modems connected to one or more of the global controllers on the local LAN.

4. Global controller shall have capability to call several different phone numbers. Numbers called may be controlled by type of alarm or time schedule.

5. Owner shall provide standard voice-grade phone line for remote communication function.

6. Global controller and supplied modem shall be capable of modem-to-modem baud rates of 56 Kbps minimums over standard voice-grade phone lines. Lower baud rates shall be selectable for areas where local phone company conditions require them.

D. Alarm Generation

1. Object change of values and change of states may be identified as alarm conditions. When such conditions exist, the global controller identifies each alarm through BACnet Get Alarm Summary Service. This summary of active alarms (Event State property value not equal to NORMAL) is presented to and displayed at the operator's terminal via Login alarm viewer and printer.

2. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

3. Each alarm may be dialed out.

4. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.

2.03 ROUTER, CONVERTER, REPEATER

A. Routing functions shall be performed using BACnet standard protocols as defined by ANSI/ASHRAE Standard 135. The converter interconnects a standard computer serial port with an MS/TP LAN. Repeater functions shall be handled by a device designed to selectively interconnect, a minimum of 4 (four) portions of MS/TP LAN.

B. Routers: The router shall perform the BACnet definition functions of interconnecting two or more BACnet LANs together, forming a BACnet Internet work. The router shall have optional plug-on boards permitting the following BACnet communication methods:

1. The router shall have the routing functionality of interconnecting BACnet Ethernet and/or ARCNET high-speed LAN to BACnet MS/TP LAN and one or more PTP LANs.

2. 2. The router shall have capability of interconnecting BACnet Ethernet high-speed LAN to BACnet ARCNET high-speed LAN.

3. BACnet PTP (RS-232 point-to-point) communication shall be available on the global controller by including an/a (optional) modem. The PTP/modem option shall operate under the BACnet half router communication protocol.

4. BACnet messages may be routed to all LANs installed on the router at the same time with no operator intervention.

C. Repeaters: BACnet repeaters shall provide selective interconnection to 4 segments of MS/TP LAN as a minimum. The repeater shall be an active device, containing logic capable of detecting and repeating signals from one MS/TP LAN segment to all other segments. Repeaters shall permit additional nodes to be added to the MS/TP LAN, up to a maximum of 128 nodes.

2.04 TERMINAL UNIT CONTROLLERS —Class 3

A. Provide one dedicated, stand-alone controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to global controller via the N2 Open field bus to the associated supervisory controller. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

2.05 VAV BOX CONTROLLERS—SINGLE DUCT—Class 3

A. Provide one (1) dedicated, stand-alone controller for each VAV box that adequately covers all objects listed in object list for unit. All controllers shall interface to global controller via the N2 Open field bus to the associates supervisory controller. Controllers shall include on board CFM flow sensor, inputs, outputs and self-contained logic program as needed for control of units.

B. Coordinate with VAV box manufacturer.

2.06 SENSORS AND MISCELLANEOUS DEVICES

A. Temperature / humidity sensors to be solid state electronic, factory-calibrated to within 0.5°F, totally interchangeable. Wall sensors enclosures to be tamperproof construction. Duct sensors to be electronically identical, housing suitable for the application. The backlit liquid crystal display (LCD) to show the set point and room temperatures. Simple push button control allows +/- 2 deg. temperature set point adjustment.

B. Digital Display Wall Controller (DWC) / Temperature Sensor – Combination Humidity Sensor (one per VAV box):

1. Room sensors shall be provided with an optional backlit liquid crystal display (LCD) the set point, room and outside air temperatures and is capable of displaying fan status (if applicable) time of day room and humidity. Simple push button control of temperature set points, fan speeds and after hours/unoccupied override.

2. Override time may be set from the wall controller. Override time count down shall be automatic. Display shall show the word "OFF" in unoccupied mode unless a function button is pressed. A 2-hour minimum run time shall be used as a standard over-ride time for after-hours push button over-ride.

3. See sequence of operation for specific operation of DWC displays and function keys in field service mode and in normal occupant mode.

4. Field service mode shall be customizable to fit different applications.

C. Low Temperature Detector: Provide manually reset freezestats on the outside air intake to each AHU's with a minimum of 20 foot vapor tension element. Interlock to AHU starter to shut unit off in either hand or auto position. Acceptable manufacturers are Johnson Controls A70, Alerton and KMC.

D. Static Pressure Transmitters: Provide electronic supply duct static pressure transmitter as required. Transmitter shall sense the differential between the supply duct and the space pressure. Sensing point shall be located 2/3 downstream in the longest ductwork run. Output shall be 4-20 MA proportional to pressure increase. Accuracy to be ±2% of full range. Acceptable manufacturers are Johnson Controls DPT-2641-6, Robinson-Halpern, Alerton and KMC.

E. Water Differential Pressure Transmitter: Provide industrial grade differential pressure transmitter to monitor and control the differential pressure across the supply and return chilled water piping. The transmitter shall have a 4-20 mA signal proportional to the pressure increase. Output variations shall not exceed .1% of full scale with a 10:1 turndown ration. Transmitter shall have integral accessible zero/span adjustment, RFI/EMI protection, 316ss diaphragm and pipe mounting bracket. Operating range 32 to 100ºF with 10 to 90% RH non-condensing. Acceptable manufacturers are Johnson Controls, Serta, Barton Model 6001, Robinson-Halpern, Alerton, and KMC.

F. Air Differential Pressure Switches: Provide differential pressure switches for fan status to the DC system. Switches to be diaphragm operated to actuate a single poke double throw snap switch. Motion of the diaphragm shall be restrained by a calibrated spring that can be adjusted to see the exact pressure differential at which the electrical switch can be actuated. Acceptable manufacturers are Johnson Controls P32 Air Flow Switch, Cleveland Controls, Dwyer, Alerton and KMC.

G. Water Differential Pressure Switch: Provide differential pressure switch for pump status to the DDC system. Switch to be in a NEMA 4 enclosure. Pressure range is from 3-150 psig. Acceptable manufacturers are Johnson Controls P74 Water Flow Switch, Serta, Penn, Alerton and KMC.

H. Electronic Air Flow Measurement: Linear temperature compensated analog electronic velocity signal. Microprocessor based electronic control signal capable of low flow sensitivity. True average velocity measurement across entire width of ductwork. 4-20 mA or 0-10 VDC output signals. Acceptable manufacturers are: Johnson Controls, Kele Products and Ebtron.

I. Water Flow Measurement: The sensor shall be a 4-20 mA output type with the repeatability of ±1% of value. Shall incorporate back-lit display and keypad on the meter. Flowmeter shall utilize Vortex shedding technology with a turndown of 20:1. Temperature limits: -40.0ø to 80.0 øC. Material is dependent upon that of the size and type of pipe material. Acceptable manufacturers are: Johnson Controls and Onicon.

J. Air Quality Transmitter (CO2 Sensors): The sensor shall be a 4-20 mA / 1-15 VDC output type and designed to monitor IAQ/CO2 levels in accordance with ASHRAE Standard 62. Acceptable manufacturers are Johnson Controls and Veris.

The backlit liquid crystal display (LCD) to show the set point and room temperatures. Simple push button control allows +/- 2 deg. temperature set point adjustment.

2.07 VALVES

A. Ball Valves (two-way 3” and smaller screwed and three way 2-1/2” and smaller screwed).

1. Valves shall be of industrial quality with bronze bodies and female NPT threads. Valve bodies may also be stainless steel.

2. All valves shall have blowout proof stem design; reinforced Teflon thrust seal washer and stuffing box. Packing gland screw shall be adjustable for wear.

3. Use chromium-plated bronze ball or where specified, stainless steel ball and stem. All valves shall be provided with reinforced Teflon seats.

B. Ball Valves (two-way 3” through 6” flanged)

1. Valves bodies shall be of industrial quality with carbon steel bodies with flange dimensions in accordance with ANSI B16.5 150. Valve bodies may also be specified stainless steel.

2. All valves shall have blowout proof stem design and reinforced thrust seal washer.

3. All valves shall be provided with standard stainless steel ball and stem, and reinforced seats, packing and O-ring.

C. Ball Valves (three way 2-1/2” through 6” flanged)

1. Valves shall be of industrial quality with flanged ends in accordance with ANSI B16.5 150. Valve bodies may be specified stainless steel.

D. Globe Valves (two- & three-way 0.5–2” screwed)

1. Valves bodies shall be bronze.

2. Valve stems shall be stainless steel and highly polished to decrease friction and improve response. Valve plugs shall be brass with guides.

3. Stem packing shall be spring loaded EP rings for water application, and Teflon rings for steam applications.

E. Globe Valves (two- & three-way 0.5–6" flanged)

1. Valves shall be cast iron flanged.

2. Valve stems shall be stainless steel and highly polished to decrease friction and improve response. Valve plugs shall be brass with guides. Stem packing shall be Teflon, spring-loaded EP rings.

F. Butterfly Valve

1. Valve shall full threaded lug-wafer style, drilled and tapped for isolation and removal of downstream piping. Flanges shall meet ANSI Standards 125 and 150. The body shall have an extended neck to allow for flange and piping insulation clearance.

2. Valves shall feature a single, through-shaft design for high strength and positive disc control.

3. The disc seat shall be heavy duty with molded-in O-rings, creating a positive seal between flange face and valve body. Gaskets between the valve and flange faces are not permitted. The resilient shall provide a tight flow shutoff in either direction with the disc closed. Seat isolates body and stem from flowing liquid. The seat shall be easily replaceable in the field.

4. Stem bearings shall be isolated from flowing liquid.

G. Pressure Independent Characterized Control Valves

1. Provide Pressure Independent Characterized Control Valves (PICCV) manufactured of forged brass body rated at no less than 600psi, chrome plated brass ball and stem, female, NPT union ends. Valves shall have pressure points and be provided with a specific chart to match flow and pressure differential.

2. The modulating control valves shall be pressure independent and shall accurately control the flow from 0 to 100% full rated flow with an equal percentage flow characteristic. The flow shall not vary more than +/- 5% due to system pressure fluctuations across the valve with a minimum of 5 PSID across the valve.

3. Combination of actuator and valve shall provide a minimum close-off pressure rating of 200 PSI.

4. The control valve shall require no maintenance and shall not include replaceable cartridges.

5. The actuator shall be directly coupled to the valve at the factory. Actuators shall be Multi-Function Technology and running time shall be 100 seconds independent of the flow setting while rotating a maximum of 90º.

6. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

7. Acceptable manufacturer: Belimo Aircontrols (USA), Inc.

2.08 ELECTRONIC VALVE ACTUATOR

A. Actuator shall be fully modulating, floating (tri-state), two position, and/or spring return as indicated in the control sequences. Specified fail-safe actuators shall require mechanical spring return.

B. Modulating valves shall be positive positioning, responding to a 2-10VDC or 4-20mA signal. There shall be a visual valve position indicator.

C. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if specified.

D. Actuator shall provide minimum torque required for proper valve close-off. The actuator shall be designed with a current limiting motor protection. A release button—clutch or handle on the actuator—shall be provided to allow for manual override (except when actuator is spring return type).

E. Actuators shall be UL listed.

F. Acceptable Manufacturer is BELIMO.

2.09 DAMPERS AND ELECTRONIC DAMPER ACTUATORS

A. Provide parallel or opposed blade control dampers with blades fabricated of reinforced galvanized steel. Welded frame to be press formed galvanized steel complete with fully adjustable linkage and control rods. Blades to be custom sized for maximum free area without blank-offs.

B. Acceptable damper manufacturers are: Vent Products 5100 Model and BELIMO.

C. Actuators shall be UL listed. Acceptable manufacturer is BELIMO.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work, this installer shall carefully review installed work of other trades and verify that such work is complete to the point where work of this Section may commence.

B. Notify the Architect / Engineer and Owner's representative in writing of conditions detrimental to the proper and timely completion of the work under this Section.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.02 INSTALLATION – GENERAL

A. Install equipment in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

C. Coordinate with piping installer the installation of wells, valves, taps for sensors, etc. Provide necessary extensions for proper access beyond insulation. Provide stainless steel or brass thermo wells suitable for respective application and for installation under other sections sized to suit pipe diameter without restricting flow.

D. Coordinate with the ductwork installer the installation of control dampers, air flow measuring stations, duct mounted sensors, etc. Provide service access doors as required. Damper shafts shall be extended beyond the duct insulation to provide space for the actuator.

3.03 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility, in general, mount 60 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from Architect / Engineer and Owner's representative prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels. Provide numerical labels on all control wires.

D. Perimeter thermostats or temperature and humidity sensors mounted on outside walls shall be mounted on a non-conducting base to insulate the device from direct contact with the wall. Wire holes shall be insulated.

E. Refer to Specifications Section 23 00 00 for the installation of access doors in areas where control devices are installed behind walls or above furred ceilings.

3.04 INTERLOCKING AND CONTROL WIRING

A. Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 26 and applicable national, state and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the Owner's representative prior to rough in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Coordinate with electrical installer the power source for all control components.

F. All control wiring in the mechanical, electrical, telephone, boiler rooms and other exposed areas to be installed in raceways. All other wiring to be installed neatly and inconspicuously per local code requirements. Control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit). Raceways shall comply with the requirements of Division 26.

3.05 FIELD SERVICES

A. Prepare and start logic control system. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for 1 year or as specified.

C. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.06 TRAINING

A. System application engineer to instruct Owner in operation of systems and equipment. Provide on-site training for up to 32 hours as part of this contract. Training shall be videotaped.

No more than eight (8), four (4) hour visits.

B. System operator's training to include, (but not limited to modification of data displays, alarm and status descriptors, requesting data and execution of commands and request of logs. Provide this training to three (3) persons.

3.07 DEMONSTRATION

A. Provide systems demonstration under provisions of Specifications Section 23 01 00.

B. Demonstrate complete operating system to Owner's representative.

C. Provide certificate stating that control system has been tested and adjusted for proper operation.

D. Include minimum eight (8) hours for this work.

3.08 TEST AND BALANCE

A. Provide on site assistance to Test and Balance Agency for coordination of energy management systems functions. Refer To Specifications Section 23 95 00.

B. Test and Balance shall verify all set points.

3.09 LABELS

A. Each control panel, pilot light, switch and control valve shall be labeled according to its operation and sequence. All labels and final hardware/software revisions shall reflect the final room designations.

B. Also refer to Specifications Section 23 08 00, Painting and Identification for additional requirements.

3.10 LIGHTNING SUPPRESSION

A. Lightning arresters must be used at each point where communication buses enter or exit a building.

3.11 AS-BUILT RECORD DRAWINGS

A. Provide a complete set of as-built record drawings with each operations and maintenance manuals. Refer to Specifications Sections 23 01 00 and 23 02 00.

B. One copy of the As-Built Control Drawings, with diskettes or CD's of system shall be submitted directly to the Owner for their use.

3.12 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and for the proper maintenance or removal of equipment.

B. Coordinate with other trades so no conduit, pipes, ceiling hangers, etc. interfere with the required clearances.

C. Notify contractor for general construction when work by other trades needs to be relocated.

END OF SECTION 239000

SECTION 23 95 00 - TEST AND BALANCE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting, or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. The contractor shall procure the services of a local, independent Test and Balance Agency, hereinafter referred to as the Agency, approved by the Architect / Engineer, which specializes in the testing and balancing of heating, ventilating, and air conditioning systems.

B. The Agency shall test, balance and adjust all water, air and steam systems and temperature control equipment specified in this Division 23 of the Specifications.

C. Include testing and balancing during heating and cooling seasons at design conditions.

D. The Contractor shall award the test and balance contract to the Agency as soon as possible to allow them to schedule their work in cooperation with other trades and meet the completion date.

E. The Agency shall assist and witness the Contractor's duct leakage test as described in Specifications and as per SMACNA Standards. Contractor may delegate testing to the Test and Balance Agency.

F. The Agency shall test each Sequence of Operation for all systems to verify proper operation. Include description of operation in report, verify that all controls are installed and operating in accordance with the control Sequence of Operation on plans or on equipment submittals.

G. Submit a certified Test and Balance Report to the Architect / Engineer at least one week prior to the scheduled Substantial Completion. Refer to Specifications Division 01 and Section 23 01 00. If the report is not available, the Substantial Completion may be re-scheduled.

H. The Agency shall be in attendance at the Substantial Completion for a random test of the values contained in their report. Refer to Specifications Section 23 01 00.

I. The Agency shall include an allowance for conducting a one-time comfort balancing of specific areas as requested by the Owner and the Architect / Engineer. Work shall be limited to adjustments to reflect actual occupancy and be accomplished within one workday. This comfort balancing does not replace any other standard requirements of the contract.

1.03 RELATED DOCUMENTS

A. Work covered under other sections of the specifications related to testing and balancing includes but is not limited to the following:

23 00 00 HVAC General Requirements
23 01 00 Project Close Out
23 02 00 Operation and Maintenance Manuals
23 05 00 Electrical Power and Auxiliaries
23 06 00 Vibration and Noise Isolation
23 08 00 Painting and Identification
23 09 00 Access and Maintenance
23 20 00 Piping General
23 21 00 Piping for HVAC Systems
23 22 00 Refrigerant Piping
23 23 00 Flow, Pressure and Temperature Measuring Devices
23 24 00 Condensate Drain Piping
23 40 00 Air Handling Mechanical Equipment
23 60 00 Water Treatment
23 65 00 Insulation - HVAC
23 73 00 Air Distribution Systems
23 75 00 Air Terminal Units
23 83 00 Computer Room Air Conditioners
23 90 00 Direct Digital Controls

B. Work performed under the above sections is herein referred to as the Installer. Refer to specific items of work provided by each Installer. Installers shall cooperate with test and balance agency as required during execution of the work under this Section.

C. Prior to commencing the work under this Section, The Agency staff shall visit the construction site to review the work specified under the above listed Sections as it relates to work under this Section. Any deviations from plans and specifications that may affect the performance of the system(s) shall be reported to the Architect / Engineer and Contractor.

1.04 QUALITY ASSURANCE

A. Contractor shall list in his bid the name of he local Agency he proposes to use for the project. Agency is subject to acceptance by Architect / Engineer. Submit qualifications of Test and Balance Agency to Architect / Engineer for review and approval. Submission shall be forwarded as soon as contractor is selected. Once accepted, contractor, without good cause, cannot replace Test and Balance Agency.

B. The Agency shall provide proof of having successfully completed at least five local projects of similar size and scope DURING THE LAST YEAR. For each reference include the name of Professional Firm responsible for the design and contact person. Agency shall be a certified member of the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB) and use their approved test and balance procedures.

C. All instruments used for test and balance shall be accurately calibrated within six months of commencing work on this project and maintained in good working order. Provide proof of calibration upon request.

D. Submit qualifications of Test and Balance Agency to Architect / Engineer for review and approval. Submit proposed test and balance procedures, list of equipment to be used and any other information that will allow the Architect / Engineer to properly evaluate Agency's capabilities as related to the Project.

E. All readings shall be within +10% / -5% of the values shown on the plans and specifications, shop drawings and manufacturer's literature. Readings for outside airflow shall be within –5% - 0% of the values shown on the plans. These allowances do not relieve the Agency from adjusting speed controllers, belts and other control devices to achieve design conditions.

F. Prior to commencing its work the Test and Balance Agency shall meet with the contractor and installers to review and obtain copies of the latest construction documents, addenda, shop drawings, change orders, field changes and any other information necessary for their thorough and complete understanding of the scope of the project. If required information is not readily available from the Contractor, Agency may request that information directly from the Architect / Engineer. Contractor shall be responsible for all reproduction costs.

G. The Agency shall be represented at the time of substantial completion for a random check of the values contained in the test and balance report. If report values cannot be verified, Agency shall re-test the entire system, prepare a new report and submit to the Architect / Engineer. Refer to Specifications Section23 01 00

H. Project will not be considered substantially complete until Test and Balance Report can be reviewed and verified.

I. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 23 00 00.

1.05 WARRANTY

A. During the first year after completion of test and balance work, the owner may request a recheck, or resetting of any outlet, supply fan, or exhaust fan listed in the test and balance report.

B. Include balancing during winter and summer operation at design conditions.

C. In addition to the one-year warranty, a Comfort Test is to be conducted after the building is occupied. Under this work, the Agency is to further adjust the airflows, in areas identified by the owner and the Architect / Engineer, as required to meet the actual characteristics of space use and/or occupancy.

1.06 REPORTS

A. At the end of each workday, the Agency technician shall furnish the Contractor with a list of items that must be repaired or adjusted. Provide a copy to the Architect / Engineer.

B. Test and Balance information shall be compiled in a neat, orderly, itemized format on standard AABC or NEBB Forms. Test data shall be submitted to the Architect / Engineer for review. Provide minimum of three (3) hard copies of the report for Engineer’s review. When electronic copies are submitted, they shall be in PDF format. For large reports, a readable CD or DVD will be required.

C. After review comments are satisfied furnish the Engineer three (3) final sets of the complete final report. A report is deemed to be final when all outstanding items listed on previous reports have been corrected and are no longer listed on the report.

D. After a Comfort Test is completed, the Agency to submit an Addendum to the Final Report listing all corrections made under that test.

E. Included in the report shall be the following minimum information. Identify each piece of equipment (air handler, condensing unit, chiller, boiler etc.) with project tag number, model number and serial number. Serial number on exhaust fans and VAV boxes may be omitted.

1. A tabulation of temperature for a typical space on each control zone and the outside temperature at the time of measurement.

2. A listing of the measured air quantities at each outlet corresponding to the temperature tabulation specified above.

3. A listing of the measured air quantities static pressures at each VAV box.

4. Air quantities at each supply, return and exhaust air handling device tabulated against CFM shown on the Drawings.

5. Static pressure readings entering and leaving each supply, return, and exhaust fan. These readings shall be related to fan curves for CFM handled. Provide pressure readings to indicate pressure drops across all components of air handling system, e.g., filter, coils, fan dampers, etc.

6. Motor current readings at each fan, compressor and other system components that use electrical power. The voltage at the time of readings shall be listed.

7. Current and temperature data on each electric heater.

8. Entering and leaving pressure at each coil, pump, heat exchanger, chiller and similar devices.

9. Entering and leaving temperature at each coil, chiller, heat exchanger, cooling tower, boiler and similar devices.

10. Provide a Table in the report that itemizes all the Outside Air Make-up “CFM compared to all the Exhaust Air CFM (specified and actual) that is to demonstrate that the building is experiencing a continual positive pressure. There is to be one Table per building.

11. If dehumidification is included in the scope of work:

    - Tabulation of the relative humidity of the control zone and the outside air temperature at the time of measurement.

    - Test control sequence of operation of dehumidification equipment.

12. Test controls and Sequence of Operations of all HVAC equipment.

13. Provide calculations and recommended fixed sheave selection for each air handling equipment where adjustable sheaves were used for test and balance. Contractor shall install fixed sheaves.

14. Provide 11” x 17” copy of plans showing sequence of the identification number of the air devices. Identification number shall correspond to number as assigned on the report.

F. Submit three (3) bound copies of the final complete Test and Balance Report one week prior to substantial completion. Electronic copies are not acceptable other than for progress review of data. Failure to comply with this request may result in a postponement of the Substantial Completion Inspection.

1.07 COORDINATION WITH CONTRACTOR AND INSTALLERS

A. The Agency staff shall visit the construction site to review and become familiar with the installation of pipe systems, sheet metal work, temperature controls and other components and parts of the heating, air conditioning, and ventilating systems. Verify that adequate provisions have been made for the testing and balancing of the systems and equipment.

B. The Agency will not instruct or direct the Contractor in any work, but will provide him with daily reports of his findings with copy to the Architect / Engineer.

C. The Contract Documents indicate valves, dampers and miscellaneous flow adjustment devices for the purpose of obtaining optimum operating conditions. When additional dampers are required by the Agency to achieve design airflows, the contractor, at no additional cost to the contract, shall provide them. It will be the responsibility of the Contractor to install these devices in a manner that leaves them accessible and adjustable. The Agency should be consulted if there are any questions concerning the arrangement and access to any control devices.

D. The controls installer shall initially set, adjust, relocate (if necessary), and calibrate all controls. The Agency shall verify proper operation of controls. Include in the report one week prior to the Substantial Completion a statement that all controls have been tested for proper operation in accordance with the Sequence of Operation and design intent.

E. Contractor to install fixed sheaves on air handling equipment as recommended by Test and Balance Agency.

1.08 COORDINATION WITH OWNER'S TEST AND BALANCE AGENCY

A. The Owner's Agency will independently verify the accuracy of the Contractor's test and balance report. Reinspection by the Owner (or their representative) of systems not properly balanced or calibrated shall be at the Contractor's expense.

B. The Contractor shall provide the same assistance to the Owner's Agency as is herein specified between the Contractor and his own Agency.

C. The Contractor's test and balance agency shall cooperate with and promptly respond to any requests from the Owner's Test and Balance Agency.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

3.01 GENERAL

A. Installer of mechanical systems shall make all preliminary tests and adjustments, place all systems and equipment in full operation and promptly notify the Test and Balance Agency to start their work. Installer shall maintain all systems in operation during each working day of testing and balancing.

B. Installer shall promptly correct all deficiencies noted by the Agency so as not to delay the completion of the test and balance work.

C. Contractor shall clean or replace air filters and strainers before test and balance work starts and thereafter as required by the Agency.

D. The Agency shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of fans, dampers, air distribution devices and the airflows through all coils. The Contractor and equipment supplier shall cooperate to provide all necessary data regarding the design and proper application of the system components, and shall furnish all labor and material required to eliminate deficiencies identified during the test and balance process.

E. During balancing, the temperature controls shall be adjusted and calibrated by the control's installer. Prove the accuracy of the final setting by taking hourly readings in a typical zone. The total variation shall not exceed 2 degrees from the median temperature.

F. In all fan systems, the air quantities shown on the Drawings may be varied as required to secure a maximum temperature variation of 2 degrees within each controlled space, but the total air quantity indicated for each zone must be obtained.

G. It shall be the responsibility of the Contractor to replace fan drives, sheaves, belts and/or motors as recommended by the Agency (without cost to the contract) to attain the specified air volumes.

H. Systems installed with self-contained pressure independent control valves shall not require hydronic system balancing. Test and Balance to check flow and/or temperature differential.

END OF SECTION 239500

SECTION 26 01 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements and Contractual Requirements of Division 1 shall apply to all work hereunder.

B. Bidders of work in Sections under Division 26 are expected to have read the above requirements and, upon subcontracting for work called for in such Sections, shall be responsible for compliance with such Sections.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. All work under Division 26 shall comply with requirements of Florida Building Code 2010, National Electrical Code (NEC) 2008, and all other pertinent codes made a part of such code by reference.

1.03 INTENT

A. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use."

B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

1.04 SURVEYS AND MEASUREMENTS

A. Base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work. All material take-offs for the site shall be field measured prior to bids.

1.05 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact location of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Architect.

B. If directed by the Architect or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. At the time of each shop drawing submission, the Contractor shall call the Engineer's attention (in writing) to, and plainly mark on shop drawings, any deviations from the Contract Documents.

D. At the close of the job, prior to final review, five (5) bound copies of the following shall be submitted by transmittal letter to the Engineer for review and acceptance.

1. Equipment warranties.

2. Contractor's warranty.

3. Parts list and manuals for all equipment.

4. Operating Instructions (in writing).

5. Written instructions on maintenance and care of the system.

1.06 REFERENCES

A. ANSI/NFPA 70—National Electrical Code.

D. NFPA 101—Life Safety Code.

F. Florida Fire Protection Code.

1.07 SUBSTITUTIONS

A. Contractor options:

1. For products specified only by a referenced standard, such as ASTM, ANSI, etc., select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers names, which complies with the Contract Documents. To comply, a product must be acceptable to the Project Architect/Engineer in quality, performance, space requirements and maintenance requirements. This Contractor must prove product acceptability.

3. For a product specified by naming only one product and manufacturer, there is no option.

4. When products are provided as an option if this Contractor selects an option, this Contractor shall be responsible for modifications required for his work and work of other trades at no additional cost to the Owner.

B. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality and performance required. The drawings are based upon equipment scheduled on drawings and specified. If another manufacturer is considered for substitution during the bidding process, the Electrical Contractor shall be responsible for coordinating all electrical, mechanical, structural, or architectural changes. Comparable equipment manufacturers which are listed as equals shall be considered as substitutes. Manufacturers other than the basis of design shall submit a catalog information and 1/4" scale plan and section drawings showing proper fit and all clearances for maintenance items.

C. Substitutions of other manufacturers will be considered for use if, in the Engineers opinion, the item requested for substitution is equal to that specified. The Contractor shall provide to the Engineer a typed comparative list of the basis of design and the proposed substitute.

Request for approval of substitutions or equals prior to bid must be made in writing. The approval of any substitutions or equals prior to bid shall not be construed as a shop drawing approval. The substitute or equal must be submitted as described in the specifications and meet all the requirements of the specifications and drawings.

D. All requests for substitutions shall specifically indicate any and all differences or omissions between the product specified as basis of design and the product proposed for substitution.

E. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical or electrical, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted to the Architect/Engineer for approval.

F. Where such approved deviation requires quantity and arrangement of equipment from that specified or indicated on the drawings, any other additional equipment required by the system, shall be provided by this Contractor at no additional cost to the Owner.

1.08 SUBMITTALS

A. Submit under provisions of Division 1.

B. Proposed Products List: Include Products specified in the following Sections, but not limited to:

26 05 33 Conduit and Raceways.
26 22 00 Power Distribution Units.
26 22 13 Ultra Low Loss Transformers.
262416 Panel boards.
262500 Enclosed Bus Assemblies (Busway).
262726 Wiring Devices.
262816 Enclosed Switches and Circuit Breakers.
264313 Surge Protective Devices (SPD).
265100 Interior Lighting.

C. It shall be understood that review of shop drawings by the Engineer does not supersede the requirement to provide a complete and functioning system in compliance with the Contract Documents.

D. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, location, section and article number of specifications governing, Contractor's name, and name of job. All equipment shall be labeled to match labeling on contract documents.

E. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.

F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

G. All shop drawings shall be submitted to the Architect/Engineer by Contractor no later than thirty (30) days from the day of contract award.

H. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.

I. Submit all Division 26 submittals at one (1) time in one (1) integral group. Piece-by-piece submission of individual items will not be acceptable. Engineer may check contents of each submittal set upon initial delivery; if not complete as set forth herein, submittal sets may be returned to Contractor without review and approval and will not be accepted until made complete.

J. The Project Architect/Engineer shall have the authority to determine the method of submitting shop drawings. The Project Architect/Engineer shall instruct the Contractor and the Subcontractors at the pre-construction meeting as to the method to be used. The Contractor shall submit shop drawings and technical data for each product within thirty (30) calendar days of award of the Contract by the Owner.

K. However, the following number of shop drawings and submittals shall be the minimum number reproduced for distribution:

1. For the Project Architect/Engineer, furnish the following.

a. 1 copy for the Project Architect's file record.

b. 1 copy for the Project Architect's Engineer for his file record.

c. 1 copy for the Contractor's main office file.

d. 1 copy for the Contractor's field office.

e. 1 copy for the Subcontractor's file.

f. 1 copy for the Subcontractor's field office.

g. 1 copy for the workers in the field.

L. Submittals are required for all items of mechanical and electrical equipment and products provided by this Contractor. Refer to each Section for additional requirements.

M. Submittals shall be referenced correctly to the Contract Documents.

N. Manufacturer's catalog cuts may be submitted for all standard cataloged equipment, provided that the item required to meet the Project Specifications is not modified in any way from the standard catalog version of said item.

O. Cut sheets shall be clearly marked to indicate the exact size, type, rating, capacity, etc., of the item to be furnished.

P. Bind shop drawings/catalog-cuts in folders with a title sheet and identification on front of the folder. Submit all at one time. Allow space for Contractor, Project Architect, and Engineer review stamps.

Q. All submittals must bear the handwritten signature of the Contractor and his stamp of approval before being considered for review by the Project Architect/Engineer.

R. Shop drawings and submittals which have not been previously approved and corrected and so marked by the Contractor, will be returned to the Contractor for such action before the Project Architect or Engineer will review and comment on such submittals.

S. Partial submittals will not be accepted for review and approval.

T. Full submittal shall be made for all equipment (whether or not it is exactly as specified) on the basis of design. Any items marked REJECTED or similarly marked shall be resubmitted and furnished exactly as specified.

U. Full electrical characteristics for each motor, piece of equipment or device shall be prominently displayed on the shop drawings or submittal. Prominently displayed on the shop drawings or prominently attached to the submittal shall mean a statement signed by maker of the submittal to the Contractor that he or she has carefully examined the electrical characteristics specified in the Contract Documents (and if remodeling or an addition, conformed to existing electrical characteristics), and that the motors, equipment or devices proposed to be furnished are compatible.

This signed statement shall be on the shop drawings or submittal before forwarding to the Contractor who shall otherwise return these documents to the Subcontractor for resubmittal. The Contractor shall not forward incomplete documents to the Project Architect/Engineer. The responsibility to provide motors and equipment having compatibility with electric service provided shall rest with the Subcontractor furnishing the equipment, at no additional cost to the Owner.

V. Operating and maintenance manuals shall be provided in an organized manner. They should include instructions, wiring/control diagrams, spare parts list, warranties and test certificates. Any special tools or keys should also be included.

W. Test and Certifications:

1. Provide insulation resistance at ground continuity tests for all feeders, branch circuits, or other equipment.

   a. In no case shall the insulation resistance be less than 50,000 ohms at 600 volts.

2. Written test results and certification shall be required for proper fire alarm operation from the installer of the fire alarm equipment.

3. Optimum phase balance under full load conditions shall be obtained. Special care shall be taken to prevent reverse rotation of motors during these adjustments.

1.09 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the General Contractor, with copies to the Architect, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. When work installed under this Division will be in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer/Architect, prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'0", clearly showing how work is to be installed in relation to the work of other trades. If the work is installed before coordinating with other trades, or so as to cause any interference with work of other trades, make all the necessary changes in work to correct the condition without extra charge.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. This Contractor shall coordinate the layout of electrical work with other trades involved. Locations of structural systems, plumbing, and heating work should take preference over the location of conduit runs.

1.10 PROTECTION

A. Protect all work and material provided under this Division from damage. All damaged equipment work or material provided under this Division shall be replaced with new. Rebuilts are not acceptable.

B. Protect all work and equipment until inspected, tested, and accepted. Protect work against theft, injury, or damage; and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

1.11 SCAFFOLDING, RIGGING, AND HOISTING

A. Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.12 REMOVAL OF RUBBISH

A. This Contractor shall at all times keep premises free from accumulations of waste materials or rubbish caused by his employees or work. At completion of work he shall remove all his tools, scaffolding, materials, and rubbish from the building and site. He shall leave the premises and his work in a clean, orderly, and acceptable condition.

1.13 SAFETY

A. This Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.333), Title 29—Labor, Chapter XIII, Bureau of Standards, Department of Labor, Part 1518—Safety and Health Regulations for Construction; and that his housekeeping and equipment be maintained in such a manner that they comply with the Florida Industrial Commission Safety Code and Regulations of the Federal Williams—Steiger Occupational Safety and Health Act of 1970 (OSHA), wherein it states that the Contractor shall not require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.

1.14 SUPERVISION

A. This Contractor shall provide a competent, experienced, full time superintendent who is acceptable to the Architect/Engineer and Owner, and who is authorized to make decisions on behalf of the Contractor. Working foreman on jobs over $50,000 shall not be considered proper supervision.

1.15 MATERIAL AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Engineer shall be furnished. Refer to substitutions in this Section.

B. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the Architect and Engineer in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

1.16 QUIET OPERATION AND VIBRATION

A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer and the Owner. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer and the Owner shall be corrected in an approved manner at no additional expense to the Owner.

1.17 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

A. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all equipment furnished under this Division, and shall submit drawings to the Architect and Engineer for approval before purchase, fabrication, or construction of same.

B. For all floor mounted equipment, provide concrete pads which extend six inches (6") beyond equipment base in all directions with top edge chamfered. Inset six inches (6") steel dowel rods into floors to anchor pads. Shop drawings of all foundations and pads shall be submitted to the Architect and Engineer for approval before same are constructed.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be the same materials and same quality of finish as the adjacent and surrounding flooring material.

D. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect and the Engineer, not strong enough shall be replaced as directed.

1.18 ACCESS DOORS FOR WALLS AND CEILINGS

A. Provide flush panel access doors with a 16 gauge steel frame and a 14 gauge steel door panel.

B. Finish is to be primed painted steel.

C. Provide concealed hinges which allow the door to open 175 degrees and have a removable pin.

D. Provide access doors with a locked flush mounted vandal proof spanner head operated steel cams.

E. Provide 1-1/2 hour "B" label door for rated chase walls.

F. Furnish masonry anchors for installation in masonry walls and metal lath wings with casing bead for plaster installation.

G. Provide a minimum 2'-0" by 2'-0" access doors unless shown or noted otherwise on the drawings.

H. Access doors for chase walls shall be mounted 16" off the finish floor.

I. Access doors for electrical equipment shall be a minimum of 12" larger than equipment all around.

J. Each pertinent Subcontractor shall furnish access doors for access to all electrical pull boxes, dampers, and other electrical equipment the Subcontractor furnishes which are concealed in walls, furring and in hung ceilings, or where may be necessary.

K. Delivery: These access doors shall be delivered to the Contractor for installation by the appropriate trade. Delivery of the access doors shall be made so as not to cause delay in the work of the Contractor or other trades.

L. Material and Finish: Access doors shall conform to the finish of adjacent construction as indicated in the Project Architect's finish schedule. Access doors shall be as specified by the Project Architect/Engineer.

M. Quality Control: Each Subcontractor shall inspect the installation of the access doors and shall immediately inform the Contractor in writing if they are not being located and installed to afford proper access to the equipment.

1.19 EXPOSED WORK

A. All ductwork, piping and conduit shall be concealed from view of occupied spaces and shall be concealed from view from the exterior, unless such is specifically identified on the Drawings or Specifications to be exposed.

1.20 MINIMUM HEAD CLEARANCE IN OCCUPIED SPACES

A. No electrical or other equipment, piping, conduit, structural framing and support elements of suspended equipment or boxed-in soffits shall be installed in a manner which occurs lower than 8'-0" above the finished floor of the area it occurs above, if people can stand or walk under it.

1.21 CONSTRUCTION FACILITIES

A. Temporary construction facilities such as temporary toilets, temporary wiring, electric outlets, temporary lighting, grounding, storage and work areas, field offices, shall be as set forth in Division 1.

B. On-site office facilities, construction water, temporary sewage connections, temporary construction site restroom facilities, electricity for construction, existing fire alarms, emergency lighting, temporary lighting, existing intercom and electrical systems, use of site, etc., shall be as set forth in Division 1.

1.22 PROJECT CONDITIONS

A. All existing electrical utilities shall be located prior to the beginning of work. Any conflicts should be identified and noted on As-Built (Record) drawings.

B. Adequate means of protection for all utilities should be provided and, if damaged during working operations, such shall be repaired to the satisfaction of the utility owner at this Contractor's expense.

C. Where existing devices are permanently abandoned, each outlet, branch circuit, etc. shall be removed completely and the conduit plugged or capped at a point well behind the proposed new finished closures or newly finished surfaces.

D. Install Work in locations shown on Drawings, unless prevented by Project conditions.

E. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

F. The Contractor shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

G. The scope of the work included under this Division of the Specifications shall include complete electrical systems as shown on the plans and as specified herein. The General Conditions and Special Conditions of these specifications shall form a part and be included under this Section of the Specifications. Provide all supervision, labor, material, equipment, machinery, factory trained personnel, and any and all other items necessary to complete the electrical systems. All items of equipment are specified in the singular; however, provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.

1.23 ELECTRICAL CONNECTIONS

A. Each Subcontractor under Division 26 shall provide and install all electrical work and connections except those specifically set forth below as being provided and installed by the Mechanical Subcontractor under Division 23.

1. The Electrical Contractor shall furnish and install all wiring under Division 26, except:

a. Temperature Control Wiring

b. Equipment Control Wiring

c. Interlock Wiring

2. The Electrical Contractor shall furnish and install under Division 26 all power wiring complete from power source to motor or equipment junction box, <u>including power wiring through starters</u> and shall connect to power lugs on the equipment. Nothing in any section in Division 23 or 26 shall overrule this.

1.24 CONDUITS

A. When conduit is required for low voltage wiring, the Electrical Subcontractor shall provide and install same under Division 26.

1.25 MOTORS

A. Motors shall be furnished by the manufacturer or supplier of the specified equipment.

B. General purpose motors shall be open drip-proof conforming to NEMA Design B, Class B insulation, continuous 40 degree C ambient, 60 Hz, 1.15 service factor, and 1800 RPM maximum speed unless specified otherwise. Voltage shall be as specified in individual Specification Sections. All motors 3/4 HP and smaller shall be self lubricating. Larger motors shall be self lubricated, if specified.

C. Motors shall be protected with thermal overload devices at the motor, or by the motor starter. Disconnect switch at motors are for service purposes and shall be unfused type, unless fusing is specifically required by the manufacturer.

D. Motors smaller than 3/4 HP shall be single phase and shall be three phase when 3/4 HP and larger, unless specified otherwise.

1. Single phase motors 1/2 HP and smaller shall have built-in overload protection furnished by the Mechanical Subcontractor; single phase and three phase motors larger than 1/2 HP shall

have separate motor starters furnished by the Mechanical Subcontractor and installed by the Electrical Subcontractor as overload protection.

2. Single phase motors shall be capacitor start, capacitor run.

3. Equipment requiring 1,000 watts or more shall have a power factor of 85% or greater at rated load conditions. Equipment with a power factor less than 85% shall be corrected to at least 90% power factor under full load operating conditions. Power factor corrective devices shall be switched with related equipment.

4. Motor characteristics which change from that specified, due to the Contractor electing to use one of the optional manufacturers, or an updated model, etc., shall be coordinated with the Electrical Subcontractor, through the General Contractor.

   a. The Contractor making the change is responsible for the cost and design of any revisions necessary to provide proper power and control connections in full accordance with the National Electrical Code, and State and Local Codes.

5. Phase monitors shall be provided by this Contractor for motors over 3/4 HP.

E. The Electrical Contractor shall install under Division 26 all motor starters and contactors, except when specified to be furnished by the equipment manufacturer under Division 23. Separate motor starters shall be provided by the Mechanical Subcontractor and installed by the Electrical Subcontractor, ANY WORK IN DIVISIONS 23 AND 26 TO THE CONTRARY NOT WITHSTANDING.

F. Electrical work provided and installed by Subcontractors under Divisions 23 and 26 shall be performed by electrical contractors licensed under the Florida Construction Industries Licensing Board, and by properly qualified foremen, journeymen and apprentices. At least one electrician licensed by the State of Florida shall be on the site whenever any electrical work is being done. All fire alarm wiring shall be by licensed and experienced technicians trained by the manufacturer of the equipment.

G. Air conditioning equipment containing various electrical components within its housing shall be furnished by Division 23 with internal wiring arranged to terminate at one set of electrical power lugs. Components shall be approved for group operation as defined by the National Electrical Code, or auxiliary equipment must be provided as required to satisfy the National Electrical Code and UL Labels (or other appropriate labels) of the unit.

H. Where specific instructions are not indicated or specified, provide the following items on the installation of motor equipment furnished under Division 26:

1. Provide templates and anchor bolts.

2. For equipment placed on the ground floor or on the structural system, provide a minimum of a four inch (4") thick reinforced concrete equipment pads, and also provide resilient isolation pads between equipment and slab or structure. Such slabs shall be designed and reinforced to meet the conditions.

3. For suspended equipment, this Contractor shall provide structural supports designed to carry all loads, with "simple" framing, anchoring devices and vibration isolation devices approved by the Project Architect/Engineer.

I. Control devices, such as thermostats, firetraps, step controllers, strip heat contactors, etc., shall be installed in place under the Mechanical Sections of these Specifications and shall be wired complete

under the pertinent Mechanical Section. All control circuiting shall be installed in accordance with diagrams furnished under the appropriate Mechanical Section, and which have been approved by the Project Architect/Engineer.

1.26 PAINTING

A. General:

1. All field painting shall be performed under the subcontract for electrical work and shall be as specified in the Painting Section of the Specifications. Each Subcontractor shall leave his work clean and free from oil, dirt, and grease and shall do field painting, where required.

B. The Contractor providing equipment, conduit, raceways, piping, etc., shall, upon completion, thoroughly clean all work to remove all dirt, grease, rust and oil. The Contractor shall vacuum clean the inside and outside of panel box and equipment cabinets. The Contractor shall clean galvanized piping, conduit, raceway, and work in exposed areas with diluted acetic acid. He shall thoroughly prepare all such work for painting.

C. Equipment:

1. All equipment shall have factory standard finish. Where zinc chromate paint is specified to be left for painting by each Subcontractor, it shall be made up in synthetic resin vehicle.

2. Factory finished equipment which has rusted or been damaged shall be repaired, cleaned, spot primed and entirely repainted the original color by this Contractor.

3. Insulation coverings shall be cleaned, sized (if necessary), and painted for service identification by this Contractor.

D. Ferrous metal installed under this Division 26 of the Specifications which is exposed to view or to the weather, such as conduits, raceway, supports, etc., shall first be painted with one coat of priming zinc chromate. Finished paint shall be in accordance with the Painting Section by the Contractor providing the work under the Electrical Section.

E. Painting Schedule for visible equipment & conduit:

Table 1. Color Identification

Classification Predominant Color	Color of Letters of System	for Legend
F - Fire protection materials and equipment	Red	White
D - Dangerous	Yellow (or Orange)	Black
S - Safe materials	Green (or the achromatic colors): white, black, gray, or aluminum	
P - Protective materials	Bright Blue	White

1.27 PENETRATION OF ROOFING MEMBRANES

A. Penetration of finished roofing or roofing membranes by work under this Division 26 shall only be done through curbed construction sufficiently high to raise the top of the perimeter 45° cant a minimum of four inches (4") above the highest point of "horizontal" roofing membrane occurring around that curb, and high enough to raise the top of the curb eight inches (8") above the highest point of "horizontal" roofing membrane around that curb.

B. Such curbs shall be constructed of either a minimum of two (2) each "laminated" layers of 3/4" thick exterior grade plywood glued and nailed together, or sixteen (16) gauge (minimum thickness) galvanized steel preformed curb system forming 1-1/2" minimum "double wall" thickness. Such curbs shall be thoroughly anchored to the roof framing system. All necessary steel framing shall be provided and installed.

C. The Subcontractor providing the conduit or equipment penetrating the finished roofing or roofing membrane shall provide the roof curbing and cant system prefabricated and ready for the (General) Contractor to install, for and to which the Roofing Subcontractor shall provide and install roofing membrane and fabric base flashing.

D. The Subcontractor providing the conduit or equipment penetrating the finished roofing or roofing membrane shall provide, for the (General) Contractor to install, miscellaneous steel framing members to support the roof curbs and to anchor to the roof framing system. For bidding purposes such Subcontractor shall assume the providing of two (2) each 3" x 3" x 3/16" steel angles by 4'-0" long, and shall also provide two (2) each 3" x 5" x 1/4" x 7'-0" long steel angles for each curbed opening for roof penetrations. Such actual sizes, quantities and miscellaneous framing members to accommodate job conditions shall be determined later.

E. The Subcontractor providing the conduit or equipment penetrating the finished roofing or roofing membrane shall, in every instance, provide the metal counterflashing (which may be an integral part of the equipment housing) to cover and to extend down over the upturned roofing membrane and fabric base flashing perimetering the curb, by a minimum of three (3) inches.

F. Penetration of finished roofing or roofing membranes by conduit vents or similar work:

1. For built-up roofs, modified bitumen roofs, single ply roofs, clay or cement tile roofs or shingle roof, conduit penetrations shall be curbed and flashed as above specified.

2. For metal roofs, conduit and similar penetrations shall be flashed with special roof vent flashings compatible with the metal roof.

Such flashing shall be furnished to the Contractor to install by the Subcontractor causing the penetration.

G. Electrical conduit shall only penetrate roofing membrane through curbed openings (whether such opening serves equipment penetration or a grouping of conduit).

1.28 PENETRATION OF WATERPROOFING (INCLUDING WATERPROOF CONCRETE)

A. Quality Control:

1. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Project Architect/Engineer before work is done.

B. Materials and Installation:

1. The Subcontractor causing the penetration shall furnish and install in a timely fashion all necessary sleeves, caulking, and flashing materials required to make openings absolutely water tight.

1.29 PENETRATION OF SOUNDPROOFING

A. The Subcontractor causing the penetration of any sound proofing materials shall provide all necessary materials and labor to provide thorough and complete caulking of all penetrations through walls, partitions and decks, whether such penetration occurs above or below dropped ceiling lines.

B. Penetrations of special materials (such as face brick, precast concrete, etc.) shall be done by the trades doing such original work, at the expense of the Subcontractor needing the penetration.

C. Penetrations shall be cut or patched by such skilled mechanics in a manner that the hole is uniformly 1/8 inch clear all around the item penetrating it (including insulation) so that a full penetration (but not excessive) sealant bead can be installed.

D. This Subcontractor shall do all sealant work required to seal completely on both sides of walls, partitions and decks which are penetrated.

E. Sealing work shall be done in strict compliance with requirements of the Caulking and Sealants Section.

F. Any pipe, duct, conduit or other item penetrating a wall, partition or deck which item tends to vibrate, shall have sufficient corrective methods effected to one or both sides of the penetration that no vibration occurs at point of penetration. This work, or the cost of such work, shall be at the expense of the Subcontractor needing the penetration.

1.30 DEFINITIONS

A. The definitions set forth in Division 1, shall apply to Sections in this Division 26. (Such also includes the definitions in the General Conditions.)

B. Additional Technical Definitions:

1. "Raceway" shall mean pipe, conduit, fittings, flanges, controls, hangers, and items customarily required in connection with the transmission of electrical energy.

2. "Concealed" shall mean embedded in masonry or other construction, installed within or behind wall furring, within partitions or double partitions or hung ceilings, in crawl spaces, in shafts, in chases, buried in trenches.

3. "Exposed" shall mean not concealed.

4. "Demolition" shall be the removal of any existing equipment, and the capping or plugging of any existing services to that equipment. (See paragraph 1.26 above.)

5. "Furnish" means to purchase and deliver products and equipment to the project site and prepare for installation.

6. "Install" means to uncrate, assemble, erect, place, anchor and connect furnished products into satisfactory operation.

7. "Provide" means to furnish and install.

C. The term "this Contractor" when used refers to the Subcontractor of each pertinent Section of Division 26.

1.31 AMPLIFICATION

A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of an item, in the Drawings or Specifications either or both, carries with it the intent to furnish and install the item, regardless of whether or not this is explicitly stated as part of the indication or description.

B. In case of discrepancy concerning quality and/or quantity within the Contract Documents, this Contractor shall provide the better quality and/or the greater quantity unless otherwise determined in writing by the Project Architect/Engineer, at no increase to the Contract amount.

C. No exclusions from, or limitations in, the language used in the Drawings or Specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted. This Contractor shall furnish and install such at no increase to the Contract amount.

D. The Drawings, of necessity, utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The Work shall be installed, in accordance with the diagrammatic intent expressed on the electrical and mechanical drawings, and in conformity with the dimensions indicated on final architectural and structural drawings. Such may be adjusted to accommodate equipment shop drawings.

E. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Project Architect/Engineer for clarification. In general, the architectural drawings shall take precedence over the mechanical or electrical drawings with reference to building construction. Any change from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to the rules of authorities having jurisdiction, shall be made at no expense to the Owner.

F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.

G. Certain details appear on the Drawings which are specific with regard to the dimensioning and positioning of the Work. These details are intended only for the purpose of establishing general feasibility. They do not obviate this Contractor's responsibility for field coordination for the indicated Work. It shall be the duty of this Contractor to supplement any plans and details shown with his own knowledge and experience concerning good installation practice and, with the approval of the inspecting authority, to make any modifications necessary to fit the specific equipment for use, to avoid conflicts with other trades, and to execute this work properly in accordance with the full intent and meaning of the Drawings and Specifications.

H. Capacities, sizes and conditions specified or shown are allowable minimums. Based on design and rated operating conditions of systems, motors shall not be overloaded. Equipment shall not operate at speeds or temperatures greater than manufacturer's published recommendations, and no strain or demand shall be imposed upon any component of any system, structure or building. Also, no quality of architectural feature, function, or end result shall be adversely affected.

I. Information as to the general construction shall be derived from structural and architectural Drawings and Specifications.

J. The use of a word in the singular shall not be considered as limiting where other indications denote that more than one item is required. The determining of correct quantities in compiling his bid shall be the responsibility of this Contractor. The authority for determining the intent of the Contract Documents shall, in the first instance, be that of the Project Architect/ Engineer.

K. In the event that extra work is authorized and performed by this Contractor, Work shown on Drawings depicting such extra work, and/or described by Addendum, or by Change Order, shall be subject to the basic building and Contract Specifications in all respects.

1.32 QUALITY ASSURANCE

A. Standards: Certain standard materials and installation requirements are described by reference to standard specifications. These standards include the following:

1. ASA..... American Standards Association.

2. ASTM..... American Society for Testing and Materials.

3. ASME..... American Society of Mechanical Engineers - Code of Unfired Pressure Vessels.

4. NFPA..... National Fire Protection Association.

5. NEMA ..... National Electrical Manufacturers Association.

6. UL ..... Underwriters Laboratories.

7. ANSI ..... American National Standards Institute.

8. ASHRAE..... American Society of Heating, Refrigerating, and Air Conditioning Engineers.

9. SMACNA..... Sheet Metal and Air Conditioning Contractors' National Association.

10. AMCA..... Air Moving and Conditioning Association.

11. ARI..... Air Conditioning and Refrigeration Institute.

12. AMA..... Acoustical Materials Association.

13. NEC..... National Electrical Code.

14. IEEE ..... Institute of Electrical and Electronic Engineers.

15. EIA ..... Electric Industries Associates.

16. IES..... Illuminating Engineering Society.

B. Whenever a reference is made to a standard, installation and materials, the intention is such shall comply with the latest published edition at the time project is bid, unless the edition is otherwise specified herein.

C. Materials and equipment herein shall be new and standard catalogued items manufactured by reputable concerns regularly supplying such materials. Material shall bear the Underwriters' Laboratories, Inc. label (or other appropriate label) where such is required or allowed by code, by Contract Documents or by authorities having jurisdiction.

D. Product deliveries shall be arranged in accordance with construction schedules and to avoid conflict with work and site conditions.

1. Deliver and store products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately upon delivery, this Contractor shall inspect shipments to assure compliance with the requirements of the Contract Documents and approved submittals, and that products are properly protected and undamaged.

3. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

E. Codes and Rules:

1. All material furnished and all work installed shall comply with the following codes as they apply to this project:

- NFPA 70, 72 and NFPA 101.
- Regulations of the Florida Industrial Commission Concerning Safety.
- Applicable County, State and Local Building Codes.
- Local and State Fire Marshal Rules and Regulations.
- Chapter 4A-47, Florida Administrative Code—Uniform Fire Safety Standards for Elevators.
- Occupational Safety and Health Agency Standards (OSHA).
- Florida State Board of Health Rules and Regulations.

Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

F. Permits, Fees, and Inspections

1. The Contractor shall give all necessary notices, obtain all permits, and pay all government fees, sales taxes, and other costs, including utility connections or extensions, in connection with this work; file all necessary approvals of all governmental departments having jurisdiction.

2. Obtain all required certificates of inspection for their work and deliver to the Owner/Engineer the same certificates before request for acceptance and final payment for the work.

3. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, and drawings required to comply with all applicable laws, ordinances, rules, and regulations.

4. The Contractor shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws, and regulations before submitting their bid.

1.33 CONTRACTOR QUALIFICATIONS

A. The Contractor or Subcontractors performing work under all Sections of this Division 26 shall be regularly engaged in the type of work to be furnished under these Sections and shall be licensed under the Florida Construction Industries Licensing Boards for such specialty trades, and such firms shall employ properly qualified foremen, journeymen and apprentices as appropriate and in keeping with best trade practices.

B. Each firm shall be able to provide, upon request, a list of similar jobs it has completed.

C. The Project Architect/Engineer and the Owner reserve the right to reject Subcontractors who have seriously questionable capabilities to perform the specific type and quality of work intended, or who have a poor record in performance.

1.34 ORGANIZATION OF THE WORK

A. Each Subcontractor in Division 26 (i.e., this Contractor) shall put his work in place as fast as possible to meet all construction schedules, but only after coordinating his own work and the work priorities of other Subcontractors and the General Contractor.

B. Prior to starting the work, this Contractor shall carefully verify all measurements at the site and determine that the work will properly clear openings, structural members and the work of other trades. Correlate the time of each work item with all other items to the best advantage of the completed job. Furnish, in ample time to avoid delays in the work, all information required to revise footing elevations, structural elements, chases and openings in floors and walls, and to provide clearances which may be required to accommodate the work. Set all sleeves, anchor bolts and inserts required to accommodate equipment before concrete is poured or masonry is started.

C. Locate existing utilities prior to beginning work. Reroute or replace existing utilities where necessary to permit installation of Work. Provide adequate means of protection during work operations. Repair existing utilities damaged during work operations to the satisfaction of the utility and at this Contractor's expense.

D. Should uncharted or incorrectly charted electrical or other utilities be encountered during work operations, notify the Project Architect/Engineer immediately for procedure directions. Cooperate with utility companies in maintaining active utilities in operation.

E. It is this Contractor's responsibility to immediately act to put any damaged utilities back in functioning conditions. Resolution to establish obligation to bear the cost will follow.

F. Each Subcontractor in Division 26 shall, at all times while work under such subcontract is taking place, keep on the site a competent superintendent in charge of the Work. Such superintendent shall be replaced if unsatisfactory to the Owner and/or Project Architect/Engineer.

G. Each Subcontractor shall maintain a complete file of all Contract Drawings, Specifications, and approved shop drawings at the site to be made available for inspection by Owner's and/or Project Architect/Engineer's representatives.

H. Installation and equipment shop drawings shall be initialed and dated upon installation. This procedure will serve to ensure proper scheduling and enable Owner's representatives to check the work in progress.

I. Each Subcontractor shall be responsible for his work until its acceptance and final Substantial Completion, and shall replace any of the same which may be damaged, lost or stolen without additional cost to the Owner.

J. Unless otherwise set forth in the subcontracting agreement, each Subcontractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery to and removal from the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

K. Each Subcontractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or his work.

L. The Contractor is required to minimize construction noise levels in all locations adjacent to or in occupied areas.

M. Protect equipment and materials during construction from damage from water, dirt, welding and cutting splatter, paint droppings, etc., by use of shields and drop cloths. Damaged equipment or materials shall be repaired or replaced by the responsible Subcontractor to the Project Architect/Engineer's satisfaction.

N. Products stored outside shall be covered with waterproof drop cloths or tarpaulins. Equipment which may be damaged by the elements shall not be stored outside. Condensation shall be prevented by heating and ventilating.

O. During construction, maintain materials and equipment in an orderly manner.

P. Provide the following accessory materials for electrical systems. Where similar accessory materials are specified with material and/or equipment, or are shown on the Drawings, the requirements of the Technical Specification Section or Drawings shall govern.

1. Anchor bolts or other anchoring devices be of the size and type recommended by equipment manufacturer for specific application.

2. Structural support (steel) for elevated or suspended mechanical items shall be made with connections using "simple" framing.

3. Resilient isolation pads for motors and equipment shall be rubber-in-shear pads and of type recommended by manufacturer of the motor and equipment unless otherwise specified. (See sound proofing requirements.)

4. Dielectric fittings shall be provided where copper joins steel, aluminum or iron, or any dissimilar metals such as insulating bushings or unions.

5. Escutcheons shall be provided where conduits pierce exposed partitions, floors, walls or ceilings, to cover raw edge. Escutcheons shall be chrome plated. (See sound proofing requirements.)

Q. Delay caused by equipment not being on the job site when required shall be avoided in the following manner:

1. This Contractor shall furnish and install a temporary substitute piece of equipment (subject to approval of the Project Architect/Engineer), allowing the building to become operative. The temporary substitute equipment shall later be removed and replaced with that originally specified (or originally approved) when it arrives, all at the convenience of and at no additional cost to the Owner.

1.35 EXCAVATION

A. Each Subcontractor shall do trench and pit excavating and backfilling inside and outside the building, as required by his work, including shoring and bracing, pumping and protection for safety of persons and property. Trench excavations performed under this Contract whether by the Contractor or any Subcontractor shall be done in strict compliance with Florida Statute Chapter 553 Part VI "The Trench Safety Act" (See Section 553.60-553.64). This pertains to the design of the trench safety system and shoring.

B. Backfill shall be compacted in layers not exceeding six inches (6") in depth. Completed backfill shall conform to surrounding ground and finished grade and with compaction requirements of Division 31, Sitework.

1. Concrete encasement: Piping passing under footings, foundations and other locations, as shown on Drawings, shall be encased on all sides. Concrete shall conform to Division 03, Concrete Requirements.

2. Extend concrete encasement around piping and each side of footings or foundations.

C. Remove non-usable excavated material from the site. Deposit any usable surplus material on site where directed by the Project Architect/Engineer. Do not remove usable material from site.

D. Provide and maintain bracing, shoring, sheet piling, or sheathing as required to safely support sides of excavations. The Contractor doing the excavation and the Contractor using the excavation are responsible for safety in excavations.

E. This Contractor shall provide and operate pumping equipment to keep excavations free of water.

F. This Contractor is responsible for repairing and restoring paving, streets, curbs, walks, and other work in the area where excavations are made. Any existing underground piping, conduit, etc. damaged during construction, shall be returned to original condition at no additional cost to Owner.

G. Provide additional excavation and backfill where required to resolve conflicts in buried lines.

H. Coordinate timing of excavations in advance with other trades.

I. Excavation shall be open cut from the surface.

J. Hold trench width to a minimum.

K. Do not excavate utility trenches parallel to building footings closer than four feet (4') from the footings except by approval of the Project Architect/Engineer. When parallel trenches require cuts deeper than the building footings, the horizontal distance from the footing shall be equal to or greater than one and one half (1-1/2) times the vertical distance below the footing, but in no case shall the horizontal distance be less than four feet (4') except by the approval of the Project Architect/Engineer.

L. Mechanical excavation shall be held to four inches (4") above final grade of the bottom of trench. The remainder shall be shaped by manual excavation, so that piping is fully supported on undisturbed soil. Shoring of piping in trench will not be allowed. Piping must be suspended from above.

M. Whenever, in the opinion of the Project Architect/Engineer, the soil is unsuitable for supporting raceway and appurtenances, provisions for proper foundations shall be made at no additional cost to the Owner. Soil test reports are bound in the Specification book.

N. The Drawings for this project show the anticipated underground utilities. Where locations will interfere with proposed construction such shall be assumed to be a known factor to each Subcontractor unless such locations can be shown to be in error.

O. Wherever trenching or excavating, assume utilities may exist in area without such being shown on the Drawings. Exercise extreme caution. Should existing facilities be damaged, repair such to Project Architect/Engineer's satisfaction at no additional cost to the Onwer.

1.36 CHASE, CUTTING AND PATCHING

A. Provide and place required sleeves, forms and inserts before walls, ceilings, partitions, floors or roofs are built. The cost of cutting and patching of walls, partitions, ceilings, roofs and floors necessary for reception of this Contractor's work caused by his failure to provide or properly locate sleeves, forms and inserts, or caused by incorrect location of his Work, shall be borne by the offending Contractor.

B. Cutting of Finished Materials:

1. When it becomes necessary to cut finished materials, submit to the Project Architect/Engineer for approval, drawings showing the work required, and obtain approval before doing such cutting.

C. Chases and Openings:

1. Chases and openings in walls will be provided under the work of other Sections of these Specifications. This Contractor shall furnish exact dimensions and locations of these openings to suit the apparatus to be used before such walls are built, or shall bear the cost of the additional work to correct and provide for installation of such work.

D. Cutting of Work by Others:

1. No cutting or altering the work of other sections in these Specifications will be permitted without the approval of the Project Architect/Engineer and the Contractor. No structural members shall be cut without the previous written approval of the Project Architect/Engineer.

E. Core Boring:

1. Any holes in existing slabs or other concrete or finished work required for the installation of new piping shall be core bored and this Contractor shall seal around pipe or material. All fire ratings of slabs shall be maintained with approved UL listed fire rated products.

2. Prior to commencement of work, the area to be core drilled shall be examined by X-ray or ground penetrating radar.

F. Finish patch cut areas with floor tile, gypsum wallboard, plaster, ceiling panels or tiles as required to match existing. Paint entire disturbed area to match existing. This Contractor shall provide, at his expense, new ceiling panels and grid which his employees may have damaged during construction, utilizing skilled Subcontractors for each trade. Such work shall match existing.

1.37 LUBRICATION AND PACKING

A. Equipment furnished under Sections in Division 26 shall be lubricated by the Contractor furnishing such equipment, using manufacturer's recommended lubricants, with correct type and quantity of lubricant before placing into service. Damage caused by not providing proper lubrication shall be repaired at this Contractor's expense.

B. Lubrication of equipment requiring factory supervised start-up shall be verified by manufacturer's representative.

C. Packing glands shall be examined by this Contractor for proper packing. Proper packing seals shall be maintained during construction and during the warranty period.

1.38 QUIET OPERATION AND VIBRATION

A. Scope:

1. All equipment provided under Sections in this Division 26 shall operate (under all conditions of load), free of noise levels higher than specified in the pertinent Section. Such shall be free of annoying vibrations. Sound and vibration conditions considered objectionable by the Project Architect/Engineer shall be corrected by whatever additional work is required in an approved manner at no cost to the Owner.

B. Quality Control:

1. Vibration control shall be by means of approved vibration eliminators (or suppressors) in a manner as specified and as recommended by the manufacturer of the eliminators. Submit shop drawings for review by the Project Architect/Engineer.

1.39 INSTRUCTIONS

A. After the systems are in operation, the Contractor furnishing the equipment will thoroughly instruct the designated Owner's personnel on operation and maintenance of electrical equipment and systems.

B. This Contractor shall certify in writing that the designated personnel of the Owner (indicated above) were fully instructed in the care, operation and maintenance of all electrical equipment. This certification shall be signed by all persons attending acknowledging they attended the full instructional program.

1.40 CLEANING

A. This Contractor shall comply with cleaning requirements set forth in Section 1G - Standard Requirements.

B. Further, upon completion, raceways, panels, cabinets and equipment shall be thoroughly cleaned of dirt, grease, rust and oil, primed where necessary, and made ready for painting.

C. Clean galvanized work in exposed areas with diluted acetic acid.

D. Clean copper in exposed areas with emery cloth and solvent.

E. Clean gauges, thermostats and fittings.

1.41 LICENSE

A. The Subcontracting Firm for the electrical and systems installation shall be licensed by the State of Florida and the local authorities, regularly engaged in the installation of electrical systems, and other related equipment. The Subcontracting Firm shall be familiar with all local conditions including interpretations, codes and shall have at least five (5) years of successful installation experience on similar projects of the same magnitude and scope.

B. The Subcontracting Firm shall list at least three (3) projects it has successfully completed over the last five (5) years for proof of experience of this caliber. This list shall be included with submittals for review by Architect/Engineer. The Subcontracting Firm shall hold a Florida State Certified Electrical Contractor license for this project. The Subcontracting firm for the fire alarm system shall be a certified "EF" installer.

1.42 AS-BUILT DRAWINGS

A. This Contractor shall provide AutoCAD as-built drawings and copies of each AutoCAD file on floppy disk before final payment will be issued. If the original construction document is not an AutoCAD produced document, Mylar Sepias will be acceptable in lieu of plotted vellums and disks.

END OF SECTION 260100

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SECTION 26 05 19 - BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Wire and Cable.

B. Remote Control and Signal Cable.

C. Power Limited Fire Protective Signaling Cable.

D. Wiring Connectors and Connections.

1.02 RELATED SECTIONS

A. Section 260533 ..... Raceways and Boxes for Electrical Systems.

1.03 REFERENCES

A. ANSI/NFPA 70—National Electrical Code.

B. NEMA WC5—Thermoplastic-insulated wire and cable for the transmission and distribution of electrical energy.

1.04 PROJECT CONDITIONS

A. Verify that field measurements are as shown on drawings.

B. All conductors shall be copper.

C. Conductor sizes are based on copper.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.05 COORDINATION

A. Coordinate work under provisions of Division 1.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.01 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THHN/THWN, XHHW material rated 90°C.

2.02 CLASS 1 REMOTE CONTROL AND SIGNAL CABLE

A. Description: ANSI/NFPA 70, Type TFFN, THHN.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.03 CLASS 2 OR 3 REMOTE CONTROL AND SIGNAL CABLE

A. Description: NEMA/ICEA WC5, thermoplastic insulated cable, individual insulated conductors twisted together, metallic shielded and covered with PVC jacket when installed in metal raceway.

B. Conductor: Copper, stranded.

C. Insulation Voltage Rating: 300 volts.

2.04 CLASS 1 AND NON POWER—LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, Type TFFN, THHN installed in metal raceway.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.05 POWER LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, Type TFFN, THHN installed in metal raceway.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.06 POWER LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, Type FPL, FPLR installed in metal raceway.

B. Conductor: Copper.

C. Insulation Voltage Rating: 300 Volts.

2.07 POWER LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, Type FPLP installed in metal raceway.

B. Conductor: Copper.

C. Insulation Voltage Rating: 300 volts.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work, likely to damage wire and cable, has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire and cable (all types) in raceway.

B. Exposed Dry Interior Locations: For feeders, branch circuits, and Class 1 remote control circuits, use only building wire in raceway. For Class 2 or 3 control cable and power limited fire protective signaling cables, run in raceway.

C. Above Accessible Ceilings: For feeders, branch circuits and Class 1 remote control cables use only building wire in raceway. For Class 2 or 3 remote control cables run exposed. For power limited fire protective signaling cables, run in raceway.

D. Wet or Damp Interior Locations: For feeders, branch circuits and Class 1 remote control cables use only building wire in raceway. For Class 2 or 3 remote control cable and power limited fire protective signaling cables run in raceway.

E. Exterior Locations: For feeders, branch circuits and Class 1 remote control cables, use only building wire run in raceway. For Class 2 or 3 remote control cables and fire protective signaling cables, run in raceway.

F. Underground Installations: For feeders, branch circuits and Class 1 remote control cables, use only building wire run in raceway. For Class 2 or 3 remote control cables and power limited fire protective signaling cables, run in raceway.

G. Use wiring methods indicated on drawings.

3.04 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Each computer/clean power receptacle and lighting circuits shall have a dedicated neutral conductor.

C. If stranded conductors are used for branch-circuits, the devices shall be pressure terminal type.

D. Use stranded conductors for control circuits and for feeder and branch circuits No. 10 and larger.

E. Use conductor not smaller than #12 AWG for power and lighting circuits.

F. Use conductor not smaller than #14 AWG for control circuits.

G. Use #10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 200 feet throughout the entire length of the branch circuit. Branch circuits of exceptionally longer lengths (i.e., site lighting, marquee signs, basketball court power, etc.) shall require an increase in conductor size.

H. Use #10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

I. All phase conductors shall have color coded insulation. Conductors size #8 and larger shall be color coded by the use of colored plastic tape applied within 6" of each conductor end. All color coding shall be with the same color being used with its respective phase or bus through the entire length of conductor with enclosures, boxes, cabinets, wireways, panels, switchboards, as follows:

120/240 VOLTS	120/208 VOLTS	277/480 VOLTS
Phase A…..Black	Phase A .....Black	Phase A….Brown
Phase B…..Orange (Hi-Leg)	Phase B .....Red	Phase B….Orange
Phase C…..Blue	Phase C .....Blue	Phase C….Yellow
Neutral…..White	Neutral .....White	Neutral ..... Gray
Ground…..Green	Ground .....Green	Ground..... Green
Travelers…Purple	Travelers……Purple	Travelers ..... Purple

J. Grounded conductors (neutral) shall be identified with a continuous outer finish that is white or gray. Color coding with plastic tape is not acceptable. Grounded conductors (larger than size #6) shall be color coded at 12" intervals with a continuous white or gray outer finish or by white plastic tape on other than green insulation along its entire length at its terminations. This marking shall encircle the conductor or insulation and cover the entire exposed portion of the conductor at the terminations.

K. Equipment grounding conductors shall be identified with a continuous outer finish that is green or green with one or more yellow stripes. Color coding with plastic tape is not acceptable. Grounding conductors (larger than size #6) shall be color coded at each end and at every point where the conductor is accessible. Identification shall encircle the conductor and shall be accomplished by one of the following:

1. Stripping the insulation or covering from the entire exposed length.

2. Cover the entire length of exposed insulation with green plastic tape at all locations the conductor is accessible.

L. Use suitable wire pulling lubricant for building wire #4 AWG and larger.

M. Protect exposed cable from damage.

N. All conduits entering boxes, enclosures, cabinets, wireways, etc., shall be labeled with a suitable approved permanent marker identifying the appropriate panel/panelboard and branch circuit number serving same. The same shall apply to all enclosure covers.

O. Use suitable cable fittings and connectors.

P. Neatly train and lace wiring inside boxes, equipment, and panelboards.

Q. Clean conductor surfaces before installing lugs and connectors.

R. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

S. Use Utilco blocks for copper conductor splices and taps, #6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

T. Terminate spare conductors with electrical tape or wirenut.

U. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, #8 AWG and smaller.

V. Splice only in accessible junction boxes.

W. Do not use quick-connect splice devices.

X. Feeders and service entrance conductors (as defined by NEC Article 100) shall not be spliced.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 1.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

E. Verify continuity of each control circuit conductor.

F. Verify proper phasing of conductors prior to energizing or reenergizing any and all electrical equipment.

END OF SECTION 260519

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SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Grounding Electrodes and Conductors.

B. Equipment Grounding Conductors.

C. Power System Grounding/Bonding.

D. Communication System Grounding.

E. Electrical Equipment and Raceway Grounding and Bonding.

F. Building Grounding/Bonding Detail.

1.02 RELATED SECTIONS

B. Section 264313 ..... Surge Protective Devices (SPD).

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70 / NEC Article 250.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. (UL) or NRTL, as suitable for purpose specified and shown.

1.04 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral and each separately-derived system (i.e., transformers and generators) neutral at service entrance equipment within five feet (5') of entrance to building to metallic water service, concrete encased rebar, to building steel, and to supplementary grounding electrodes.

B. All low voltage communication systems shall be bonded per the grounding detail.

1.05 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Indicate location of system grounding electrode connections and routing of grounding electrode conductor.

1.06 PERFORMANCE REQUIREMENTS

A. The grounding system installed on permanent building and structures shall provide a maximum of 10 ohms resistance to ground. Grounding systems installed on relocatable structures and playcourts shall provide a maximum of 25 ohms resistance to ground.

PART 2 PRODUCTS

2.01 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch for permanently installed buildings and structures.

C. Length: 20 feet minimum.

2.02 MECHANICAL COUPLINGS (GROUND RODS)

A. Material: Bronze.

2.03 WIRE

A. Material: Solid copper 4 AWG and smaller. Stranded copper larger than 4 AWG.

B. Foundation Electrodes: 3/0 copper conductor.

C. Grounding Electrode Conductor: Size to meet National Electrical Code Table 250-66 requirements.

2.04 GENERAL

A. All connections shall be exothermic welds to made electrodes (Erico CADWELD or equal). Access boxes shall be provided for inspections, whether in sidewalks, concrete, or landscape areas. Provide an Eritech T416B HDP inspection well for each driven ground rod.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Minimum twenty feet (20') continuous/unbroken per NEC.

D. Provide grounding and bonding at Utility Company's metering equipment and pad-mounted transformer.

E. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.

F. Provide bonding to meet Regulatory Requirements.

G. Bond together metal siding not attached to grounded structure.

H. Bond together each metallic raceway, pipe, and other metal objects.

I. Provide equipment grounding conductors in all raceways including FAS/Intercom or Paging/CATV/Data/Telecommunications/Power/Lighting/etc. per NEC. A minimum #6 AWG insulated bonding/grounding conductor shall be installed for telecommunication, CATV, intercom and data systems. A minimum #12 shall be installed for fire alarm and power/lighting systems.

J. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, or ground bar.

K. Provide a system bonding jumper from each separately derived system to connect the equipment grounding conductors of the separately derived system to the grounded conductor. The grounded conductor of the separately derived system shall be bonded to the to equipment grounding conductors at the transformer of origin.

L. The following systems and/or equipment shall be bonded in strict accordance with the NEC as minimum requirements:

1. Fire alarm systems.

2. Intercommunication systems.

3. Building power/lighting systems.

4. Raceway and conduit systems.

5. Telecommunication systems.

6. Lightning protection systems/SPD.

7. Non-current carrying metal parts of all motors, panels, and other electrically operated equipment.

8. CATV Systems.

M. Use minimum 4 AWG copper conductor for communications service bonding conductor.

N. All connections to ground rods, footer steel and ground rings shall be made by exothermic welds. Also see Electrical Distribution Grounding System detail and ground buss on contract drawings.

O. All ground rod installations shall be a minimum 20' in total length.

3.03 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Prior to energizing, measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms for permanent buildings and structures and 25 ohms for relocatables and playcourts.

C. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method. Submit test results to Engineer for review and approval.

3.04 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of grounding electrodes.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

END OF SECTION 260526

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Conduit and Equipment Supports.

B. Fastening Hardware.

C. Luminaire Supports.

1.02 COORDINATION

A. Coordinate size, shape, and location of concrete pads.

1.03 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 GENERAL

2.01 MATERIAL

A. Support Channel: Galvanized or Painted Steel or Aluminum (Interior). Aluminum or Stainless Steel (Exterior).

B. Hardware: All exterior hardware (nuts, bolts, screws, washers, etc.) shall be stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fasten hanger rods, conduit clamps, outlets, and junction boxes to building structure using expansion anchors, beam clamps, or spring steel clips. All supporting devices and hardware shall be UL listed for that purpose and per other sections of this specification. In no case will the support device be less than this specification or the manufacturer's requirements and standards for the equipment/material to be supported.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. All raceways shall be independently supported to building structure. Do not use boxes with attached conduit brackets as sole conduit support.

D. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

E. Do not use powder-actuated anchors.

F. Do not drill structural steel members. Limited to strapping conduit. All other holes shall have Structural Engineer's approval prior to cutting or drilling.

G. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

H. In wet locations, install free-standing electrical equipment on concrete pads.

I. Install surface-mounted cabinets and panelboards with minimum of four (4) anchors.

J. Bridge studs (top and bottom) with channels to support flush-mounted cabinets and panelboards in stud walls.

K. Gym and highbay, low bay fixtures shall be supported with bolts/screws that run through the outlet box to the top side with lock nuts and washers. Blank plates/covers shall not be used as support of fixtures.

L. Safety of Overhead Materials, Fixtures, and Equipment (Reference Specification Section 265100, Interior Lighting):

1. Troffer or Lay-In Fixtures

   a. Typical 2' x 4', 1' x 4', and 2' x 2' lay-in light fixtures shall be independently supported at all four corners with a minimum #12 solid galvanized wire to building structure (i.e., four (4), independent, support/tie wires to each fixture). Support wires shall not exceed 45º angles to support means.

2. Surface Mounted Fixture

   a. Each surface mounted fixture on plaster ceilings, shall be secured to lighting outlet box and shall be installed with two (2), ¼" threaded rods (one on each end) secured to structural ceiling joists.

   b. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. (i.e., four (4), independent, support/tie wires to each fixture, or ¼" all thread to bar joist or to unistrut bolted to bar joist). Support wires shall not exceed 45º angles to support means.

3. Pendant Mounted/Suspended Fixture

   a. Grid Ceilings: Each pendant mounted fluorescent light fixture shall be independently secured by a secondary and supplementary system of two (2) wires from the canopy and support system of each pendant leg of such fixtures to the building's structural framing above.

   b. Plaster Ceilings: Each surface mounted fixture on plaster ceilings, shall be secured to lighting outlet box and shall be installed with two (2), ¼" threaded rods (one on each end) secured to structural ceiling joists. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaires at indicated height.

4. Recessed Fixtures

a. Grid Ceiling: Each recessed fixtures shall be independently supported at all four corners with a minimum #12 solid galvanized wire to building structure (i.e., four (4), independent, support/tie wires to each fixture). Support wires shall not exceed 45º angles to support means.

b. Hard Ceilings: Support recessed luminaires in hard ceiling directly from building structure. (i.e., four (4), independent, support/tie wires to each fixture). Support wires shall not exceed 45º angles to support means.

5. Wall Mounted Fixtures

a. Each wall mounted fixture shall be secured to lighting outlet box and shall be installed with either two (2) ¼" 20 toggle bolts, or tapcons or metal screws secured to block or stud walls.

6. Exit Signs

a. Install exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend exit sign at indicated height. Outlet box shall be supported by T-Bar hanger with one tie wire to structural support.

7. Emergency Battery Packs

a. Each wall mounted, emergency batter pack shall be secured to outlet box and shall be installed with either two (2) ¼" 20 toggle bolts, or tapcons or metal screws secured to block or stud walls.

8. Any incandescent (or other fixture) shall be independently secured by a secondary and supplementary system of one (1) wire from the fixture can or canopy and support system of each such fixture to the building's structural framing above.

9. Other similar equipment (heavy speakers, etc.) shall be similarly secured with and independent secondary and supplementary support system.

10. Connection to structure, fixtures, equipment:

a. Wire shall penetrate the cans or canopies of light fixtures and equipment or otherwise connect to such in a fool-proof and positive manner. Wire shall loop through structural framing members above. Wire shall be turned back onto itself and be given two (2) minimum full twists with at least one inch (1") tail remaining beyond the twist. Wire kinked or evidencing failure at twists or elsewhere shall be replaced. Wire shall be installed in a taut fashion (not slack).

b. Wire rope and cable shall penetrate or pass through a portion of the fixture or equipment in a manner adequate to sustain the force developed by the fixture or equipment should it drop or fail. Wire rope and cable shall be either turned back into itself or continue into a complete loop until it lays beside-itself. Wire rope and cable shall be secured to itself with a minimum of two (2) each swagings or clips, fully tightened. A minimum of one inch (1") tails shall protrude after tightening of the clamping device.

c. Chain shall pass through a portion of the fixture or equipment in a manner adequate to sustain the force should the fixture or equipment drop or fail, or should the primary support system fail or fall. Chain shall be secured to the fixture or equipment and to the building's structural framing by means of special links, shackles, or fittings.

d. Wire, chain, wire rope, and cable shall be installed as nearly vertical as possible and in no event at an angle of more than 45 degrees from the vertical.

11. Materials

a. General Specifications for Chain: Equivalent to Campbell Chain Company's specified system of steel, electrically welded standard finish (do not galvanize or electroplate) in continuous lengths. Comply with manufacturer's recommendations.

b. Drop Forged Chain Fittings (eye bolts, pad eyes, inks, chain shackles, snaps, anchor shackles, swivels, turn buckles): Of the same materials and finish as the chain and of the same or greater working load limits, of the same manufacturer or as may be specifically recommended by the chain manufacturer.

c. General Specifications for Wire: 12-gauge galvanized annealed steel wire (multiple strands of lesser gauge will not be considered acceptable). Each wire shall, itself, be looped through the building structural framing above and not to other wiring systems. The angle of the wires shall be kept as vertical as possible and not over 45 degrees from the vertical.

d. Cable for Exposed-to-Public-View-Applications: Where suspended chandeliers, light fixtures, or special equipment occurs, stainless steel flexible aircraft cable or stainless steel flexible marine cable, 302/304, as manufactured by Paulsen, or equal, or Sailbryte as manufactured by Macwhyte corrosion resistant stainless steel or better, right regular lay, in continuous lengths, shall be used. Comply with manufacturer's recommendations.

e. Forged and other stainless steel fittings for stainless steel aircraft or marine cable (turnbuckles, swagings, Nicro-Press sleeves, wire rope clips, use only in concealed positions), connecting links shoulder rivets, jaw fittings, eye fittings, lifting eyes, thimbles, swivels, eye nuts, heavy thimbles, clevis nuts, eye pads, shoulder pins); of same material, of same or greater working loads limits as the cable, of the same manufacturer or as recommended by the cable manufacturer, of type 304/316 electro-polished finish, drop forged, non-magnetic (when available for particular fitting). Manufactured by Merrill or equal. See Workmanship paragraph below.

f. Stainless steel cable for loads (per cable) not exceeding 100 lbs.: 3/32" 7x19 with tensile load limit of 920 lbs. minimum.

g. Stainless steel cable for loads (per cable) not exceeding 500 lbs.: 3/16" 7x19 with tensile load limit of 3,700 lbs. minimum.

h. Workmanship: Stainless steel cable is required to be used only in areas where such is exposed to "public view;" therefore, only fittings designed for cold swaging or Nicro-Press fittings or swagless terminals such as Macwhyte Norseman Terminals are to be used whereby no wire ends, nuts, pins, or cotter keys, or clips are visible. Swaging shall be done only with a rotary swager (not a roll swager). Manufacturer's recommendations and specifications shall be adhered to. Pertinent portions of the booklet Wire Rope Facts published by Banks Wire Rope and Sling, Inc. (available in Tampa) and Construction Care and Maintenance of Marine Rigging by Macwhyte Wire Rope Company (available at the Lazzerette Company) which may pertain also to stainless steel cable, shall be adhered to.

END OF SECTION

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SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal Conduit.

B. Flexible Metal Conduit.

C. Liquidtight Flexible Metal Conduit.

D. Electrical Metallic Tubing.

E. Non-Metal Conduit.

F. Fittings and Conduit Bodies.

G. Wall and Ceiling Outlet Boxes.

H. Floor Boxes.

I. Pull and Junction Boxes.

J. In-Ground Cast Concrete Boxes.

K. FS/FD Cast Device Boxes

1.02 RELATED SECTIONS

A. Section 260100 ..... Basic Electrical Requirements.

B. Section 206526 ..... Grounding and Bonding.

1.03 REFERENCES

A. ANSI C80.1—Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3—Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1—Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. ANSI/NFPA 70—National Electrical Code.

E. NECA "Standard of Installation."

F. NEMA TC 2—Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. NEMA TC 3—PVC Fittings for Use with Rigid PVC Conduit and Tubing.

H. UL651A—Type EB and A Rigid PVC Conduit and HDPE Conduit.

I. UL651B—Continuous Length HDPE Conduit.

J. ANSI/NEMA OS 1—Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

K. NEMA 250—Enclosures for Electrical Equipment (1,000 Volts Maximum).

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 1-1/4 inches.

B. Accurately record actual routing of all underground conduits.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Division 1.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.07 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

D. Verify locations of floor boxes and outlets to rough-in.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Homerun shall mean first outlet box or adjacent J-box for lighting branch circuits. Homeruns shall be a minimum size of three-quarter inch (¾"), unless otherwise specified.

B. Underground Installations:

1. Use thickwall nonmetallic conduit, Schedule 40 PVC.

2. In or Under Slab-on-Grade: Use Schedule 40 PVC or gray HDPE pipe, per NEC requirements. Use only UL listed and approved fittings for coupling and change-over to different type raceways.

3. Minimum Size: ¾".

4. Install rigid steel, long radius elbows for conduits larger than two inches (2").

5. Under slab metal conduit or poured-in concrete metal conduit shall be painted with a coat of bitumastic. The bitumastic shall be continuous and continue up through penetration of concrete slabs, up to 12" A.F.G. Corrosion tape is acceptable.

C. Outdoor Locations, Above Grade: Use rigid steel and liquidtight flexible metal conduit.

D. Wet and Damp Locations: Use rigid steel, aluminum, intermediate, and liquidtight flexible metal conduit.

E. Dry Locations:

1. Concealed: Use rigid steel, aluminum, intermediate metal conduit, and electrical metallic tubing.

2. Exposed:

a. Exterior—Rigid Steel only.

b. Interior—Rigid Steel to 4'0" A.F.G., then Electrical Metallic Tubing.

F. Fire alarm systems raceways/conduits shall be RED its entire length as applied by the manufacturer.

2.02 METAL CONDUIT

A. Rigid Steel, Aluminum, and Intermediate Metal Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings.

C. Provide a minimum of half-inch (½") for flexible connections to equipment.

2.03 FLEXIBLE METAL CONDUIT

A. Description: For exposed locations, interlocked steel construction. For concealed locations, interlocked steel construction or aluminum.

B. Fittings: ANSI/NEMA FB 1.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel set screw or steel compression coupling or connectors. All connectors shall be insulated throat, up to one inch.

2.06 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT

A. Description: UL651A; UL651B, extruded rigid, Schedule 40, high density polyethylene. Gray in color.

B. Fittings: UL651A.

2.08 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required. Minimum depth—2½-inches.

2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, cast feralloy deep type. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.09 FLOOR BOXES

A. Floor Boxes: ANSI/NEMA OS 1, fully adjustable.

B. Material: Cast metal with brass cover plate.

C. Shape: Round or Rectangular.

D. Conform to regulatory requirements for concrete-tight floor boxes.

E. Hubbell: B-2436, B-4233, and B-4333 Series.

F. Walker: 880CS1, 880CS2, and 880CS3.

G. Replace trims, covers, and device with new in existing floor boxes.

2.10 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel. Minimum depth—2½-inches.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type 4, flat-flanged, surface-mounted junction box.

1. Material: Stainless Steel.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 EXECUTION

3.01 INSTALLATION OF RACEWAYS

A. All work shall be done in a neat and workman like manner per NECA “Standard of Installation.”

B. PVC conduits and raceways are only permitted underground or under slabs. Exception: PVC is permitted within block walls to first outlet box A.F.F. if PVC raceway is one inch (1") trade size or smaller.

C. All underground conduits and raceways, not under building slabs, shall have a yellow marker tape for communication or a red marker tape for power installed above its entire length and placed approximately 12" below finished grade. Exception: Raceway installation by directional boring.

D. Provide a yellow marker ribbon for communication conduits and a red marker ribbon for power conduits installed underground. Exception: Raceway installation by directional boring.

E. Contractor shall provide a one-inch (1") conduit from the nearest mechanical room to the electrical service meter. Provide a 'FD' type cast junction box and cover at the electrical meter and a 4" x 4" square box and cover in the mechanical room. Provide a nylon pullstring. Locate box adjacent to controls equipment cabinet. Coordinate with Mechanical Engineer/Mechanical Contractor.

F. All thru-slab conduits and raceways larger than one inch (1") installed into block masonry walls and through slabs shall be rigid galvanized conduit to the first enclosure, cabinet, panelboard/switchboard, or box/outlet. All exposed/surface mounted raceways thru slabs to panelboards/switchboards, enclosures, cabinets, conduits and boxes shall be rigid galvanized conduits entering into same enclosures with no junction boxes. All 90° ells and sweeps larger than 1" shall be rigid galvanized conduit.

G. All raceways and conduits within concrete second floor and above slabs shall be intermediate metal conduit, rigid galvanized conduit, or PVC. EMT is not acceptable. EMT conduits may be used in tilt-wall construction using approved fittings and methods and coated with an asphalt trim paint, corrosive tape or other approved coating.

H. All raceway and conduits installed under-slabs and under-buildings shall be installed under the slab and not within the concrete pour or slab.

I. All exterior conduits and raceways shall be rigid galvanized steel or aluminum conduit, or intermediate metal conduit. EMT and PVC shall not be used. Exterior conduits that transition to underground shall be rigid galvanized steel or intermediate metal conduit.

J. All conduit shall be concealed whenever possible. Concealed conduit run above the ceiling shall be supported independent of ceiling supports. When a lay-in type ceiling is utilized, the conduit must be installed high enough to permit removal of ceiling tile.

K. Exposed and surface mounted raceway systems shall have two approved supporting devices per 10' length as equally spaced as practical.

L. Route exposed conduit parallel and perpendicular to walls. Exposed conduits shall only be run in mechanical and electrical rooms unless otherwise specified.

M. Conduit/raceway chases to above-ceiling spaces for all cable drops communication, data, CATV and telephone shall have a bushing at the top of the conduit/raceway for protection or terminated in an approved box.

N. All above ceiling and within partition wall raceways and conduits shall be EMT, intermediate metal conduit or rigid galvanized conduit. PVC is not permitted above the ceiling spaces.

O. All conduit and raceway systems shall have UL approved supports (equal to Erico Caddy® SK-I Clamp) within three feet (3') of boxes or enclosures and couplings/fittings/condulets. Bar Joist spacing exceeding three feet (3') shall meet the N.E.C. 5' exception to the rule for support.

P. Tie-wire, tie-wrap, duct tape, etc. shall not be permitted as a means of support for any conduit or raceway system. All conduits and raceways shall be adequately supported with U.L. approved supporting devices. Tie wire or tie wraps shall not be permitted for support and/or securing of electrical raceways, boxes, or equipment.

Q. Conduit systems shall be racked and run in parallel and perpendicular from its point or origin (i.e., panelboard/panel/switchboard, systems cabinet, etc.) to its destination or first termination. Authority having jurisdiction shall approve any deviation or conflicts with this rule. All conduits after the first point of termination shall be run parallel with or at right angles to building walls or building structure.

R. Arrange supports to prevent misalignment during wiring installation.

S. Horizontal runs of conduit in masonry walls is not permissible.

T. Home-Run conduits are to be a minimum of ¾" trade size to first point of use box/enclosure. Branch circuit conduits for lighting and receptacles shall be filled a maximum of three (3) phase/hot conductors.

U. A minimum of two spare ¾" conduits shall be stubbed out of each panelboard or panel to building structure above and terminated in a J-box with cover. Conduits stubs shall also be capped at top with approved fittings where not terminating in a box.

V. Conduit shall be continuous from outlet to outlet, from outlet to cabinet, junction box to pull box in such a manner that each system shall be electrically continuous from point of service to all outlets.

W. Any conduit that penetrates a firewall shall be sealed with a fire barrier caulk or similar compound to preserve the fire rating of the wall. Fire-rated foam spray is acceptable.

X. Conduits not terminating in boxes and unused shall be capped.

Y. All empty conduits and raceways shall have a pull-string installed capable of pulling conductors typical of conduit size.

Z. Arrange conduit to maintain headroom and present neat appearance. Minimum headroom for equipment suspended from ceiling or building structure shall be 6’8” unless otherwise specified.

AA. Maintain 12" clearance between conduit and surfaces with temperatures exceeding 104°F (40°C) unless otherwise specified.

BB. Cut conduit square using saw or pipecutter; de-burr cut ends. Bring conduit to shoulder of fittings; fasten securely.

CC. Install no more than equivalent of four (4) 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender or factory elbows for bends in metal conduit larger than 2" size.

DD. Provide fittings designed to accommodate expansion and deflection where conduit crosses, control, and expansion joints.

EE. Threadless connectors and couplings for intermediate metal conduit and rigid galvanized conduits are not permitted. Exception: By approval of the "Authority Having Jurisdiction" for special conditions.

FF. EMT Fittings (connectors/couplings) shall be steel set screw or steel compression type. Fittings in wet locations shall be compression type.

GG. When hot dipped rigid galvanized steel conduit is installed below grade, it shall be coated with an asphalt trim paint or approved corrosion tape.

HH. PVC sweeps into utility transformers shall be permitted.

II. Install nonmetallic conduit in accordance with manufacturer's instructions.

JJ. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting.

KK. Corrosive environments/pool pump houses:

1. PVC conduits, fitting, conduit fittings, boxes, and enclosures shall be permitted.

2. Additional conduit supports shall be provided if PVC conduit is exposed.

LL. HDPE conduit shall not be installed above grade per NEC.

MM. All flexible conduits in exposed areas shall be steel or metal seal-tite. All flexible raceways in damp or wet locations shall be metal seal-tite. All flexible conduits above suspended lay-in ceilings shall be aluminum or steel. Flexible conduits are not permitted above drywall, plaster or hard ceilings where not accessible. Minimum size flexible conduits for all installations shall be ½" trade size and shall not exceed 6' in length. Flexible metal conduit fittings and connectors shall be clamp-type. Set screw type fittings and connectors are not permitted. Exceptions as approved by Project Architect.

NN. Seal tight or flexible conduit shall <u>NOT</u> be installed through walls.

OO. Flexible metal conduit shall be used for a flexible connection only, not raceways.

PP. All raceway terminations at boxes and enclosures one inch (1") and smaller shall be made with insulated throat connectors. RMC, aluminum, intermediate metal conduit to comply with NEC.

QQ. All raceway terminations at boxes and enclosures larger than one inch (1") shall be made with insulated throat connectors or metallic insulated bushings. Plastic bushings are not acceptable. Conduits/raceways enclosing #3 or larger conductors shall have connectors with insulated throat or use metal insulated bushings.

RR. Install metallic insulated grounding bushings with lug on all mains, sub-feeders, switchboards, panelboards, transformers, chillers, disconnects, and equipment rated at 100 amps and above.

TT. Install and seal boxes and conduit in acoustical treated walls and ceilings per architectural acoustics specifications.

3.02 INSTALLATION OF BOXES

A. Install electrical boxes, as shown on drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Boxes shall not be installed more than 4 feet above finished ceiling. Use 1/4" threaded rod for box support up to 4' in length and 3/8" threaded rod for box supports exceeding 4' in length.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire. Openings shall be a minimum 24” x 24” hinged door with cylinder cam.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods that are UL listed and tested.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 12 inch separation. Provide minimum 24 inches separation in fire-rated walls. Through-the-wall boxes are not allowed.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. All boxes and enclosures, including wiremold boxes, shall be grounded by use of a threaded ground lug/screw. No ground clips acceptable. This shall apply to new and existing installations.

O. Use gang box where more than one device is mounted together. If sectional boxes are used, barriers are required to separate different voltage systems.

P. Use gang box with plaster ring for multiple devices mounted together.

Q. Use FD malleable outlet boxes in exterior locations exposed to the weather, wet locations, kitchens, and toilet rooms where surface mounted with weatherproof “while-in-use” cover. Standard weather proof cast boxes are not acceptable.

R. Set floor boxes level.

T. Interior PVC boxes, PVC junction boxes, PVC pull boxes, and PVC enclosures are not acceptable for any purpose.

V. All boxes are to be supported to building structure or building structural support with approved supports and hardware suitable for the task. No box, cabinet, or enclosure will be supported by the conduit or raceway only. Tie wraps, tie wire, or any other non-approved supports shall not be permitted.

W. All boxes, junction boxes, and enclosures shall have the exterior cover marked identifying the branch circuit and panelboard of origination with an indelible ink marker or grease pencil.

X. Myers hubs shall be used on all exterior boxes or enclosures where the conduits terminate on top of box or enclosure. Sealing lock nuts or Myers hubs shall be used where the conduits enter the side or bottom of the box or enclosure.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods that are UL listed and tested.

B. Install electrical boxes, as shown on drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

C. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Boxes shall not be installed more than 4 feet above finished ceiling. Use 1/4" threaded rod for box support up to 4' in length and 3/8" threaded rod for box supports exceeding 4' in length.

E. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire. Openings shall be a minimum 24” x 24” hinged door with cylinder cam.

F. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods that are UL listed and tested.

G. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

H. Use flush mounting outlet boxes in finished areas.

I. Do not install flush mounting boxes back-to-back in walls; provide minimum 12 inch separation. Provide minimum 24 inches separation in fire-rated walls. Through-the-wall boxes are not allowed.

J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

K. Use stamped steel bridges to fasten flush mounting outlet box between studs.

L. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

M. Use adjustable steel channel fasteners for hung ceiling outlet box.

N. Do not fasten boxes to ceiling support wires.

O. All boxes and enclosures, including wiremold boxes, shall be grounded by use of a threaded ground lug/screw. No ground clips acceptable. This shall apply to new and existing installations.

P. Use gang box where more than one device is mounted together. If sectional boxes are used, barriers are required to separate different voltage systems.

Q. Use gang box with plaster ring for multiple devices mounted together.

R. Use FD malleable outlet boxes in exterior locations exposed to the weather, wet locations, kitchens, and toilet rooms where surface mounted with weatherproof “while-in-use” cover. Standard weather proof cast boxes are not acceptable.

S. Set floor boxes level.

T. Interior PVC boxes, PVC junction boxes, PVC pull boxes, and PVC enclosures are not acceptable for any purpose.

U. All boxes are to be supported to building structure or building structural support with approved supports and hardware suitable for the task. No box, cabinet, or enclosure will be supported by the conduit or raceway only. Tie wraps, tie wire, or any other non-approved supports shall not be permitted.

V. All boxes, junction boxes, and enclosures shall have the exterior cover marked identifying the branch circuit and panelboard of origination with an indelible ink marker or grease pencil.

W. Myers hubs shall be used on all exterior boxes or enclosures where the conduits terminate on top of box or enclosure. Sealing lock nuts or Myers hubs shall be used where the conduits enter the side or bottom of the box or enclosure.

END OF SECTION 260533

SECTION 26 25 00 - ENCLOSED BUS ASSEMBLIES (BUSWAY)

PART 1 SUMMARY

A. This specification covers the electrical characteristics and general requirements for a continuous opening, low voltage vertical or horizontal distribution system (busway).

B. System shall be designed primarily as an overhead distributed power distribution center. System shall be designed to be located near critical distribution points to power specific loads, servers and or work stations. Once installed, the completed system will provide a manageable, economical means for the distribution of power and communications. Distribution of power and communications will be made through the adaptation of Tap Off plug-in units mounted securely to the busway rails.

C. Tap Off points shall be easily modifiable for phase configuration and be safe for installation and decommissioning while the busway is in its live state.

D. System shall be 100% recyclable and be shipped in recyclable containers and packing

PART 2 STANDARDS AND CERTIFICATION

A. The low voltage distribution busway shall be manufactured and labeled to the following standards:

1. Underwriters Laboratories Standard, UL 857 – The common UL, CSA, and ANSI
2. Standard for Busways that is derived from the fifth edition of CSA Standard C22.2 No. 27, the twelfth edition of UL 857, and the second edition of NMX-J-148-1998-ANSI.
3. IEC 60439-2 Standard - Low-voltage switchgear and control gear assemblies - Part 2: Particular requirements for bus bar trunking systems (busways)
4. IEC 60264 Standard – Use of the Busway housing assembly as the protective ground conductor.
5. Low Voltage Directive (73/23/EEC) including Amendment (93/68/EEC).
6. IEC 60364 Standard – Requiring that the tap-off units instantly connect loads or secondary runs
7. IEC/EN 60439-2 Standard –IEC standard for busway systems with installation standards and regulations for busway with an additional internal conductor with a cross-section equal to half that of the phases.
8. Low Voltage Switchgear and Control gear Assemblies, Part 1: Type Tested and partially type tested Assemblies, IEC 60439-1: 1999. Part 2: Particular Requirements for Bus Bar Trunking systems (Busways), IEC 60439-2: 2000

B. Compliant for: National Electrical Code (NEC)Article 364 – Busways 19

C. Compliant: NEMA AB1, Molded Case Circuit Breakers and Molded Case Switches

D. Compliant: NEMA KS-1, Enclosed and Miscellaneous Distribution Equipment Switches (600VAC).

E. Compliant: NFPA 70 – National Fire Protection Association

PART 3 SYSTEM DESCRIPTION

A. ELECTRICAL REQUIREMENTS:

1. Rated system voltage: 208V, 400V, 480V, up to 600V (rating and voltage identified on plans)
2. Operating Frequency: 50/60 Hz

3. Ampacity Rating at Full Load: (160), (225), (250), (400), (600) - (rating identified on plans)
4. Neutral Capacity: Minimum of 100% of rating (optional 150% - 160A to 400A)
5. Short Circuit Rating shall be: (22kAIC, up to 480V; 35kAIC, up to 480V with 400 amprating, 42kAIC up to 480V with 600 amp rating)
6. Grounding: One piece aluminum housing assembly
7. Conductors: Individual, isolated, and insulated
8. Conductors: 3 Phase Bus, 1 Neutral Bus
9. Conductors shall be silver or tin - plated copper
10. Voltage Drop: Less than 3V per 100' of installed system
11. Operating Temperature: 55°C rise over 40°C / 104°F with no de-rating
12. Position: 100% rating for any horizontal or vertical orientation.

MANUFACTURING REQUIREMENTS:

1. Basis of Design: PDI Corporation
2. Approved Equal

PART 4 SUBMITTALS

A. Submittals shall be in accordance with specified procedures. A line by line compliance is required and deviations to the specification are to be explained. Submit shop drawing and product data for record and approval prior to shipment.

B. All submittals shall include construction details; dimensions, weights, clearances, connection details and component layout. Include submittals for all Tap Off units including but not limited to breaker, communication, cabling and lengths as well as Tap Off unit schedules.

C. All submittals shall include connection details for configurations, document the integrated BCMS option if selected, show external power wiring and connections, as well as the size and location of all conduit connections and terminations.

D. Submittal shall include documentation regarding, transportation, handling and installation requirements.

PART 5 WARRANTY

A. The Busway manufacturer shall guarantee the entire system against defective material and workmanship for a period of one(1) year from installation or eighteen (18) months from shipment with optional extended warranty periods of two (2) and three (3) years.

PART 6 COMPONENTS

A. Housing Construction

1. Housing shall be of a single piece extruded aluminum designed to act as a 100% ground conductor. Standard lengths must include 5, 6, 10, 12 foot. Bus bar conductor must not extend beyond the housing.
2. Bus bar conductors must terminate a minimum of 1" (2.54cm) from the end of the housing assembly. The extruded housing must accommodated the direct insertion of hanger assemblies which attach directly to the housing assembly.
3. Hanger assemblies shall include the option for ceiling mount, side wall mount and must not interfere or obstruct the housing opening intended for the installation of Tap Off units.

4. The complete assembly shall be of the continuous opening design and shall have a slotted opening on one side of the bus to accommodate the insertion of the Tap Off units.

5. The busway shall be constructed to allow any individual section to be removed and replaced without disruption to adjacent sections.

6. All the bus systems shall be finger safe IP2X rated and tested.

B. Conductor and Conductor Assemblies

1. All phase and neutral conductors shall be made of silver or tin-plated copper with a minimum of 98.9% electrical grade purity and sized to handle a minimum of 100% of the continuously rated current with ambient temperatures at or below 40°C/104°F. All conductors shall be electrically isolated from the housing using a Class H (220) ,150°C (302° F) fiber-reinforced Glastic material with non propagating properties. All insulators must be UL recognized.

2. All critical power junction points must have redundant connection points, or contact springs when relying on spring force to maintain the connection to avoid the fatigue or failure of a single spring force junction from comprising the critical load.

C. Conductive Fittings and Components

1. All conductive fittings including Tees, Crosses, and Elbows etc. shall be of the same material from the same manufacturer. All insulating material shall be a Class H (220), 150° C (302° F) fiber-reinforced Glastic material. All insulators must be UL recognized.

D. Plug-In Tap Units

1. Plug-in Tap Off units shall be polarity matched to the busway system.

2. Plug-in Tap Off units shall use (Square D or approved equal, MG Schneider circuit breakers or equal) for branch circuit protection. The breakers shall compliment AIC rating of the application

3. Plug-in Tap Off units shall permit inherently safe two step insertion and removal, and shall allow mechanically securing and then energizing contact with the bus rail conductors in isolated, sequential steps. Plug-in Tap Off units shall make Ground contact prior to full insertion in the bus system. The two step insertion and removal process compliments safety and change procedures at Mission Critical sites.

4. Plug-in Tap Off units must be able to be repositioned on busway without de-energizing the busway system.

5. Plug-in Tap Off units requiring a cord assembly shall be manufactured with cord grips and receptacles as specified in the drawings.

6. All Tap Off boxes will be equipped to provide current/voltage information for optional Branch Circuit Monitoring System and Branch Circuit Monitoring Hub devices. When equipped with the BCMS option the Tap Off boxes shall be plug & play. No installer wiring shall be required.

7.0 INSTALLATION

A. Busway runs will consist of specific factory manufactured straight lengths and fittings as shown on the approval drawings.

B. Suspension System: Using supplied mounting hardware the busway will be hung from the ceiling using threaded rod. Contractor shall be responsible for the connections on the supporting structure. Maximum hanger spacing will be no more than 10' maximum on center – see Installation Manuals for recommendations for contractor. Height and plane changes of the busway system will be evaluated and submitted prior to release of final approval drawings.

C. Connecting Busway Sections: The installer will follow all manufacturers' installation details.

Specifications for the cam-operated splice joint will include the alignment of the position indicators on each joint in a straight line. The splice joints shall not have any visible sag when installed per factory instructions

D. End of Runs: End pieces and end caps will be provided to install at the ends of each run.

E. Closure Components: The bottom opening of the bus system can be closed at any point along the system with the addition of the optional closure. Closure hardware can be field modified for length and fit.

END OF SECTION 261013

SECTION 26 22 13 - ULTRA LOW LOSS TRANSFORMERS

1.01 WORK INCLUDED

A. New dry-type transformers optimized to save energy and minimize change-out cost, with following key attributes:

1. Optimized for loss reduction under a load profile of typically electronic equipment and loading less than 25% of the nameplate rating on average – see performance section of specification
2. Aluminum-wound transformer delivering an average of 33% less losses across the kVA range than current EPACT 2005/NEMA TP1 legislation, when tested according to DOE 10 CFR part 431.
3. This transformer has substantially lower no load losses and exceeds the performance requirements of NEMA PREMIUM, CEE Tier 1, CSL3, and US DOE 2016 minimum efficiency legislation.
4. K-4 rated in order to be UL Listed for the application
5. UL Listed for 2” rear clearance from ventilated surfaces to facilitate fitting into existing available footprint, since most of the transformers to be retrofitted are closer to the wall than current 6” UL restriction carried by most new transformers.
6. Impedance shall be addressed for each individual transformer in order to avoid inrush issues, or exceed the interrupting current capacity and arc flash hazard ratings of exiting components.
7. Manufacturer shall arrange internal primary and secondary terminal placement for each replacement transformer to facilitate reuse of existing conductors without introducing splicing and minimize installation cost.

1.02 REFERENCES

A. US Department of Energy, 10 CFR Part 431, April 18, 2013. Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule

B. DOE Test Method for Measuring the Energy Consumption of Distribution Transformers under Appendix A to Subpart K of 10 CFR part 431.

C. ANSI/NEMA ST 20 - Dry Type Transformers for General Applications.

D. NEMA Premium Efficiency Transformer Program

E. Consortium for Energy Efficiency (CEE): Specification for Low-Voltage, Dry- Type Distribution Transformers

F. EPACT 2005 - United States Energy Policy Act 2005

G. NEMA TP1 - Guide for Determining Energy Efficiency for Distribution Transformers

H. ANSI/NEMA TP-2 – Standard Test Method for Measuring Energy Consumption of Distribution Transformers

I. Metering Standards:

a. Computational algorithms per IEEE Std 1459-2000

b. UL 916, UL 61010C-1 CAT III

J. IEEE C57.110-1998 – IEEE Recommended Practice for establishing transformer capability when feeding nonsinusoidal load currents

K. IEEE Std C57.12.91-1995 Standard Test Code for Dry-Type Transformers

L. IEEE-1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

M. LEED – Leadership in Energy and Environmental Design, U.S. Green Building Council.

N. Seismic Qualification References: International Building Code, 2006/2009 Edition, California Building Code, 2007/2010 Edition, ASCE Standard 7, 2005 Edition to OSHPD CAN 2-1708A.5, Rev. , ICC-ES AC 156, Effective 01/01/2007, OSHPD

O. ISO 9001– International Standards Organization - Quality Management System, latest revision

P. ISO 14001– International Standards Organization - Environmental Management System, latest revision

Q. ISO 17025 – International Standards Organization - General requirements for the competence of testing calibration laboratories.

1.03 INTERNATIONAL STANDARDS ORGANIZATION REGISTRATION

A. Manufacturer Registration up to date ISO standards listed is required.

B. ISO 9001 Registered – Quality Management System

C. ISO 14001 Registered – Environmental Management System

D. ISO 17025:2005 – Efficiency Test Lab

1.04 SUBMITTALS

A. Linear load Test Reports per US DOE 10 CFR Part 431, NEMA TP2, signed by factory test engineer of previously manufactured units – representative of the kVA range on the project, tested in ISO 17025 Certified Efficiency Test Lab, documenting compliance with performance requirements of this specification

B. ISO 17025 Certified Efficiency Test Lab Measurement and Verification (M&V) Reports – representative of the kVA range on the project, documenting compliance with performance requirements of this specification.

C. ISO 17025 Efficiency Test Lab Certificate where testing is performed.

D. Where one or more of the integrated transformer options is selected for this project, provide associated documentation.

E. Understanding that the products supplied will comply with customization requirements on a unit by unit basis while maintaining compliance with the specification, for submittal purposes, provide typical construction details including:

i. kVA rating, primary & secondary nominal voltages, voltage taps, BIL, insulation class, temperature rise, core and coil materials, impedances, audible noise level, unit weight, enclosure dimensions and efficiency data.

i. Inrush and primary/secondary short circuit data

ii. Efficiency Data to include

a. No load and full load losses per NEMA ST20

b. Linear load efficiency data @ 1/6, 1/4, 1/2, 3/4 & full load

c. Linear Load Efficiency @ 35% loading tested per NEMA TP-2.

d. Efficiency under specified nonlinear load profile at 15%, 25%, 50%, 75%, 100% of nameplate.

F. Description of ISO 17025 Certified Efficiency Test Lab Measurement and Verification (M&V) Program

G. Provide ISO 14001certification to latest revision of the standard

H. Provide ISO 9001 certification to latest revision of the standard

I. 25 year Product Warranty Certificate

J. Provide letter confirming that transformers being replaced will be recycled and will not be put back in service.

K. Documentation that materials used for shipment packaging meet the environmental requirements specified. Provide a representative picture of the packaging materials.

L. ISO 17025 CERTIFIED EFFICIENCY TEST LAB MEASUREMENT & VERIFICATION (M&V)

i. The M&V procedure shall reproduce an equivalent load profile and load current THD profile on a transformer-by-transformer basis for each transformer for which baseline data on the existing transformers was measured in the field.

ii. Efficiency shall be determined per definition in IEEE Std C57.12.91-1995 Standard Test Code for Dry-Type Transformers.

iii. The load bank shall include both linear loads and nonlinear phase-neutral equipment with a profile representative of a mix of typical commercial grade electronic equipment receptacle loads with the ability to be blended to produce different load levels and current THD profiles.

iv. Metering and CTs shall both be revenue class accurate and carry up to date calibration certificates. CTs shall be operated within their approved accuracy loading range and characterized to minimize error.

v. Test Report: Include results compared to both baseline conditions and specification requirements. Identify compliance & non-compliance. Report to be issued by qualified engineer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and protect products

B. Store in a warm, dry location with uniform temperature. Cover ventilation openings to keep out dust, water and other foreign material.

C. Handle transformers using lifting eyes and/or brackets provided for that purpose. Protect against unfavorable external environment such as rain and snow, during handling.

1.06 WARRANTY

A. Transformer shall carry a 25-year pro-rated warranty, based on factory invoice, which shall be standard for the product line.

B. Manufacturer warranty shall remain in effect through a qualified seismic event

1.07 FACTORY PRODUCT PERFORMANCE WITNESS TESTING

A. At time of order, the customer may request that the project engineer, or other designated customer representative, witness the performance testing of one or more of the transformers on the project at the manufacturer's facility.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Basis of design: Powersmiths International Corp. ("E-Saver-2016-R")

B. Power Quality International

C. Manufacturers wishing to have products evaluated for acceptability and conformance with the performance requirements of this specification, including site survey and detailed report as outlined in this specification, shall provide detailed compliance and/or exception statements, along with the required submittal documentation and test documentation, signed by an engineer, that confirms that the transformer(s) meet the project requirements as outlined in this specification, and that the manufacturer commits to the required customization.

D. Manufacturer must be able to demonstrate successful track record in Energy Savings Performance Contracting (ESPC) application of transformers as well as demonstrated competence at performing the Retrofit Transformer Performance Validation as detailed in this specification.

E. Failure to provide the required documentation no less than 7 days prior to the bid date will disqualify products from consideration for this project.

2.02 PACKAGING FOR SHIPMENT

A. During the manufacturing process, manufacturer to identify every transformer by location, tag number and manufacturing specifics. Prior to shipping, manufacturer to place an ID sticker/tag on the transformer packaging and on the nameplate with a number corresponding to the number on the sticker/tag that was placed on the existing transformer to be replaced. This will represent the final quality control and verification that the corresponding transformer was manufactured. The installing electrical contractor will be able to do a one-to-one match up.

B. Transformers shall be packaged for shipment using materials that reduces environmental impact

C. Transformer Wrapping

a. Transformers shall be wrapped for shipment in a film coating that is 100% compostable and biodegradable.

D. Transformer Shipping Base

a. Transformers shall be shipped on a base that uses at least 50% less wood than traditional pallets.

E. Wood used in the shipping base shall be Forestry Stewardship Council (FSC) certified as having been sustainably harvested.

F. Shall minimize or eliminate use of materials that are not commonly recycled at the destination.

2.02 TRANSFORMER SPECIFICATION

A. Compatibility: This product must have a track record of reducing voltage distortion in order to improve the long-term compatibility of the electrical system with both linear and nonlinear loads.

B. Built to NEMA ST20 and relevant NEMA, UL and IEEE standards; 200% rated neutral; 60Hz rated; Transformers 750 kVA and less, 600 volt primary and less, shall be U.L. listed and CSA Listed and bear the appropriate label. All terminals, including those for changing taps, must be readily accessible by removing a front cover plate. Windings shall be continuous with terminations brazed or welded 10kV BIL.

C. Seismic Qualification: Transformer has been seismically qualified in accordance with: International Building Code, 2006/2009 Edition, California Building Code, 2007/2010 Edition, ASCE Standard 7, 2005 Edition to OSHPD CAN 2-1708A.5, ICC-ES AC 156, Effective 01/01/2007, OSHPD approved: OSP-0110-10

a. Unit shall remain operational and shall not suffer electric or mechanical damage within the limits of a qualified seismic event

b. Certification Level: Short period spectral acceleration: SDS= 1.5 g, Seismic importance factor: Ip= 1.5, Installation height: z/h= 1.0, Installation restrictions: None - Valid for below grade, at grade and roof installations in floor mounted configuration

D. Insulation System:

a. Shall be NOMEX-based with an Epoxy Co-polymer impregnant for lowest environmental impact, long term reliability and long life expectancy

b. Class: 220 degrees C

c. Impregnate Properties for low emissions during manufacturing, highest reliability and life expectancy

d. Epoxy co-polymer

e. VOC: less than 1.65 lbs/gal (low emissions during manufacturing)

f. Water absorption (24hrs @25C): less than 0.05% (superior insulation, longer life)

g. Chemical Resistance: Must have documented excellent performance rating by supplier

h. Dielectric Strength: minimum of 3200 volts/mil dry (for superior stress, overvoltage tolerance)

i. Dissipation Factor: max. 0.02 @25C to reduce aging of insulation, extending useful life

E. Operating Temperature Rise: 130 degree C in a 40 degree C maximum ambient

F. Noise levels:

a. NEMA ST-20

b. Production Test every unit. Data to be available upon request.

G. UL Listed & Labeled K-Rating: K-4 or higher

H. Windings: Aluminum, but manufacturer may substitute copper as needed to meet performance/footprint or other parameters

I. Performance Interpolation: For kVAs not listed, use DOE straight line interpolation method

J. Exceeds the performance requirements of NEMA PREMIUM, CEE Tier 1, and DOE CSL3

K. Exceed minimum efficiency requirements of US Department of Energy, 10 CFR Part 431, April 18, 2013, Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule which takes effect January 1, 2016

L. Comply with the table of Maximum No Load Losses, efficiency requirements at 1/6 load, efficiency at 35% load per 10 CFR Part 431, and efficiency at 25% load under a K-4 load profile.

kVA	No Load losses (Watts)	Efficiency @ 1/6 load (%)	Efficiency @ 35% load (%)	Efficiency at 25% load under K-4 nonlinear load
15	47	97.81%	97.90%	97.93%
20	60	97.92%	98.02%	98.06%
25	66	98.04%	98.13%	98.11%
30	71	98.17%	98.25%	98.22%
45	97	98.31%	98.40%	98.36%
50	112	98.40%	98.43%	98.40%
63	120	98.45%	98.52%	98.46%
75	135	98.52%	98.60%	98.55%
100	180	98.61%	98.70%	98.64%
112.5	195	98.69%	98.80%	98.70%
125	215	98.73%	98.83%	98.73%
150	235	98.80%	98.90%	98.80%
175	270	98.81%	98.92%	98.81%
200	310	98.82%	98.93%	98.82%
225	350	98.83%	98.95%	98.85%
250	381	98.85%	98.97%	98.89%
300	404	98.89%	99.02%	98.94%
400	543	98.92%	99.08%	98.97%
450	611	98.94%	99.11%	98.99%
500	663	99.00%	99.14%	99.04%
600	844	99.02%	99.18%	99.07%
750	977	99.05%	99.23%	99.08%
850	1080	99.07%	99.26%	99.09%
1000	1404	99.11%	99.30%	99.10%

M. Voltage Taps: For transformers 30kVA-300kVA, provide full capacity taps; two 2-1/2% above and four 2-1/2% taps below nominal primary voltage.

N. TRANSFORMER OPTIONS TO BE SUPPLIED

a. Provide lockable hinged doors on the transformer to facilitate access in support of NFPA 70E/CSA-Z462 Arc Flash Standard to minimize arc flash risk when opening the enclosure of live equipment

b. Integrated Access Port to Transformer Output Voltages and Currents

i. Supply access to transformer output voltages and currents without opening the enclosure, via

twistlock connectors, in support of NFPA 70E/CSA-Z462 Arc Flash Standard to avoid arc flash risk as associated with opening the enclosure of live equipment

ii. Currents shall be accessed via integrated FTRZ listed 333mV CTs.

c. Integrated Rotatable Infrared (IR) Viewing Port to address NFPA 70E/CSA-Z462 Arc Flash Standard

i. Provide integrated rotatable IR viewing port that provides single point viewing point that enables the thermal scanning of all live connections including primary and secondary feeder terminations and taps without requiring opening of the transformer enclosure or exposure to live parts.

ii. The port shall be easily usable by a wide variety of makes and models of commercially available thermal scanning devices, without requiring any proprietary connectors, adapters or other components.

iii. Basis of performance: Powersmiths Rotatable IR Viewing Port.

iv. For the installation of one or more fixed IR windows to be considered an acceptable alternative on this project, the transformer manufacturer shall provide detailed drawings prepared by a qualified engineer detailing how all live terminals will be viewable. The manufacturer shall commit that should all terminals not be viewable once installed, the manufacturer shall rectify the situation at his own expense.

d. Electrostatic Shield: Each winding is independently single shielded with a full-width copper electrostatic shield [Double shields or triple shields may also be specified]

e. Lug Kit: supply with Compression lugs configured as specified at time of order

f. Low Inrush: less than 6 times primary full load current with a 3% source impedance

PART 3 EXECUTION

3.01 INSTALLATION

A. Follow all national, state and local codes with respect to transformer installation.

B. Where sound level may be of concern, utilize the services of a recognized and established Acoustical Consultant to provide the proper installation environment to minimize noise and vibration.

C. Check for damage and loose connections.

D. Set the transformer plumb and level.

E. Mount transformer on vibration isolation pads suitable for isolating the transformer.

F. Provide Seismic restraints where required.

G. Coordinate all work in this Section with that in other sections.

H. Verify all dimensions in the field.

I. Adjust transformer secondary voltages to provide the required voltage at the loads.

J. Where integrated meter option has been specified to be connected to an external network, contractor to provide the required connection and commissioning to customer's specified system.

K. Upon completion of the installation, an infrared scan shall be provided for all bolted connections. Correct any deficiencies. Repeat thermal scan 3 months after installation and prepare a report for the customer.

L. Identify non-compliant products to the engineer and replace at no cost to the customer.

M. Contractor to ensure the transformers removed from the project are not re-used, but they are destroyed and recycled. Provide documentation from the responsible 3rd party recycler that the transformers on this project have been recycled as specified.

N. Contractor is responsible for audit, measurement and verification, and reporting as specified.

END OF SECTION 262213

SECTION 26 24 16 - PANELBOARDS

1.01 WORK INCLUDED

A. Distribution Panelboards.

B. Lighting and Appliance Branch Circuit Panelboards.

1.02 REFERENCES

A. FS W-C-375—Circuit Breakers, Molded Case, Branch Circuit and Service.

B. FS W-P-115—Power Distribution Panel.

C. NEMA PB 1—Panelboards.

D. NEMA PB 1.1—Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NEMA PB 1.2—Application Guide for Ground-fault Protective Devices for Equipment.

1.03 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Division 1.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement, and sizes.

1.04 SPARE PARTS

A. Keys: Furnish five (5) each to Owner [one (1) for Electrical Manager in Maintenance Department].

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—PANELBOARDS

A. Square D.

B. Cutler Hammer.

C. Siemens.

D. General Electric.

E. Substitutions: Under provisions of Division 1.

2.02 GENERAL

A. All panelboards and circuit breakers shall be fully rated for available fault current.

B. All panelboards shall be MCB type. No MLO panelboards shall be accepted. Any exceptions shall be prior approved by Owner.

2.03 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1; bolted circuit breaker type.

B. Provide cabinet front with concealed trim clamps and hinged door with flush lock. Finish in manufacturer's standard gray enamel.

C. Provide panelboards with copper bus, ratings as scheduled on drawings. Provide copper ground bus in all panelboards.

D. Minimum Integrated Short Circuit Rating: As shown on drawings.

E. Molded Case Circuit Breakers: NEMA AB-3; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Current Limiting Molded Case Circuit Breakers: NEMA AB-3, Federal Specification WC-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

2.04 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1; bolted circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or 3 R as shown on drawings.

C. Cabinet Size: 6 inches deep.

D. Provide flush or surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel. Panelboards to have hinge-type interior access.

E. Provide panelboards with copper bus, ratings as scheduled on drawings. Provide copper ground bus in all panelboards.

F. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as shown on drawings. These ratings may be lowered by short circuit calculations performed by manufacturer stating actual A.I.C. ratings throughout entire system.

G. Molded Case Circuit Breakers: NEMA AB-3; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on drawings.

H. Current Limiting Molded Case Circuit Breakers: FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

I. All multi-pole breakers shall have factory installed common trip handle ties.

2.05 EXISTING BRANCH CIRCUIT PANELBOARDS

A. Distribution, Lighting, and Appliance Branch Circuit Panelboards: NEMA PB1; bolted circuit breaker type or plug-in circuit breaker type to match existing.

B. Minimum Integrated Short Circuit Rating: Match existing rms symmetrical amperes in existing panels.

C. Molded Case Circuit Breakers: FS W-C-375; bolt-on or plug-in type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb [and flush with wall finishes], in conformance with NEMA PB 1.1.

B. Height: 6 feet 6 inches.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard by building and room FISH number, new or existing. Revise directory to reflect circuiting changes required to balance phase loads. Trace out all circuits in existing panelboards to indicate an accurate directory per new space changes and room numbers. Indicate type of load served.

E. Stub three (3) empty ¾" conduits and two (2) empty 1" conduits to accessible location above ceiling out of each recessed panelboard. Install duct tape in ends of conduits to prevent insects and rodents from entering panelboard.

F. Panelboards/switchboards shall be provided with a minimum of 20% spare spacing for future additions.

G. All panelboards shall have built in locks and keys provided.

H. Load centers shall not be permitted.

I. Branch circuits/conductors originating from different panelboards shall not be in same raceway(s).

J. Panelboards shall not be used as raceways.

K. Install lightning surge protector per manufacturer's recommendations on all service entrances, as shown on drawings, and connect to ground bus.

L. Install in accordance with manufacturer's instructions and per NEC 110-26.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed twenty percent (20%), rearrange circuits in the panelboard to balance the phase loads within twenty percent (20%). Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 262416

SECTION 26 26 00 - POWER DISTRIBUTION UNITS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish factory assembled PDU in accordance with the contract documents and the following specification with all elements to conform to all relevant standards of manufacturing and construction, including but not limited to, NFPA, IEEE 519-1991, ANSI C33.4, UL67, UL50, UL489, UL478, NEMA ST-20, NEMA AB-1, NEMA PB-1, NEC, UL695, UL60950, FIPS, OSHA and all relevant local codes.

B. Work of this section, as shown or specified shall be in accordance with the requirements of the contract documents.

C. The bidder shall participate in determining the means available for receiving and handling the equipment.

D. Off-loading, installation, interconnecting cables and lugs and all associated costs are the responsibility of the contractor. Installation shall be in accordance with the manufacturer's recommendations.

1.02 WORK INCLUDED

A. Furnish components for PDU units as herein specified for installation under another contract.

B. Provide all materials and services for manufacturing, testing, and delivery to a designated jobsite. The work required under this contract shall include the following:

1. Furnishing PDU as herein specified.

2. Complete configuration drawings and installation drawings.

3. Factory tests as herein specified.

1.03 SUBMITTAL REQUIREMENTS

A. The information with the bid shall include, at a minimum, the following items:

1. Technical proposal, including specification and description of all components, lug sizes, transformer ratings, frame sizes and current ratings of circuit breakers and operation.

2. Outline and installation drawings showing dimensions and weight of the equipment, along with external power cable connections and recommended cable entrances and exits.

3. Proposed fabrication schedule, factory test dates and delivery date per contract documents.

4. Warranty schedule

B. Bidders shall provide a compliance review of all specifications and addenda. The review will be a paragraph-by-paragraph review designating Compliance ("C"), Deviation ("D"), Exception ("E") with numbered footnotes explaining reasons for the proposed deviations or exceptions and how the intent of the specification will be satisfied.

1.04 SHOP DRAWINGS

A. The Seller shall submit a minimum of four (4) sets of shop drawings within two weeks of receipt and acceptance of purchase order and prior to proceeding with any fabrication or assembly of equipment.

B. All submittals shall be a complete package properly indexed and cross referenced. Submittals shall contain all required and detailed information.

1.05 OPERATING AND MAINTENANCE INSTRUCTIONS AND MANUALS

A. The seller shall submit a minimum of one (1) set of operating and maintenance instructions and manual, covering the complete operation and maintenance of the equipment furnished hereunder to the owner.

B. The Seller shall provide sufficient operation and maintenance instruction for building operators, with on-the-job factory trained engineers representing the manufacturers. The instruction shall be scheduled at time(s) convenient to the Owner's personnel.

1.06 INSTALLATION

A. Installation shall be in compliance with all of the manufacturer's recommendations and local codes. All start up and warranty troubleshooting shall be performed by the manufacturer or an authorized representative. Initial startup and site testing shall be done by the manufacturer or an authorized representative.

1.07 GUARANTEE

A. The PDU shall be warranted by the manufacturer to be free from defects in workmanship and material for a period of eighteen (18) months from initial shipment or one (1) year from start-up, whichever occurs first. This warranty is contingent upon having a factory authorized representative perform the start-up. Warranty shall include all costs of repair, parts, labor, travel and living expenses for the service personnel.

1.08 STANDARDS

A. The complete System shall be in accordance with the standards previously listed and in compliance with the applicable portions of Underwriters Laboratories UL 60950. All equipment is to be listed and labeled prior to shipment by UL, ETL or CSA.

PART 2 PRODUCT SPECIFICATION

2.01 GENERAL

A. The Power Distribution Unit (PDU) shall be a transformation and distribution system that delivers computer grade power from a single input power source. The PDU shall be custom configured and assembled in a cabinet combining a Transformation Module for voltage transformation, isolation, and/or harmonic reduction, and a Distribution Module that is configured to feed and protect specific downstream loads. The performance and operation of the PDU shall be controlled and monitored through an Operator Interface Module.

2.02 CONSTRUCTION

A. Enclosure for the PDU shall be constructed in modular configuration to NEMA Type-1 standards. The enclosure shall be primed and painted with a suitable semi-gloss enamel both inside and out. Color shall be manufacturer's standard: IBM Pearl White (or "computer hardware off-white"). Optional colors are available upon request. .

B. Each PDU cabinet shall be designed for mounting on both fixed and raised flooring. Each cabinet shall contain full swivel, heavy duty casters. Once the system is placed in its final position, the unit should feature stop-feet for stabilization of the unit.

C. The cabinet enclosure shall include a pre-punched output cable landing panel to provide ample output cable space for both immediate and future cabling requirements.

D. All operator controls and instrumentation shall be visible through the front door. All breakers and switches shall be mounted behind closed doors to limit control access to only authorized personnel.

E. All wiring shall be rated per the National Electric Code. The PDU shall include a computer grade single point ground in accordance with FIPS Pub 94 and the requirements of the NEC.

2.03 SYSTEM MODULES

A. Transformer Module

1. The PDU shall be fed from an integral three (3) phase, copper-wound, high isolation transformer rated 150 kVA. Each unit is complete with dual electrostatic shielding and six (6) full load two and one-half percent (2 1/2%) compensation taps (two [2] above and four [4] below nominal). Transformer taps face the rear of the PDU cabinet, but can be rearranged to face the front if front access/service is required. NOTE: If front access/service is required, all distribution shall be mounted in side cars. No devices should be mounted in front of the transformer which would obstruct IR of the transformer. The transformer is specifically designed for this application and provides voltage transformation, high isolation, conditioning, shielding, and voltage adjustment.

2. Each PDU shall be provided with a 480V main input circuit breaker with a minimum of 25k amps interrupting capacity (65kAIC is optional). This thermal-magnetic circuit breaker shall be manually operated and sized in compliance with the 2005 NEC standard and contain an internally powered shunt trip mechanism to operate a local Emergency Power Off (EPO). A 24VDC shunt trip signal shall be available to interface with Remote Emergency Power Off (REPO) stations.

3. The K-20 transformer shall contain six (6) thermal overload protection devices to monitor core temperature in each winding. The first set of thermal devices shall be calibrated at 180°C. The second thermal device shall be calibrated at 200°C. In the event of any winding reaching a 180°C core temperature condition, the thermal overload protection device will close a set of contacts for remote annunciation of a potential over-temperature. In the event of any winding reaching a 200°C core temperature condition, the thermal overload protection device will close a set of contacts and initiate an automatic shutdown event.

B. Distribution Module

1. The PDU system shall include up to ten (10) 42-pole distribution panelboards. Each panelboard shall be rated 225 amperes and contain all-copper busbars. Each panelboard shall be provided with a 42-position ground bus kit and a 200% rated neutral assembly to accommodate the effects of non-linear loads. Each panelboard bus structure shall be designed to accept either snap-in or bolt-on branch circuit breaker protective devices. Access to the each panelboard shall be through a hinged door. Within this door shall be another hinged dead front panel that allows wiring access without removing the cover.

   Each 42 pole distribution panelboard shall be protected by a 3 pole, 240 volt rated secondary main circuit breaker. This thermal-magnetic protective device shall be rated at 22,000 AIC and shall be sized in compliance with the 2005 NE standards

2. The PDU shall be equipped with (4) 3-Pole 250 amp subfeed circuit breaker. Access to the each subfeed breaker shall be through a hinged door. Within this door shall be another dead front panel that allows wiring access.

C. Contractor Interface Board

1. A low voltage control junction box shall not be included on this equipment. All Remote Emergency Power Off, HVAC Interlocks, building alarms, communication ports and other control wiring shall be terminated onto a Contractor Interface Board which is an integral component within the PDU system itself. The Contractor Interface Board shall contain, as a minimum the following:

   a. Two remote emergency power off interconnect positions

   b. Summary Alarm Contacts (1 x NO & 1 x NC plus common) rated 2amps

   c. HVAC Contacts (1 x NO & 1 x NC maintained and 1 x NO & 1 x NC momentary) rated 2 amps

   d. Four Building alarm contacts rated 2 amps

   e. Remote monitoring connection ports (ModBus RTU Protocol, RS-422/485 port) or optional SNMP

D. Additional Modules

1. Transient Voltage Surge Suppression

   The PDU shall have an internal high energy surge suppressor system with a solid state, bipolar, clamping device designed to suppress both positive and negative transients from either the line or the critical load, and integral capacitors for noise attenuation. The TVSS shall be designed to turn on in less than 5 nanoseconds. The line to neutral suppression levels should be equivalent to 160 volts rms. (nominal rms. of 120 volts) and line to line suppression limit to 300 volts rms. (120 v nominal line to line). The total surge capacitance shall be either 60,000 amperes (80,000 amperes optional).

2. Lightning Arrestor/Surge Suppressor

   The PDU shall include a Lightning Arrestor/Surge Suppressor which features an air gap device engineered to attenuate high energy impulses up to 3,000 volts. The unit should be a three phase secondary class Lightning Arrestor to divert high energy transients to ground. It shall be mounted in parallel ahead of all electrical components to provide maximum protection and be capable of repeated transient voltages and surge currents. The device should utilize zinc oxide elements to limit the voltage being subjected to sensitive circuits. The Lightning Arrestor should be UL listed and rated 650 volts maximum rms. with a discharge current of 20,000 amperes. The Surge Suppressor shall provide an additional surge element to reduce the rate of rise of high energy transient voltages to increase the effectiveness of the Lightning Arrestor. The system shall consist of a three phase capacitor designed to coordinate with the Lightning Arrestor for high speed, high energy operation.

3. Manual Restart Option

   The PDU shall contain a manual restart circuit to protect the connected load during a system restart sequence. A circuit shall be provided to allow this feature to be field deactivated

E. Operator Interface Module

A microprocessor based panel (containing an 40x16 character and graphics LCD display) shall be mounted on the front of the system to monitor power points within the PDU unit. The Operator Interface Module shall be easily accessible from the front of the PDU, but should not be mounted on the front door. Each power conductor supplying the Operator Interface Module must allow upgrades or preventative maintenance without “live” power. A monitor maintenance switch and shunt trip disconnect shall be provided isolate the monitor during maintenance. The operator interface module shall employ an audible alarm to annunciate and fault condition. A USB port shall be provided on the Operator Interface Module front face for service / calibration use only.

The PDU shall continuously monitor the core temperature of the main isolation transformer. The transformer shall be equipped with two thermal sensors, one to announce high temperature conditions (180 degree C) and the other to shut down the PDU upon hazardous temperature condition (200 degree C).

The PDU monitoring panel shall contain a red illuminated EPO pushbutton assembly. This control circuit shall be interconnected to the shunt trip device and shall allow the operator to completely remove the PDU from the line by tripping the main circuit breaker.

The monitor shall be on a draw out assembly / slide mechanism for easy repair / board maintenance.

The Interface shall consist of the following:

Operator Controls

Maintained Switches for Operator Control shall include:

Guarded Illuminated Emergency Power Off (EPO) Push Button

Audible Alarm SILENCE (Enter)

Scrolling Control to view stored alarms as well as monitored parameters

Annunciation Panel

The system shall include an audible notification method to notify operators of existing or pending failures. This method shall be available at the Annunciation Panel and shall include: Audible Alarm, Alarm Silence, and Summary Alarm indication.

Digital Display Panel

The PDU shall be equipped with a front accessible LCD display. Momentary push buttons allow the Operator to scroll and hold on any of the following parameters for display:

True RMS Analog Readouts of:

a. Total Harmonic Distortion - Input Voltage
b. Input Voltage (V_{L-L})
c. Output Voltage (V_{L-L}, V_{L-N})
d. Phase Current (A,B, & C)
e. Output Neutral and Ground Current (amps)
f. Output kVA, kW, kWh, Power Factor
g. Load Level (in % total kVA)
h. Frequency (Hz)
i. Phase Rotation
j. Time of Day
k. Date

Alarm Messaging for Internal Faults and Customer Selected External Points:

a. Transformer Over Temp
b. Phase Rotation Error
c. Summary Alarms
d. Input Voltage High
e. Input Voltage Low
f. Output Voltage High
g. Output Voltage Low
h. Phase Loss
i. High Current
j. Ground Fault
k. Frequency Deviation

In addition to the above monitoring features, the system shall have the ability to accept either normally open or normally closed contacts from up to four building alarm interface points. The PDU Operator Interface Panel shall provide the user the name of the unit as well as the ability to assign a name of the building alarm point. The ability to program a corrective action message shall also be included.

2.04 ELECTRICAL CHARACTERISTICS

A. PDU Input Source voltage: 480 Vac nominal, three-phase, three-wire plus ground.

B. PDU kVA rating: 150 kVA @ K-rating (K20)

C. Input Frequency: 60 Hz. +/- 5 Hz, 50 Hz optional

D. Power factor from .5 leading to .5 lagging.

E. Full Load Efficiency: 97.5%

F. Insulation Class: Class “R”

G. Standard Temperature Rise: 150 °C (130°C, 115°C & 80°C are optionally available)

H. Harmonic Distortion: 0.5% max

I. Percent Reactance: 3.0%

J. Percent Impedance: 3.0 to 5.0%

L. Minimum Noise attenuation: -120db common mode, -30db transverse mode

M. Standard Inrush

2.05 ENVIRONMENTAL REQUIREMENTS

A. Storage temperature shall be between -36°C to +70°C (-33°F to 158°F).

B. Operating temperature shall be between 0°C to +40°C (32°F to 104°F).

C. Relative humidity from 0% to 95% non-condensing.

D. Maximum Operating Altitude 2,500 Meters

E. Non-Operating Altitude: 15,000 Meters

F. Audible Noise: 45db maximum @ three meters

PART 3 EXECUTION

3.01 FACTORY TESTS

A. The manufacturer shall provide test reports with each PDU certifying that the unit has passed the following tests.

1. Functional test: All meters, alarms and shunt trips.

3.02 HI-POT TEST AT 2 KV FOR 1 MINUTE. PACKAGING AND SHIPPING

A. The manufacturer shall provide adequate packaging to ensure there is no damage to the unit(s) while in transport.

B. The manufacturer shall provide adequate notice to the contractor of shipping and arrival times.

C. The contractor shall arrange for receiving and provide storage for any units prior to installation. Unit storage should be provided in accordance with the environmental conditions outlined in this specification.

3.03 FIELD SERVICE

A. All field service work shall be performed by the manufacturer's trained and certified personnel.

B. A 24 hour telephone service organization shall be provided and the phone numbers displayed on the door of each enclosure.

C. The manufacturer shall provide on-site training for the customer's personnel in the operation of the equipment.

3.04 INSTALLATION

A. The contractor shall provide labor for the installation of the new equipment in accordance with the manufacturer. All rigging for unloading and installation shall be the responsibility of the contractor. The manufacturer shall assist the contractor as required in interpreting the installation instructions.

B. The manufacturer shall provide all inter-cabinet wiring as required.

C. The contractor shall install the equipment as shown on the drawings and ensure all required working clearances are maintained.

D. Following installation, the manufacturer shall verify the correct installation of the PDUs.

3.05 START-UP COMMISSIONING

A. The manufacturer shall provide the services of a qualified technician to perform the manufacturer recommended start-up procedures. Upon completion, the manufacturer shall provide a commissioning report to the owner.

B. The contractor shall notify manufacturer at least ten (10) days in advance of the date when start-up will be required. The contractor shall coordinate with the manufacturer and the engineer to establish an agreeable start-up and testing schedule

C. Required load banks for testing and acceptance are the sole responsibility of the contractor.

D. The manufacturer shall provide the services of a field service engineer for site testing and installation supervision as required to complete the check out.

3.06 ACCEPTANCE

Final Acceptance shall occur when the certified start-up reports are submitted to the owner.

END OF SECTION 262600

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall Switches.

B. Wall Dimmers.

C. Receptacles.

D. Device Plates and Decorative Box Covers.

E. Floor Box Service Fittings.

F. Time Switch.

1.02 RELATED SECTIONS

A. Section 260533 ..... Raceways and Boxes for Electrical Systems.

1.03 REFERENCES

A. NEMA WD 1—General Purpose Wiring Devices.

B. NEMA WD 5—Specific Purpose Wiring Devices.

C. NEMA WD 6—Wiring Device Configurations.

D. Federal Specification—FS-W-C-596 Series—General Specifications.

E. Federal Specification—FS-W-S-896 Series—Toggle Switches.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:

1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.

PART 2 PRODUCTS

2.01 WALL SWITCHES

A. Manufacturers:

1. Arrow Hart.

2. Hubbell.

3. Leviton.

4. Pass & Seymour.

5. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1, heavy-duty industrial grade AC only general-use snap switch.

C. Device Body: Ivory plastic with toggle handle.

D. Indicator Light: Separate pilot strap; red color lens.

E. Locator Light: Lighted handle type switch; red color handle.

F. Voltage Rating: 120-277 volts, AC.

G. Current Rating: 20 amperes.

H. Motor Rating: Motor rated for fractional horsepower.

I. Motors 1/2 HP and Smaller: Provide switch with thermal overloads to match motor nameplate rating, if motor does not have built-in overload protection.

2.02 WALL DIMMERS

A. Manufacturers:

1. Lutron.

2. Leviton.

3. Hubbell.

4. Pass & Seymour.

5. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1, Type I semiconductor dimmer for incandescent lamps.

C. Device Body: Ivory plastic with slider knob.

D. Voltage: 120 volts.

E. Power Rating: Match load shown on drawings.

2.03 RECEPTACLES

A. Manufacturers:

1. Arrow Hart.

2. Hubbell.

3. Leviton.

4. Pass & Seymour.

5. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1; heavy-duty industrial grade general-use receptacle.

C. Device Body: Ivory plastic for general use receptacles. Gray plastic for clean/data communications receptacles.

D. Configuration: NEMA WD 6; type as specified and indicated.

E. Convenience Receptacle: NEMA Type 5-20.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

G. Tamper-Resistant Receptacles: Shall be hospital grade with integral thermoplastic safety shutter to prevent access of foreign objects to the electrical contacts of the receptacle.

H. Range, dryer, and special purpose receptacles shall be four (4) wire/grounding type. This Contractor shall verify equipment housing has not been bonded by the manufacturer.

2.04 WALL PLATES

A. Device Cover Plate: Smooth stainless steel, only. Stainless steel oversized cover plates required. Plastic, fiberglass, nylon, and veneer are not acceptable.

1. Hubbell.

2. Leviton.

3. Pass & Seymour.

4. Substitutions: Under provisions of Division 1.

B. Weatherproof Cover Plate: Gasketed, cast aluminum with hinged, gasketed device cover. Cover shall be key lockable.

1. Hubbell.

2. Crouse Hinds.

3. Substitutions: Under provisions of Division 1.

2.05 FLOOR MOUNTED SERVICE FITTINGS

A. Flush Cover Convenience Receptacle:

1. Walker.

2. Hubbell.

3. Arrow Hart.

4. Steel City.

5. Substitutions: Under provisions of Division 1.

6. Material: Brass

7. Configuration: Duplex flap opening.

B. Flush Cover Combination Fitting:

1. Walker.

2. Hubbell.

3. Steel City.

4. Substitutions: Under provisions of Division 1.

5. Material: Brass.

6. Configuration: Duplex flap opening.

C. Carpet or Tile Trim Ring:

1. Walker.

2. Hubbell.

3. Steel City

4. Substitutions: Under provisions of Division 1.

5. Material: Brass.

2.06 TIME SWITCHES

A. Manufacturers

1. Intermatic Model #ET70115C (Basis of Design).

2. Paragon.

3. Tork.

B. Furnish and install (where shown) time switches of the multipurpose two-channel digital or seven day type. Display shall be of LCD type. Controller shall have 365 day holiday capabilities with sixteen (16) single dates and five (5) holiday blocks of unlimited duration.

C. Time switch contacts shall be capable of switching 40 amperes per pole continuously at rated voltage, as indicated, and shall have pole and switching arrangement, as indicated on the drawings.

D. Time switch shall have user selectable daylight saving or standard time function. Controller shall be capable of manual override on/off.

E. Enclosure shall be NEMA 1 for indoor flush use and NEMA 3R for outdoor use. NEMA 1 enclosure shall have combination 1/2" - 3/4" knock-outs on bottom and both sides. Provision shall be made for positive padlocking and/or sealing.

F. Terminals shall be capable of receiving up to #8 AWG wire.

G. Controller shall have 72 hour memory back-up with rechargeable battery.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions under provisions of Division 1.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Verify floor boxes are adjusted properly.

E. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify/provide all lighting wall switches to be on opposite side/direction of door swing (door swing not to obstruct switch access).

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface. Shall not be set back from the finished surface more than 1/4" per NEC 314-20.

B. Clean debris from outlet boxes.

C. All devices shall be U.L. listed and labeled. Prior to installation, all wiring devices shall be stored on the jobsite in the original labeled cartons.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions. All wiring devices shall be of one manufacturer; no mixing of manufacturers shall be permitted.

B. Install devices plumb and level.

C. Install switches in the vertical position with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging, as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Install receptacles with grounding pole on top.

G. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

H. Connect wiring devices by wrapping conductor clockwise around screw terminal. "Quick wire"/push-in/snap-in residential type wiring devices shall not be permitted. Receptacles and switches shall be pig-tailed, no feed through wiring.

I. Install galvanized and raised steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

J. Assemble all devices and equipment shipped loose with furniture furnished by others as a part of this project. Provide all necessary wiring, plugs, conduit, etc., required to complete this work.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 260533 to obtain mounting heights specified and indicated on drawings.

B. Install wall switch at forty-eight inches (48") above finished floor to top of outlet box.

C. Install convenience receptacle at sixteen inches (16") above finished floor to top of outlet box.

D. Install convenience receptacle at six inches (6") to top of outlet box, above backsplash of counter, and coordinate with Architectural drawings.

E. Install dimmers, light switch, and other similar standard height device outlet boxes at forty-eight inches (48") above finished floor to top of outlet box.

F. Install telephones and computer outlet boxes at sixteen inches (16") above finished floor to top of outlet box.

G. Install telephone and computer outlet boxes at six inches (6") to top of outlet box, above backsplash of counter, and coordinate with Architectural drawings.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation. Using a tester specifically designed to test GFCI receptacles or branch circuits.

F. All 120 V, 15 amp and 20 amp receptacle devices in kitchens shall be GFCI protected.

G. All interior rooms/spaces, including classrooms with more than one entrance/exit, shall have three way or four way lighting control at each entrance/exit.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION 262726

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SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Disconnect Switches.

B. Fuses.

C. Circuit Breakers.

D. Enclosures.

1.02 REFERENCES

A. ANSI/UL 198C—High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E—Class R Fuses.

C. FS W-F-870—Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-S-865—Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1—Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—DISCONNECT SWITCHES

A. Square D.

B. Cutler Hammer.

C. Siemens.

D. General Electric.

E. Substitutions: Under provisions of Division 1.

2.02 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Type HD, FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F- 870.

B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD, FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; as indicated on drawings.

D. All service disconnects shall be "Heavy-Duty Type." General duty equipment is not acceptable.

2.03 ACCEPTABLE MANUFACTURERS—FUSES

A. Bussmann.

B. Gould-Schawmut.

C. Littelfuse Tracor.

D. Substitutions: Under provisions of Division 1.

2.04 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class J for feeders and transformer loads and Class RK 5 for motor loads. Dual element, current limiting, time delay, one-time fuse, 250 or 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

C. Spare fuses shall be provided in the amount of 10% of each size and type of fuse installed; but, in no case, shall be less than three (3) spares for each different size and class of fuse being provided. Store in fuse cabinet of sufficient size to house all fuses (provided by Electrical Contractor), located by Architect/Engineer.

2.05 ACCEPTABLE MANUFACTURERS—CIRCUIT BREAKERS

A. Square D.

B. Cutler Hammer.

C. Siemens.

D. General Electric.

E. Substitutions: Under provisions of Division 1.

2.06 CIRCUIT BREAKERS

A. Molded Case Circuit Breakers: Inverse time with integral thermal and instantaneous magnetic trip elements in each pole.

B. Electronic Trip Circuit Breaker: As scheduled on the drawings, electronic circuit breakers shall have, at a minimum, adjustments for long time trip, short time trip and instantaneous trip. Provide integral ground fault sensing with adjustable ground fault trip where indicated on the drawings.

C. Ratings: Ratings as shown on the Drawings.

D. Enclosure:

Indoor: NEMA Type -1code gauge steel with rust inhibiting primer and baked gray enamel finish.

Outdoor: NEMA 3R code gauge zinc coated steel with baked gray enamel finish or NEMA 4 when indicated on drawings.

Corrosive Areas, Kitchen/Food service areas, Therapeutic/Pool spaces and damp/Wet locations: NEMA Type 4X, 304 stainless steel with brushed finish.

E. Accessories:

Provide accessories as scheduled, to NEMA AB 1.

Shunt Trip Device: 120 volts, AC.

Handle Lock: Include provisions for padlocking.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated on drawings. Where equipment is manufactured/provided with integral disconnecting means, disconnect switches shall not be required.

B. Install fuses in fusible disconnect switches.

C. Fuses and fuse holders shall be equipped with UL Class “R” rejection clips.

D. All fusible switches which contain current limiting fusing shall have UL Class “R” rejection clips

E. Fuses shall be dual element and current limiting.

F. When using fuses of ratings above 600 amperes, specify 600 volt UL Class “L”, current limiting/ time delay/dual element with 200,000 ampere interrupting capacity (AIC).

G. When using fuses of ratings 600 ampere and below, specify UL Class RK1 current limiting/time delay/dual element with 200,000 ampere interrupting capacity (AIC).

H. All fuses shall be by the same manufacturer.

I. Install enclosed circuit breakers where shown on Drawings, in accordance with manufacturer's instructions.

J. Adjusting: Adjust trip and time delay settings to values as recommended in coordination study provided by manufacturer or as instructed by the Architect/Engineer.

K. Field Quality Control: Inspect visually and perform several mechanical ON-OFF operations on each circuit breaker.

L. All multi-pole breakers shall have factory installed common trip handle ties.

M. Install in accordance with manufacturer's instructions and per NEC 110-26.

END OF SECTION 262816

SECTION 26 43 13 – SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work required under this Division shall include all materials, labor and auxiliaries required to furnish and install complete surge suppression for the protection of building electrical and electronics systems from the effects of line induced transient voltage surge and lightning discharge as indicated on drawings and specified in this Section.

B. Related work specified elsewhere:

1. Section 260100.....Basic Electrical Requirements.
2. Section 206519.....Building Wire and Cable.
3. Section 260533.....Raceways and Boxes for Electrical Systems.

1.02 QUALITY ASSURANCE

A. All surge protective devices (SPD) devices shall be manufactured by a company normally engaged in the design, development, and manufacture of such devices for electrical and electronics systems equipment.

B. The surge suppressor manufacturer shall offer technical assistance through support by a factory representative and local stocking distributor.

C. Submittals: Surge suppression submittal shall include:

1. Schematic data on each suppressor type indicating component types.
2. Dimensioned drawing of each suppressor type.
3. Manufacturer's performance data for each suppressor type.
4. Manufacturer shall furnish complete maintenance and installation manuals and a list of replacement parts.
5. The manufacturer shall certify that their SPD device has been designed and tested to fail in a safe, non-violent mode with no smoke, fire, flame, case, or module physical damage.
6. Manufacturer shall provide independent third party test data confirming unit will not have any holdover current.
7. Manufacturer shall submit the cover page of the manufacturer’s UL Test Report to show compliance with UL 1449, Second Edition.

D. Equipment Certification: Items shall be listed by Underwriters' Laboratories as an assembly, shall bear the UL seal and be marked in accordance with referenced standard U.L. 1449, Revision 2.5. Protection modes shall be as follows: seven (7) modes Wye = L-N, L-G, N-G; six (6) modes Delta = L-G, L-L.

E. Surge suppression devices shall be installed and located in accordance with requirements of all applicable National Fire Protection Association (NFPA) Codes.

F. Manufacturer shall have a minimum of ten (10) years experience in the design, development, and manufacture of TVSS equipment and a minimum of one (1) year experience with the technology being submitted and installed in the field.

1.03 WARRANTY

A. All surge suppression devices shall be warranted for a minimum period of five (5) years with free replacement of the device by the Manufacturer if the device fails to perform for any reason within those five (5) years. Replacement shall be interpreted to include parts and shipping costs only.

B. It is the intent that failed devices shall be replaced at no cost to Owner throughout the 5-Year Warranty period.

1.04 CODES AND STANDARDS

A. The following standards and publications are referenced in various parts of this specification and shall apply.

1. UL 1449, Third Edition—Surge Protective Devices.

2. ANSI/IEEE C62.41-1991 (IEEE 587)—Guide for Surge Voltages in Low-Voltage AC Power Circuits.

3. ANSI/IEEE 62.11-1987—Standard for Testing Heavy Duty Service Entrance Surge Arrestor.

4. ANSI/IEEE C62.45-1992—IEEE Guide for Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

5. UL 1283—Standard for Electromagnetic Interference Filters.

1.05 REQUIRED SUPPRESSORS

A. Provide U.L. transient voltage surge suppression for the equipment described herein and as indicated on the drawings:

1. On electrical service entrance panels.

2. On distribution and branch circuit panels.

PART 2 PRODUCTS

2.01 SUPPRESSORS FOR ELECTRICAL SERVICE ENTRANCE PANELS, SECONDARY PANELS, OR BRANCH PANELS

A. Transient voltage surge suppressors shall be installed at the service entrance on the load side of the first main disconnect.

B. Suppressors shall be installed as close as feasible to the device being protected in a position which will minimize lead length between suppressor and the buses or control breaker to which the suppressor connects. Suppressor leads shall not extend beyond the suppressor manufacturer's recommended maximum lead length without specific approval of the Engineer.

C. Suppressors shall be designed for the specific type and voltage of electrical service and shall provide clamping action for line to neutral, line to ground, and neutral to ground.

D. Suppressors shall be designed to withstand a maximum continuous operating voltage of not less than 125% of nominal RMS line voltage for 120V and 115% of nominal RMS line voltage for 277V.

E. The Transient Voltage Surge Suppressor shall be life cycle tested as per ANSI/IEEE 62.45-1992 to withstand 1,000 test surges at 10 KA for service entrance devices and 1,000 test surges at 3 KA for all other applications without failure or degradation of UL 1449 clamp voltages by more than 10%.

F. Suppressors shall be UL 1449, Second Edition, listed for all specified suppression modes and shall be approved for the location in which they are installed.

G. Suppressors shall have an operating temperature range of -10 degrees C to +50 degrees C.

H. Provide visible/audible or redundant visible alarm systems to indicate when the unit is operable and when it has failed. The alarm system shall be provided for each coupling mode.

I. Suppressors shall be marked with their short circuit current rating as per Article 285.6 of the 2002 NEC and shall be rated as such to comply with the minimum A.I.C. rating of the service gear and or panelboard in which the SPD is to be installed.

2.02 SUPPRESSOR CRITERIA: SUPPRESSORS SHALL MEET OR EXCEED THE FOLLOWING CRITERIA

A. Service Entrance (2 device types)

1. 277/480 Volt, 3 Phase, 4 Wire plus ground, Wye and 120/208 Volt, 3 Phase, 4 Wire plus ground, Wye.

a. Minimum Single Impulse Current Rating: 75,000 amperes per coupling mode (8/20 µs waveform).

b. Suppressors shall be failsafe, shall not holdover current, shall have repeated surge capability, shall be self-restoring, and shall be fully automatic.

c. The ANSI/IEEE C62.41.2—2002, Category B/'C Low' clamping voltage shall not exceed the following (not including any integral disconnects):

VOLTAGE	L-N	N-G	L-G
120/208	750	750	750
277/480	1200	1200	1200

d. Where direct connections are not provided, terminals shall be provided for all of the necessary power, neutral, and ground connections. Each terminal shall accommodate a minimum wire size of #8 AWG.

B. Distribution and Branch Circuit Panels: (1 device type)

1. 277/480 Volt, 3 Phase, 4 Wire plus ground, Wye.

a. Minimum Single Impulse Current Rating: 40,000 amperes per coupling mode (8/20 µs waveform).

b. Suppressors shall be failsafe, shall not holdover current, shall have repeated surge capability, shall be self-restoring, and shall be fully automatic.

c. The ANSI/IEEE C62.41.2-2002 Category B/'C Low' clamping voltage shall not exceed the following (not including any integral disconnects):

VOLTAGE	L-N	N-G	L-G
277/480	1200	1200	1200

d. Where direct connections are not provided, terminals shall be provided for all of the necessary power and ground connections. Each terminal shall accommodate a minimum wire size of #8 AWG.

2. 120/208 Volt, 3 Phase, 4 Wire plus ground, Wye (1 device type)

a. Minimum Single Impulse Current Rating: 40,000 amperes per coupling mode (8/20 µs waveform).

b. Suppressors shall be failsafe, shall not holdover current, shall have repeated surge capability, shall be self-restoring, and shall be fully automatic.

c. The ANSI/IEEE C62.41.2-2002 Category B/'C Low' clamping voltage shall not exceed the following (not including any integral disconnects):

VOLTAGE	L-N	N-G	L-G
120/208	750	750	750

d. Where direct connections are not provided, terminals shall be provided for all of the necessary power and ground connections. Each terminal shall accommodate a minimum wire size of #8 AWG.

e. All computer power panelboards shall have integral SPD protection.

2.03 ACCEPTABLE MANUFACTURERS

A. Atlantic Scientific.

B. Ditek Corporation.

C. Erico, Inc.

D. L.E.A. International.

E. Surge Suppression, Inc.

F. Advanced Protection Technologies (A.P.T.)

PART 3 EXECUTION

3.01 INSTALLATION OF SUPPRESSORS

A. Suppressors shall be installed as close as practical to the electric panel to be protected.

B. Suppressors shall be installed in a neat, workmanlike manner. Lead dress shall be as short and as straight as possible and be consistent with recommended industry practices for the system on which these devices are installed.

C. Equipment shall be installed following manufacturer's recommendations and guidelines in compliance with NEC Article 280/250 for grounding and bonding; NEC Article 110-9 and 110-10 for overcurrent protection.

D. All surge suppression devices specified in this specification section shall be designed and installed such that normal operation of the system shall not be impaired by the installation of these devices.

E. All SPD devices shall be installed and connected to overcurrent devices. Tap or Buss connections are not acceptable.

END OF SECTION 264313

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SECTION 26 51 00 – INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Luminaires and Accessories.

B. Exit Signs.

C. Ballasts.

D. Lamps.

1.02 RELATED SECTIONS

A. Section 260529 ..... Hangers and Supports for Electrical Systems.

A. Section 260533 ..... Raceways and Boxes for Electrical Systems.

1.03 REFERENCES

A. ANSI C78.379—Electric Lamps—Incandescent and High-Intensity Discharge Reflector Lamps—Classification of Beam Patterns.

B. ANSI C82.1—Ballasts for Fluorescent Lamps—Specifications.

C. ANSI C82.4—Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

D. ANSI/NFPA 70—National Electrical Code.

E. ANSI/NFPA 101—Life Safety Code.

F. NEMA WD 6—Wiring Devices-Dimensional Requirements.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of each luminaire.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

B. Maintenance Data: Include replacement parts list.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three (3) years experience.

1.08 EXTRA MATERIALS

A. Furnish under provisions of Division 1.

B. The Electrical Contractor shall at Substantial Completion, inspect the work, replace all burned out or defective light bulbs, and provide three percent (3%) (of the total lamp count) of spare lamps and ballasts (to be left at site).

C. Provide two (2) of each plastic lens type installed.

PART 2 PRODUCTS

2.01 LUMINAIRES

A. Furnish products as specified on drawings.

B. Substitutions: Under provisions of Division 1.

C. Install ballasts, lamps, and specified accessories at factory.

D. Lenses per NEC 410 4-E.

2.02 BALLASTS

A. Fluorescent Ballast:

1. Description: ANSI C82.11, high power factor type, electronic ballast, program start, UL Listed Class P, energy efficient type. Input current third harmonic content is held to below 10% of the input current.

2. Provide ballast suitable for lamps specified.

3. Voltage: Match luminaire voltage.

4. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.

5. Ballast shall be individually fused and have class "A" sound rating.

6. Ballast shall not contain PCBs.

B. High Intensity Discharge (HID) Ballast:

1. Description: ANSI C82.4, as scheduled.

2. Provide ballast suitable for lamp specified.

3. Voltage: Match luminaire voltage.

4. LS-NC Rating: NEMA LE2; equal to or less than ratings listed in Table C-1.

2.03 LAMPS

A. Incandescent Lamp inside—Frosted type.

B. Fluorescent Lamp—4100 degrees Kelvin, all by the same manufacturer.

C. Reflector Lamp Beam Patterns—ANSI C78.379.

D. Exit signs—LED.

2.04 EXIT SIGNS AND BATTERY PACKS

A. Shall be self-diagnostic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine each luminaire to determine suitability for lamps specified.

B. Emergency lighting with battery back-up shall be independent wall packs.

C. General lighting shall be utilized for emergency lighting when emergency power is provided by a generator set.

3.02 INSTALLATION

A. General

1. Install in accordance with manufacturer’s instructions.

2. Support all luminaires independent of ceiling framing.

3. Install accessories furnished with each luminaire.

4. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaires.

5. Bond products and metal accessories to branch circuit equipment grounding conductor.

6. Fixture whips shall be steel or aluminum. M/C cable shall be permissible for fixture whips/connections. M/C cable shall not be used for branch circuit wiring. Fixture whips/connections shall be made with a minimum of #14 AWG copper conductors.

7. Each light fixture shall be individually connected with its own fixture whip. Looping between light fixtures shall not be permissible. Equipment grounding conductors shall be provided in all fixture whips and/or connections.

8. All fixture whips shall be supported to fixture support wire/cable with an approved fastener equal to an Erico "KX" flexible conduit hanger or other UL listed supports and fasteners.

9. Reference Specification Section 260529, Hangers and Supports for Electrical Systems

B. Specific Lighting Types

1. Troffer and Lay-In Fixtures

   a. Lay-in light fixtures shall be connected by flexible raceways (6' maximum) from a J-box.

   b. Fixtures are not to be used as a raceway unless stamped for use as raceway by manufacturer. Single fixture in lay-in ceilings shall not be used for raceway and shall be connected to an outlet box located within six feet (6') of fixture with flexible conduit or fixture whips.

2. Surface Mounted Fixtures

   a. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

3. Pendant Mounted/Suspended Fixtures

   a. Install pendant mounted/suspended luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

4. Recessed Fixtures

   a. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

   b. Install recessed luminaires to permit removal from below.

   c. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

5. Wall Mounted Fixtures

   a. Install wall mounted luminaires at height as indicated on drawings but no higher than ten feet (10') above finished floor.

6. Exit Signs

   a. Install exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

b. Install exit signs at height as indicated on drawings.

7. Emergency Battery Packs

a. Install emergency battery packs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

b. Install emergency lights at height as indicated on drawings.

8. H.I.D. Lighting

a. Provided with Remote Ballast Systems located where serviceable from ground level. Also, provide additional Quartz Re-Strike Lighting within same lighting fixtures for loss of power temporary lighting (quantity as necessary).

3.03 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.04 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Aim and adjust luminaires, as directed.

C. Adjust exit sign directional arrows, as indicated.

3.05 CLEANING

A. Clean work under provisions of Division 1.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.06 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Provide minimum of two (2) hours demonstration of luminaire operation.

3.07 WARRANTY

A. Lamps and ballast shall be warranted as a combination installation for a minimum of five (5) years for the ballast and three (3) years for lamps from the date of final Substantial Completion.

END OF SECTION 265100

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. . . Fire Protection by Computer Design

NATHANIEL JACE HATCHER
LICENSE
No 59350
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

HATCHER ENGINEERING INC.
2108 W. RISK STREET
PLANT CITY, FL 33563
813-752-6900

59350
4/25/2014

Issued 09.09.14

Job Name	:	Manatee County 7th Floor (2013-0633)
Building	:	FP2.1
Location	:	Bradenton, FL
System	:	0633-A
Contract	:	
Data File	:	2013-0633-A.WXF

HYDRAULIC CALCULATIONS
for

Project name: Manatee County 7th Floor (2013-0633)
Location: Bradenton, FL
Drawing no: FP2.1
Date: 03/17/2014

Design
Remote area number: 0633-A
Remote area location: Office Area
Occupancy classification: Light Hazard
Density: 0.10
Area of application: 934
Coverage per sprinkler: 225 Max
Type of sprinklers calculated: Reliable - Q
No. of sprinklers calculated: 8
In-rack demand: N/A
Hose streams: 100
Total water required (including hose streams): 244.3 - GPM @ 82.7
Type of system: Wet Pipe
Volume of dry or preaction system: N/A - Gal

Water supply information
Date: 08/10/201
Location: Existing Pump
Source: Piper Fire Protection, Inc. - Asher D. / Ryan C

Name of contractor: N/A
Address:
Phone number:
Name of designer: Richard W. Lyon
Authority having jurisdiction:
Notes: (Include peaking information or gridded systems here.)

2014-0633-A

Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Pressure / Flow Summary - STANDARD

HATCHER ENGINEERING INC.
Manatee County 7th Floor (2013-0633)

Date 03/17/2014

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
1S	97.0	5.6	11.16	na	18.71	0.1	100	7.0
2S	97.0	5.6	11.89	na	19.31	0.1	144	7.0
1	97.667		11.81	na				
2	97.667		12.96	na				
4S	97.0	5.6	8.6	na	16.42	0.1	140	7.0
5S	97.0	5.6	9.0	na	16.8	0.1	168	7.0
6S	97.0	5.6	12.58	na	19.86	0.1	168	7.0
4	98.75		8.67	na				
5	98.75		9.39	na				
6	98.75		13.38	na				
8S	97.0	5.6	8.64	na	16.46	0.1	140	7.0
9S	97.0	5.6	9.05	na	16.84	0.1	168	7.0
10S	97.0	5.6	12.64	na	19.91	0.1	168	7.0
8	98.75		8.71	na				
9	98.75		9.44	na				
10	98.75		13.45	na				
3	97.667		16.48	na				
7	97.667		16.05	na				
11	97.667		16.14	na				
12	97.667		21.29	na				
13	96.833		23.85	na				
14	96.833		25.3	na				
18	97.667		19.25	na				
17	97.667		22.86	na				
16	96.833		25.05	na				
15	96.833		26.91	na				
19	96.833		29.13	na				
20	96.833		31.44	na				
SP7	96.833		39.3	na	100.0			
SP1	10.0		78.37	na				
SP0	1.0		82.43	na				
F1	1.0		82.52	na				
PUMP	1.0		82.71	na				

The maximum velocity is 14.11 and it occurs in the pipe between nodes 2 and 3

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv.	Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
1S	97	5.60	18.71	1	3E	6.0	2.083	120	11.164	
to						0.0	6.000		-0.289	
1	97.667		18.71	1.049		0.0	8.083	0.1152	0.931	Vel = 6.95
			0.0							
1			18.71						11.806	K Factor = 5.45
2S	97	5.60	19.31	1	2E	4.0	2.083	120	11.893	
to					T	5.0	9.000		-0.289	
2	97.667		19.31	1.049		0.0	11.083	0.1220	1.352	Vel = 7.17
			0.0							
2			19.31						12.956	K Factor = 5.36
1	97.667		18.71	1		0.0	10.000	120	11.806	
to						0.0	0.0		0.0	
2	97.667		18.71	1.049		0.0	10.000	0.1150	1.150	Vel = 6.95
2	97.667		19.31	1	T	5.0	3.250	120	12.956	
to						0.0	5.000		0.0	
3	97.667		38.02	1.049		0.0	8.250	0.4272	3.524	Vel = 14.11
			0.0							
3			38.02						16.480	K Factor = 9.37
4S	97	5.60	16.42	1	3E	6.0	3.167	120	8.596	
to						0.0	6.000		-0.758	
4	98.750		16.42	1.049		0.0	9.167	0.0903	0.828	Vel = 6.10
			0.0							
4			16.42						8.666	K Factor = 5.58
5S	97	5.60	16.80	1	2E	4.0	3.167	120	9.000	
to					T	5.0	9.000		-0.758	
5	98.750		16.8	1.049		0.0	12.167	0.0943	1.147	Vel = 6.24
			0.0							
5			16.80						9.389	K Factor = 5.48
6S	97	5.60	19.86	1	2E	4.0	3.167	120	12.576	
to					T	5.0	9.000		-0.758	
6	98.750		19.86	1.049		0.0	12.167	0.1285	1.563	Vel = 7.37
			0.0							
6			19.86						13.381	K Factor = 5.43
4	98.750		16.42	1		0.0	8.000	120	8.666	
to						0.0	0.0		0.0	
5	98.750		16.42	1.049		0.0	8.000	0.0904	0.723	Vel = 6.10
5	98.750		16.80	1		0.0	12.000	120	9.389	
to						0.0	0.0		0.0	
6	98.750		33.22	1.049		0.0	12.000	0.3327	3.992	Vel = 12.33
6	98.750		19.86	1.25	E	3.0	1.583	120	13.381	
to					T	6.0	9.000		0.469	
7	97.667		53.08	1.38		0.0	10.583	0.2083	2.204	Vel = 11.39
			0.0							
7			53.08						16.054	K Factor = 13.25
8S	97	5.60	16.46	1	3E	6.0	3.167	120	8.640	
to						0.0	6.000		-0.758	
8	98.750		16.46	1.049		0.0	9.167	0.0909	0.833	Vel = 6.11
			0.0							

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv.	Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
8			16.46						8.715	K Factor = 5.58
9S	97	5.60	16.84	1	2E	4.0	3.167	120	9.046	
to					T	5.0	9.000		-0.758	
9	98.750		16.84	1.049		0.0	12.167	0.0948	1.153	Vel = 6.25
			0.0							
9			16.84						9.441	K Factor = 5.48
10S	97	5.60	19.91	1	2E	4.0	3.167	120	12.640	
to					T	5.0	9.000		-0.758	
10	98.750		19.91	1.049		0.0	12.167	0.1290	1.570	Vel = 7.39
			0.0							
10			19.91						13.452	K Factor = 5.43
8	98.750		16.46	1		0.0	8.000	120	8.715	
to						0.0	0.0		0.0	
9	98.750		16.46	1.049		0.0	8.000	0.0908	0.726	Vel = 6.11
9	98.750		16.84	1		0.0	12.000	120	9.441	
to						0.0	0.0		0.0	
10	98.750		33.3	1.049		0.0	12.000	0.3342	4.011	Vel = 12.36
10	98.750		19.91	1.25	E	3.0	1.583	120	13.452	
to					T	6.0	9.000		0.469	
11	97.667		53.21	1.38		0.0	10.583	0.2092	2.214	Vel = 11.41
			0.0							
11			53.21						16.135	K Factor = 13.25
3	97.667		-32.04	2	E	5.0	32.250	120	16.480	
to						0.0	5.000		0.0	
7	97.667		-32.04	2.067		0.0	37.250	-0.0114	-0.426	Vel = 3.06
7	97.667		53.07	2		0.0	15.500	120	16.054	
to						0.0	0.0		0.0	
11	97.667		21.03	2.067		0.0	15.500	0.0052	0.081	Vel = 2.01
11	97.667		53.22	2	E	5.0	90.250	120	16.135	
to						0.0	5.000		0.0	
12	97.667		74.25	2.067		0.0	95.250	0.0542	5.159	Vel = 7.10
12	97.667		0.0	2	E	5.0	25.500	120	21.294	
to					T	10.0	15.000		0.361	
13	96.833		74.25	2.067		0.0	40.500	0.0542	2.194	Vel = 7.10
13	96.833		0.0	2	T	10.0	16.833	120	23.849	
to						0.0	10.000		0.0	
14	96.833		74.25	2.067		0.0	26.833	0.0542	1.454	Vel = 7.10
14	96.833		0.0	2		0.0	29.583	120	25.303	
to						0.0	0.0		0.0	
15	96.833		74.25	2.067		0.0	29.583	0.0542	1.602	Vel = 7.10
			0.0							
15			74.25						26.905	K Factor = 14.31
3	97.667		70.07	2	E	5.0	52.000	120	16.480	
to						0.0	5.000		0.0	
18	97.667		70.07	2.067		0.0	57.000	0.0487	2.774	Vel = 6.70
18	97.667		0.0	2	E	5.0	69.167	120	19.254	
to						0.0	5.000		0.0	
17	97.667		70.07	2.067		0.0	74.167	0.0486	3.608	Vel = 6.70

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv.	Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
17	97.667		0.0	2	2E	10.0	27.583	120	22.862	
to						0.0	10.000		0.361	
16	96.833		70.07	2.067		0.0	37.583	0.0487	1.829	Vel = 6.70
16	96.833		0.0	2	E	5.0	23.083	120	25.052	
to					T	10.0	15.000		0.0	
15	96.833		70.07	2.067		0.0	38.083	0.0487	1.853	Vel = 6.70
			0.0							
15			70.07						26.905	K Factor = 13.51
15	96.833		144.32	2	T	10.0	2.000	120	26.905	
to						0.0	10.000		0.0	
19	96.833		144.32	2.067		0.0	12.000	0.1852	2.223	Vel = 13.80
19	96.833		0.0	2	T	10.0	2.500	120	29.128	
to						0.0	10.000		0.0	
20	96.833		144.32	2.067		0.0	12.500	0.1852	2.315	Vel = 13.80
20	96.833		0.0	2	Fsp	0.0	10.250	120	31.443	
to					B	6.0	16.000		3.000	* * Fixed Loss = 3
SP7	96.833		144.32	2.067	T	10.0	26.250	0.1852	4.862	Vel = 13.80
SP7	96.833	H100	100.00	4	E	13.167	87.500	120	39.305	
to						0.0	13.167		37.607	
SP1	10		244.32	4.26		0.0	100.667	0.0145	1.459	Vel = 5.50
SP1	10		0.0	6	B	12.573	50.000	120	78.371	
to					E	17.603	30.176		3.898	
SP0	1		244.32	6.357		0.0	80.176	0.0021	0.165	Vel = 2.47
SP0	1		0.0	8	3E	85.404	115.000	140	82.434	
to						0.0	85.404		0.0	
F1	1		244.32	8.27		0.0	200.404	0.0004	0.087	Vel = 1.46
F1	1		0.0	8	4E	84.564	80.000	120	82.521	
to					2T	82.215	245.471		0.0	
PUMP	1		244.32	8.249	2F	21.141	325.471	0.0006	0.188	Vel = 1.47
					S	52.853				
					G	4.698				
			0.0							
PUMP			244.32						82.709	K Factor = 26.86

Pump Data:

P1 - Pump Churn Pressure	:	153
P2 - Pump Rated Pressure	:	127
P2 - Pump Rated Flow	:	1250
P3 - Pump Pressure @ Max Flow	:	92
P3 - Pump Max Flow	:	1875

Demand:

D1 - Elevation	:	41.578
D2 - System Flow	:	144.316
D2 - System Pressure	:	82.709
Hose (Demand)	:	100
D3 - System Demand	:	244.316
Safety Margin	:	67.476