

INVITATION FOR BID  
CONSTRUCTION  
NO. 23-TA004595SAM  
IMPROVEMENTS AT  
MASTER LIFT STATION 39A  
PROJECT NO. 6017982,  
6017983, 6014984  
MARCH 9, 2023

Manatee County BCC  
Procurement Division  
1112 Manatee Avenue West Ste 803  
Bradenton, FL 34205  
[purchasing@mymanatee.org](mailto:purchasing@mymanatee.org)



**ADVERTISEMENT**

**INVITATION FOR BID CONSTRUCTION NO. 23-TA004595SAM  
IMPROVEMENTS AT MASTER LIFT STATION 39A**

Manatee County, a political subdivision of the State of Florida (hereinafter referred to as County), will receive sealed bids from individuals, corporations, partnerships, and other legal entities authorized to do business in the State of Florida, to provide Improvements at Master Lift Station 39A, as specified in this Invitation for Bid Construction to include master lift station improvements.

**DATE, TIME AND PLACE DUE:**

The Due Date and Time for submission of Bids in response to this Invitation for Bid Construction (IFBC) is **April 18, 2023 at 2:00 PM ET**. Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205 prior to the Due Date and Time.

**SOLICITATION INFORMATION CONFERENCE:**

No Solicitation Information Conference will be conducted for this solicitation.

**DEADLINE FOR QUESTIONS AND CLARIFICATION REQUESTS:**

The deadline to submit all questions, inquiries, or requests concerning interpretation, clarification or additional information pertaining to this Invitation for Bid Construction to the Manatee County Procurement Division is March 31, 2023. Questions and inquiries should be submitted via email to the Designated Procurement Contact shown below.

**Important: A prohibition of lobbying is in place. Review Section A.13 carefully to avoid violation and possible sanctions.**

**DESIGNATED PROCUREMENT CONTACT:** Sherri Meier, Procurement Team Leader  
(941) 749-3042, Fax (941) 749-3034  
Email: [sherri.adamsmeier@mymanatee.org](mailto:sherri.adamsmeier@mymanatee.org)  
Manatee County Financial Management Department  
Procurement Division

AUTHORIZED FOR RELEASE: \_\_\_\_\_

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## **SECTION A, INFORMATION FOR BIDDERS**

To receive consideration, entities who submit a response to this Invitation for Bid Construction (Bidders) must meet the minimum qualification requirements and comply with the following instructions. Bid responses (Bids) will be accepted from single business entities, joint ventures, partnerships or corporations.

### **A.01 BID DUE DATE**

The Due Date and Time for submission of Bids in response to this Invitation for Bid Construction (IFBC) is **April 18, 2023 at 2:00 PM ET**. Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205 and time stamped by a Procurement representative prior to the Due Date and Time.

Bids received after the Due Date and Time will not be considered. It will be the sole responsibility of the Bidder to deliver its Bid to the Manatee County Procurement Division for receipt on or before the Due Date and Time. If a Bid is sent by U.S. Mail, courier or other delivery services, the Bidder will be responsible for its timely delivery to the Procurement Division. Bids delayed in delivery will not be considered, will not be opened at the public opening, and arrangements will be made for their return at the Bidder's request and expense.

### **A.02 SOLICITATION INFORMATION CONFERENCE AND SITE VISIT:**

A non-mandatory site visit will be held at 9:00 AM ET on March 17, 2023 at the MLS 39A, 5621 39<sup>th</sup> Street East, Bradenton, FL 34203.

Attendance to mandatory information conferences and/or site visits are required to meet the minimum qualification requirements of the IFBC. Attendance to non-mandatory information conferences and/or site visit is not required, but is strongly encouraged.

### **A.03 PUBLIC OPENING OF BIDS**

Bids will be opened immediately following the Due Date and Time at the Manatee County Administration Building, Suite 803 in the presence of County officials. Bidders or their representatives may attend the Bid opening.

Manatee County will make public at the opening the names of the business entities which submitted a Bid and the total bid price submitted. No review or analysis of the Bids will be conducted at the Bid opening.

### **A.04 SUBMISSION OF BIDS**

The contents of the Bid sealed package must include:

- One (1) bound original clearly identifying Bidder and marked "ORIGINAL".
- One (1) electronic format copy clearly identifying Bidder.

Electronic format copy should be submitted on a Universal Serial Bus (USB) portable flash memory drive or compact disc (CD) in Microsoft Office® or Adobe Acrobat®

portable document format (PDF) in one continuous file. Do not password protect or otherwise encrypt electronic Bid copies. Electronic copies must be searchable and contain an identical Bid to the original.

Submit the Bid package in a sealed container with the following information clearly marked on the outside of the package: IFBC NO. 23-TA004595SAM, Improvements at Master Lift Station 39A, Bidder's name, and Bidder's address. Bids must be delivered to the Manatee County Procurement Division prior to the Due Date and Time at the following address:

Manatee County Procurement Division  
1112 Manatee Avenue West, Suite 803  
Bradenton, FL 34205

#### **A.05 DISTRIBUTION OF SOLICITATION DOCUMENTS**

All documents issued pursuant to this IFBC are distributed electronically and available for download at no charge at [www.mymanatee.org](http://www.mymanatee.org) > *Bids and Proposals*. Documents may be viewed and downloaded for printing using Adobe Reader® software.

At its sole discretion, the County may utilize third-party providers to distribute proposals. Visit the third-party's website for more information regarding this service. Participation in the third-party system is not a requirement for doing business with Manatee County.

Additionally, the IFBC and all related documents are available for public inspection at the Manatee County Procurement Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205. Call (941) 749-3014 to schedule an appointment. Documents are available between the hours of 8:00 A.M. and 5:00 P.M., Monday through Friday, with the exception of County holidays.

As a courtesy, Manatee County notifies the Manatee County Chamber of Commerce and the Manatee County Black Chamber of Commerce of all active solicitations, who then distributes the information to its members.

#### **A.06 EXAMINATION OF BID DOCUMENTS AND SITE(S)**

It is the responsibility of each bidder before submitting a bid, to (a) examine the IFBC documents thoroughly; (b) visit the Project 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 IFBC documents; and (e) notify County in writing of all conflicts, errors, or discrepancies in the IFBC 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 Project 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 IFBC 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 Project 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 IFBC 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 IFBC documents.

Inspection of the Project Site(s) is not a requirement to be considered for award of this bid. Prior to submitting a bid, each bidder shall examine the Project Site(s) and all conditions thereon fully familiarizing themselves with the full scope of the Work. Failure to become familiar with Project 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 Project Plans and Specifications. Bidder shall acknowledge inspection of the Project Site(s) on his/her signed, submitted Bid Form.

#### **A.07 ADDENDA**

Any interpretations, corrections or changes to this IFBC will be made by addenda. Addenda will be posted on the Procurement Division's web page of the County website at <http://www.mymanatee.org/purchasing> > *Bids and Proposals*. For those solicitations that are advertised on a third-party website, addenda will also be posted on the third-party's distribution system on the 'Planholders' link.

All addenda are a part of the IFBC and each Bidder will be bound by such addenda. It is the responsibility of each Bidder to read and comprehend all addenda issued. Failure of any Bidder to acknowledge an issued addendum in its Bid will not relieve the Bidder from any obligation contained therein.

#### **A.08 BID FORMS**

Bids must include the forms provided in this IFBC. If needed, additional pages may be attached to a form. Bidders must fully complete and execute all Bid Forms. Bid Forms must be executed by an authorized official of the company who has the legal authority to bind the company.

#### **A.09 BID EXPENSES**

All costs incurred by Bidder in responding to this IFBC will be the sole responsibility of the Bidder.

#### **A.10 QUESTION AND CLARIFICATION PERIOD**

Each Bidder shall examine all IFBC documents and will judge all matters relating to the adequacy and accuracy of such documents. Any questions or requests concerning interpretation, clarification or additional information pertaining to this IFBC, including the sample Agreement, shall be made in writing via email to the Manatee County Procurement Division to the Designated Procurement Contact or to [purchasing@mymanatee.org](mailto:purchasing@mymanatee.org). All questions received and responses given will be provided to potential bidders via an addendum to this IFBC.

Manatee County will not be responsible for oral interpretations given by other sources including County staff, representative, or others. The issuance of a written addendum by the Procurement Division is the only official method whereby interpretation, clarification or additional information will be given.

#### **A.11 FALSE OR MISLEADING STATEMENTS**

Bids which contain false or misleading statements, or which provide references which do not support an attribute or condition claimed by the Bidder, may be rejected. If, in the opinion of the County, such information was intended to mislead the County in its evaluation of the Bid, and the attribute, condition or capability is a requirement of this IFBC. Such Bidder will be disqualified from consideration for this IFBC and may be disqualified from submitting a response on future solicitation opportunities with the County.

#### **A.12 CONFIDENTIALITY OF SECURITY RELATED RECORDS**

- a. Pursuant to Florida Statutes § 119.071(3), the following records (hereinafter referred to collectively as “the Confidential Security Records”) are confidential and exempt from the disclosure requirements of Florida Statutes § 119.07(1):
  - i. A Security System Plan or portion thereof for any property owned by or leased to County or any privately owned or leased property held by County.
  - ii. Building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, arena, stadium, water treatment facility, or other structure owned or operated by County.
  - iii. Building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout or structural elements of an attractions and recreation facility, entertainment or resort complex, industrial complex, retail and service development, office development, or hotel or motel development in the possession of, submitted to County.
- b. Successful Bidder agrees that, as provided by Florida Statute, it shall not, as a result of a public records request, or for other reason disclose the contents of, or release or provide copies of the Confidential Security Records to any other party absent the express written authorization of County’s Property Management Director or to comply with a court order requiring such release or disclosure. To the extent successful Bidder receives a request for such records, it shall immediately contact the County’s

designated Contract administrator who shall coordinate County's response to the request.

#### **A.13 LOBBYING**

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

#### **A.14 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 the 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, and other supporting documentation which the Bidder obtained and upon which the Bidder relied upon to develop its Bid. County reserves the right to deem any presumptive unbalanced Bid where the Bidder is unable to demonstrate the validity and/or necessity of the unbalanced unit costs as non-responsive.

#### **A.15 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, and other documents 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.16 WITHDRAWAL OR REVISION OF BIDS**

Bidders may withdraw Bids under the following circumstances:

- a. If Bidder discovers a mistake(s) prior to the Due Date and Time. Bidder may withdraw its Bid by submitting a written notice to the Procurement Division. The notice must be received in the Procurement Division prior to the Due Date and Time for receiving Bids. A copy of the request shall be retained, and the unopened Bid returned to the Bidder; or
- b. After the Bids are opened but before a contract is signed, Bidder alleges a material mistake of fact 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 in the Bid. Request to withdraw a Bid must be in writing and approved by the Purchasing Official.

#### **A.17 IRREVOCABLE OFFER**

Any Bid may be withdrawn up until the Due Date and Time. Any Bid not so withdrawn shall, upon opening, constitute an irrevocable offer for a period of one hundred twenty (120) days to provide the goods or services set forth in this IFBC or until one or more of the Bids have been duly accepted by County, whichever occurs first.

#### **A.18 RESERVED RIGHTS**

County reserves the right to accept or reject any and/or all bids, to waive irregularities and minor 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 IFBC 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 IFBC.

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.19 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 Procurement Division shall be in accordance with the Manatee County Procurement Ordinance as amended.

#### **A.20 COLLUSION**

By submitting a bid in response to this IFBC, 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. Further, Bidder, and in the case of a joint bid each party thereto, certifies as to their own organization, that in connection with this IFBC that:

- a. All 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. All 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 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 is/are named in Bidder's Bid and that no person other than those identified has any interest in the Bid or in the resulting Agreement to be entered into.
- 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.21 CODE OF ETHICS**

With respect to this and any bid, if a Bidder violates, directly or indirectly, the ethics

provisions of the Manatee County Procurement Code and/or Florida criminal or civil laws related to public procurement, including but not limited to Florida Statutes Chapter 112, Part II, Code of Ethics for Public Officers and Employees, such Bidder will be ineligible for award to perform the work described in this IFBC, and may be disqualified from submitting on any future quote or bid requests 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.

#### **A.22 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 Section 287.133, Florida Statutes, 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 Section 287.017, Florida Statutes, 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.23 SCRUTINIZED COMPANIES**

Florida Statutes § 287.135, as amended from time to time, may contain limitations on the part of a company to conduct business with the County. Submission of a response to this solicitation shall be subject to all procedural requirements contained within that statute including the submission of any required certification of eligibility to contract with the County. It shall be the responsibility of the company responding to this solicitation to concurrently review the current version of the statute and ensure it is compliant. To the extent a certification is required, it shall be provided on the form located at Appendix F *Vendor Certification Regarding Scrutinized Companies Lists*.

#### **A.24 AGREEMENT**

The successful Bidder will be required to execute the Agreement, a sample of which is attached hereto and made a part hereof. The County will transmit the Agreement to the successful Bidder for execution. The successful Bidder agrees to deliver the required number of duly executed copies of the Agreement, with any other required documents, to the County within ten calendar days of receipt.

#### **A.25 LEGAL NAME**

Bidders shall clearly indicate the full legal name, including any d/b/a, address, email address, and telephone number on the Bid Form. Bid Forms shall be signed above the typed or printed name and title of the signer. The signer must be an official of the organization and 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.26 DISCOUNTS**

All discounts must be incorporated in the prices contained in the bid and not shown separately. Unless otherwise specified in this IFBC, pricing must be all inclusive, including delivery costs. The prices indicated on the Pricing Form shall be the prices used in determining award.

#### **A.27 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 its bid for any sales or service taxes.

The successful Bidder will be responsible for the payment of taxes of any kind, including but not limited to sales, consumer, use, and other similar taxes payable on account of the work performed and/or materials furnished under the award in accordance with all applicable laws and regulations.

#### **A.28 QUALITY**

Unless otherwise specifically provided in the IFBC documents, all goods provided shall be new, the latest make or model, of the best quality, of the highest grade of workmanship, and of the most suitable for the purpose intended.

Unless otherwise specifically provided in the IFBC 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.29 AUTHORIZED PRODUCT REPRESENTATION**

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 do so may, in the 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.

**A.30 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.

**A.31 AMERICANS WITH DISABILITIES ACT**

Manatee 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 document at least twenty-four (24) hours in advance of either activity.

**A.32 EQUAL EMPLOYMENT OPPORTUNITY**

In accordance with Title VI of the Civil Rights Act of 1964, Title 15, Part 8 of the Code of Federal Regulations and the Civil Rights Act of 1992, Manatee County hereby notifies all Bidders that it will affirmatively ensure minority business enterprises are afforded full opportunity to participate in response to this IFBC and will not be discriminated against on the grounds of race, color, national origin, religion, sex, age, handicap, or marital status in consideration of award.

**A.33 MINORITY AND/OR DISADVANTAGED BUSINESS ENTERPRISES**

The State of Florida Office of Supplier Diversity provides the certification process and maintains the database of certified MBE/DBE firms. Additional information may be obtained at [https://www.dms.myflorida.com/agency\\_administration/office\\_of\\_supplier\\_diversity\\_osd](https://www.dms.myflorida.com/agency_administration/office_of_supplier_diversity_osd) or by calling (850) 487-0915.

**A.34 DELIVERY**

Unless otherwise specified, all prices shall include all delivery cost (FOB Destination).

### **A.35 MATHEMATICAL ERRORS**

- a. Bid pricing forms without imbedded mathematical formulas: 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. In the event the dollar amount for contract contingency is omitted, it will be added to the total price of the Bid.
- b. Bid pricing forms with imbedded mathematical formulas: Interactive bid pricing forms that contain mathematical formulas may be provided solely for the convenience of the Bidder to automate lengthy and complex bid forms. In the event bid pricing forms with imbedded formulas are used and a multiplication/extension error(s) is discovered in the formula, the unit price entered by the Bidder shall prevail. In the event of addition error(s) the extension totals shall prevail.
- c. Bidder shall assume the responsibility and accuracy of the information input in the bid pricing form and therefore shall verify that the calculations are correct before submitting its Bid.
- d. Regardless of the type of bid pricing form used, all Bids shall be reviewed mathematically by the County using these standards.

### **A.36 SUBCONTRACTORS**

The successful bidder will obtain prior written approval from the County for any subcontractor(s) and the work each will perform. A subcontractor is defined as any entity performing work within the scope of the project who is not an employee of the successful Bidder.

Bidders subcontracting any portion of the work shall include a list of subcontractors along with their bid. The list shall include: name and address of subcontractor, type of work to be performed and the percent of the contract amount to be subcontracted.

### **A.37 E-Verify**

Prior to the employment of any person under this contract, the successful Bidder shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of (a) all persons employed during the contract term by the successful Bidder to perform employment duties within Florida and (b) all persons, including subcontractors, assigned by the successful Bidder to perform work pursuant to the contract with Manatee County. For more information on this process, please refer to United States Citizenship and Immigration Service site at: <http://www.uscis.gov/>.

Only those individuals determined eligible to work in the United States shall be employed under this contract.

By submission of a bid in response to this IFBC, the successful Bidder commits that all employees and subcontractors will undergo e-verification before placement on this contract.

The successful Bidder shall maintain sole responsibility for the actions of its employees and subcontractors. For the life of the contract, all employees and new employees brought in after contract award shall be verified under the same requirement stated above.

### **A.38 DISCLOSURE**

Upon receipt, all inquiries and responses to inquiries related to this IFBC become "Public Records," and shall be subject to public disclosure consistent with Florida Statutes, 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 bids shall be conducted at the public 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.

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 the County, successful Bidder must:

- a. Keep and maintain public records required by public agency to perform the service.
- b. Upon request from the public agency's custodian of public records, provide the public agency with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in 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 for the duration of the contract term and following completion of the contract if the successful Bidder does not transfer the records to the public agency.
- d. Upon completion of the contract, transfer, at no cost, to the public agency all public records in possession of contractor or keep and maintain public records required by the public agency to perform the service. If the successful Bidder transfers all public records to the public agency upon completion of the contract, the successful Bidder shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the successful Bidder keeps and maintains public records upon completion of the contract, the successful Bidder shall meet all applicable requirements for retaining public records. All records stored

electronically must be provided to the public agency, upon request from public agency's custodian of public records, in a format that is compatible with the information technology systems of the public agency.

**IF THE SUCCESSFUL BIDDER HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE SUCCESSFUL BIDDER'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO ANY RESULTING CONTRACT, CONTACT COUNTY'S CUSTODIAN OF PUBLIC RECORDS AT:**

**Phone: (941) 742-5845**

**Email: [debbie.scaccianoce@mymanatee.org](mailto:debbie.scaccianoce@mymanatee.org)**

**Mail: Manatee County BCC**

**Attn: Records Manager**

**1112 Manatee Ave W.**

**Bradenton, FL 34205.**

**A.39 LOCAL PREFERENCE**

Local business is defined as a business legally authorized to engage in the sale of the goods and/or services, and which certifies within its Bid that for at least six (6) full months prior to the advertisement of this IFBC 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:

- a. Purchases or agreements which are funded, in whole or in part, by a governmental or other funding entity, where the terms and conditions governing the funds prohibit the preference.
- b. Any bid announcement which specifically provides that local preference, as set forth in this section, is 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.
- c. For a competitive solicitation for construction services in which fifty percent (50%) or more of the cost will be paid from state.
- d. 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](http://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 Procurement Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205.
- e. 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.40 VENDOR REGISTRATION**

Registering your business will provide Manatee County a sourcing opportunity to identify suppliers of needed goods and services and identify local businesses. To register as a

supplier with the County go to [www.mymanatee.org/vendor](http://www.mymanatee.org/vendor). For assistance with supplier registration, call the Procurement Division main number at (941) 749-3014. Office hours are Monday – Friday, 8:00 A.M. to 5:00 P.M., excluding County holidays.

A link to Vendor Registration is listed on the Procurement Division’s web page at <http://www.mymanatee.org/home/government/departments/financial-management/purchasing.html>. Click on “*Register as a Vendor*”, then “*Vendor Registration Form*”. Registration is not mandatory to submit a Bid.

#### **A.41 ENVIRONMENTAL SUSTAINABILITY**

All bidders are encouraged to use as many environmentally preferable "green" products, materials, as supplies, as possible to promote a safe and healthy environment. Environmentally preferable are products or services that have a reduced adverse effect on the environment.

Bidder shall acknowledge in its Bid if Bidder has an environmental sustainability initiative. In addition, Bidder shall submit with its Bid a brief summary of Bidder’s environmental sustainability initiative. This information will be used as a determining factor in the award decision when all other factors, including local preference, are otherwise equal.

#### **A.42 ePAYABLES**

Manatee County Board of County Commissioners and the Manatee County 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 of the Circuit Court will issue a unique credit card number to vendor after goods are delivered or services rendered, vendors submit invoices to the remit to address on the purchase order. 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 Bidder is interested in participating in this program, complete the ePayables Application attached herein and return the completed form via email to [tina.mancini@manateeclerk.com](mailto:tina.mancini@manateeclerk.com).

#### **A.43 BASIS OF AWARD**

County will not make award to a Bidder who is delinquent in payment of any taxes, fees, fines, contractual debts, judgments, or any other debts due and owed to the County, or is in default on any contractual or regulatory obligation to the County. By submitting this solicitation response, Bidder attests that it is not delinquent in payment of any such debts due and owed to the County, nor is it in default on any contractual or regulatory obligation to the County. In the event the Bidder’s statement is discovered to be false, bidder will be subject to suspension and/or debarment and the County may terminate any award it has with bidder.

Award shall be to the lowest, responsive, responsible bidder(s) meeting specifications which includes delivery time requirements, qualification requirements, and having the lowest total offer for requirements listed on the Bid Form for the Work as set forth in this IFBC. Bid prices shall include costs for furnishing all labor, equipment and/or materials for the completion of the Work to the County's satisfaction, in accordance with and in the manner set forth and described in the IFBC documents and within the prescribed time.

Multiple schedules for completion of Work shall be considered. Two (2) bids shall be submitted and considered, Bid 'A' based on 425 calendar days completion time and Bid 'B' based on 485 calendar days completion time. County, at its sole discretion, shall select either Bid 'A' or Bid 'B', whichever is in the best interest of the County. Only one (1) award will be made.

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 responsive, responsible bids which are equal with respect to price and all other evaluation factors are received, the bid from the local business shall be given preference in award.

Whenever two or more responsive, responsible bids which are equal with respect to price are received, and both or neither of these bids are from a local business, the award shall be determined by a chance drawing, coin toss, or similar tie-breaking method conducted by the Procurement Division and open to the public.

Bidder acknowledges that County has, or may hire, others to perform work similar to or the same as that which is within the scope of work of this IFBC. In the event that the successful Bidder cannot meet the delivery time or availability requirements of materials, the County, at its sole discretion can obtain the goods and services from other sources.

#### **A.44 SCOPE OF WORK**

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

The successful Bidder shall furnish all shop drawings, work 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 the County.

The successful Bidder shall perform work as shown on the plans and specifications.

**A.45 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. Completion time shall be based on Bid 'A' for 425 calendar days or Bid 'B' based on 485 calendar days time at the County's sole discretion.

**A.46 LIQUIDATED DAMAGES**

If the successful Bidder fails to achieve substantial completion of the Work within the contract time and as otherwise required by the Agreement (to include not only the entire Work but any portion of the Work as set forth therein), the County shall be entitled to retain or recover from the successful Bidder, as liquidated damages and not as a penalty, the sum of \$1005.00 per calendar day, commencing upon the first day following expiration of the contract time and continuing until the actual date of substantial completion.

Such liquidated damages are hereby agreed to be a reasonable estimate of damages the County will incur because of delayed completion of the Work. The County may deduct liquidated damages as described in this paragraph from any unpaid amounts then or thereafter due the successful bidder under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the successful bidder shall be payable to the County at the demand of the County, together with interest from the date of the demand at the maximum allowable rate.

**A.47 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 IFBC 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 County 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 Sum and Contract Time, and adding bid items not previously contemplated that change the initial Scope of Work.

#### **A.48 LICENSES AND PERMITS**

The successful Bidder shall be solely responsible for obtaining all necessary license and permit fees, including, but not limited to, all license fees, permit fees, impact fees, or inspection fees, and responsible for the costs of such fees. Successful Bidder is solely responsible for ensuring all work complies with all Federal, State, local, and Manatee County ordinances, orders, codes, laws, rules, regulations, directives, and guidelines.

#### **A.49 PROTEST**

Any actual bidder, proposer, or contractor who is aggrieved in connection with the notice of intent to award of a contract with a value greater than \$250,000 where such grievance is asserted to be the result of a violation of the requirements of the Manatee County Procurement Code or any applicable provision of law by the officers, agents, or employees of the County, may file a protest to the Purchasing Official.

Protest must be in writing and delivered via email at [purchasing@mymanatee.org](mailto:purchasing@mymanatee.org) or by hand delivery to the Procurement Division at 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205 by 5:00 p.m. on the fifth business day following the date of posting of the Notice of Intent to Award on the County website. There is no stay of the procurement process during a protest. The Purchasing Official shall have the authority to settle and resolve a protest concerning the intended award of a contract.

For additional information regarding the County protest process, visit the Procurement Division webpage on the County website.

#### **A.50 ACCESSIBILITY**

The County is committed to making its documents and information technologies accessible to individuals with disabilities by meeting the requirements of Section 504 of the Rehabilitation Act and best practices (W3C WCAG 2). **For assistance with accessibility regarding this solicitation, contact the Manatee County Procurement Division via email at [purchasing@mymanatee.org](mailto:purchasing@mymanatee.org) or by phone at 941-748-4501 X3014.**

Successful Bidder shall ensure all its electronic information, documents, applications, reports, and deliverables required under this Agreement are in a format that meets the requirements of Section 504 of the Rehabilitation Act and best practices (W3C WCAG 2).

Where not fully compliant with these requirements and best practices, Successful Bidder shall provide clear points of contact for each document and information technology to direct users in how to obtain alternate formats. Further, successful Bidder shall develop accommodation strategies for those non-compliant resources and implement strategies to resolve the discrepancies.

#### **A.51 SOLICITATION SCHEDULE**

The following schedule has been established for this Solicitation process. Refer to the County's website ([www.mymanatee.org](http://www.mymanatee.org) > Business > *Bids & Proposals*) for meeting locations and updated information pertaining to any revisions to this schedule.

Scheduled Item	Scheduled Date
Non-Mandatory site tour in accordance with Article A.02	March 17, 2023, 9:00 AM ET
Question and Clarification Deadline	March 31, 2023
Final Addendum Posted	April 7, 2023
Bid Response Due Date and Time	April 18, 2023, 2:00 PM, ET
Projected Award	June 2023

NOTE: Any statements contained in the Scope of Work, Bid Summary, Construction Agreement, General Conditions of the Construction Agreement and/or Exhibits which vary from the information in Section A, Information for Bidders, shall have precedence over the Information for Bidders.

**END OF SECTION A**

**SECTION B, BID FORMS**

(To be completed and returned with Bid)

## APPENDIX A, MINIMUM QUALIFICATIONS

IFBC No. 23-TA004595SAM

Bidders must submit the information and documentation requested in this Attachment that confirms Bidder meets the following minimum qualification requirement(s):

1. Must have been registered with the State of Florida, Division of Corporations to do business in Florida.

**No documentation is required. The County will verify registration.**

2. Bidder, or Bidder's subcontractor combined must possess a General Contractor's License issued by the Florida Department of Business and Professional Regulation for a period of at least five (5) consecutive years since March 1, 2018. License must be current and valid through the Due Date for submission of bids for this IFBC.

**If Bidding as a General Contractor, provide a copy of the license, issued by the Florida Department of Business and Professional Regulation and documentation confirming Bidder or Bidders Subcontractor has been licensed and or certified for the period of March 1, 2018, through the date of submission of the bid.**

3. Bidder or Bidder's subcontractor has provided lift station improvements for at least three (3) projects since March 1, 2018 in which each project included the following components: lift (i) station rehabilitation; (ii) installation, testing, and startup of new submersible pumps; (iii) construction, plumbing, electrical and mechanical related to left station improvements. Project clients must be agreeable to responding to an email inquiry by the County.

**Provide the following information for the three (3) qualifying project references.**

- a) Name of client
- b) Project name
- c) Location (City/State)
- d) Client contact name
- e) Contact phone
- f) Contact email
- g) Service dates (Start/End)

4. Bidder, on the day the bid is submitted, has a certified or registered Qualifying Agent, as required by Section 489.119, Florida Statutes, and that Qualifying Agent has been the same Qualifying Agent of Bidder for a period of at least two (2) consecutive years, since March 1, 2021.

**Submit a copy of Bidder's Qualifying Agent's registration or certification along with supporting documentation confirming Qualifying Agent has been the Qualifying Agent for Bidder for two (2) years, since March 1, 2021.**

5. Bidder is not on the Florida Department of Management Services Suspended, Debarred, Convicted Vendor Lists.

**No documentation is required. The County will verify.**

6. If Bidder is submitting as a joint venture must file the required documents with the Florida Department of Business and Professional Regulation as required by Florida Statute Section 489.119, prior to the Due Date and Time.

**If Bidder is a joint venture, provide a copy of Bidder's approved filing with the Florida Department of Business and Professional Regulation.**

7. Bidder has no reported conflict of interests in relation to this IFBC.

**If no conflicts of interests are present, Bidder must submit a fully completed copy of Appendix J.**

**If there is a potential conflict of interest, on a separate page submit a statement to that affect and disclose the name of any officer, director or agent who is an employee of the County. Disclose the name of any County employee who owns, directly or indirectly, any interest in Bidder's firm or any of its branches.**

**END OF APPENDIX A**

**APPENDIX B, BIDDER'S QUESTIONNAIRE**

IFBC No. 23-TA004595SAM

**Bidder must fully complete and return this form with its Bid. 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.

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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.

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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.

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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.

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

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12. If any part of work will be subcontracted, list MBE/DBE/WBE/VETERAN to be utilized. Include the estimated dollar amount of the portion of Work each will perform.

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BIDDER: \_\_\_\_\_

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

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

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15. If applicable to the Work for this IFBC, Drilling Supervisor Qualifications: Contractor shall provide a boring specialist who shall remain on the project site during the entirety of the directional boring operation. This includes, but is not limited to, drilling fluid preparation, seaming, boring and pulling. The boring specialist shall have a minimum of five (5) years' experience in supervising directional bores of similar nature, diameter, materials and lengths. (Reference: Specification Section 02619, Horizontal Directional Drilling).

Provide the contact information for a minimum of three (3) projects wherein the boring specialist has performed this type of work, diameter, materials and lengths.

Boring specialist's name: \_\_\_\_\_

Boring specialist's years of experience in supervising directional bores \_\_\_\_\_

Provide contact name, and contact number for projects:

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16. If applicable to the Work for this IFBC, Pipe Fusion Qualifications: All boring and fusing equipment shall be certified for operation. The Contractor responsible for thermal butt fusing pipe and fittings shall have manufacturer certification for performing such work or a minimum of five (5) years of experience performing this type of work.

Thermal butt fusing pipe and fittings contractor or subcontractor's name: \_\_\_\_\_

Attach a copy of contractor's/subcontractor's manufacturer certification to this Questionnaire

OR

Provide contractor's/subcontractor's years of experience in thermal butt fusing pipe and fittings

\_\_\_\_\_

If manufacturer certification is not provided, include contact name, and contact number for projects that confirms five years of experience:

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BIDDER: \_\_\_\_\_

17. If applicable to the Work for this IFBC, Pipe Bursting Qualifications: The Contractor shall be certified by the manufacturer of the pipe bursting system that they are fully trained licensed installer of the manufacturer's pipe bursting system. Contractor shall provide a letter to the County documenting this requirement. (Reference: Specification Section 02619A, Pipe Bursting (PB) of Existing Mains).

18. List the following regarding 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: \_\_\_\_\_

19. Is Bidder a local business as defined in Section A.38, Local Preference?

Yes

No

If yes, by signing below Bidder certifies that for at least six months prior to the advertisement date of this IFBC it has maintained a physical place of business in Manatee, Desoto, Hardee, Hillsborough, Pinellas or Sarasota counties with at least one full-time employee at that location.

BIDDER: \_\_\_\_\_

BY: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

TITLE/DATE: \_\_\_\_\_

PHYSICAL ADDRESS OF QUALIFYING LOCAL LOCATION: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NAME OF QUALIFYING EMPLOYEE AT LOCAL LOCATION: \_\_\_\_\_

20. Confirm if Bidder has an environmental sustainability initiative as defined in Section A.41.

Yes       No

If yes, submit a brief summary (2-3 paragraphs) of the environmental sustainability initiative.

BIDDER: \_\_\_\_\_

**APPENDIX C, ENVIRONMENTAL CRIMES CERTIFICATION**

IFBC No. 23-TA004595SAM

SWORN STATEMENT PURSUANT TO ARTICLE V, MANATEE COUNTY PROCUREMENT CODE

**Bidder must fully complete and return this form with its Bid. 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 an Owner's Agreement for public improvements, procurement of goods or services (including professional services) or an Owner's lease, franchise, concession or management agreement, or shall receive a grant of Owner's monies unless such person or entity has submitted a written certification to Owner 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 Owner'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 Owner's Purchasing Official. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with Owner.

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 AGREEMENT 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 \_\_\_\_\_  
COUNTY OF \_\_\_\_\_

Sworn to and subscribed before me this \_ day of \_\_\_\_\_, 20\_\_\_\_  
by \_\_\_\_\_

Who is personally known / has produced \_\_\_\_\_ as  
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.

**APPENDIX D, FLORIDA TRENCH SAFETY ACT**

**Bidder must fully complete and return this form with its Bid. 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 **IFBC No. 23-TA004595SAM**
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 the County and Engineer of Record, 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 \_\_\_\_\_: \_\_\_\_\_

My commission expires: \_\_\_\_\_



# Angelina M. Colonnese

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](http://www.manateeclerk.com)

**Bidder must fully complete and return this form with its Bid.**

## APPENDIX E: ePAYABLES 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 Via email to:

[tina.mancini@manateeclerk.com](mailto:tina.mancini@manateeclerk.com)

Via fax to: (941) 741-4011

Via mail:

PO Box 1000

Bradenton, FL 34206

Revised: September 30, 2015

“Pride in Service with a Vision to the Future”

Clerk of the Circuit Court – Clerk of Board of County Commissioners – County Comptroller – Auditor and Recorder

**APPENDIX F, SCRUTINIZED COMPANY CERTIFICATION**  
IFBC No. 23-TA004595SAM

This certification is required pursuant to Florida State Statute Section 287.135.

As of July 1, 2011, a company that, at the time of bidding or submitting a proposal for a new contract or renewal of an existing contract, is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List is ineligible for, and may not bid on, submit a proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services of \$1 million or more.

**Bidder must fully complete and return this form with its Bid.**

Company \_\_\_\_\_ FID \_\_\_\_\_ or EIN \_\_\_\_\_ No. \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

I, \_\_\_\_\_, as a representative of \_\_\_\_\_ certify and affirm that this company is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List.

\_\_\_\_\_  
Signature Title

\_\_\_\_\_  
Printed Name Date

**APPENDIX G, MANATEE COUNTY, A POLITICAL SUBDIVISION OF THE STATE  
OF FLORIDA INDEMNITY AND HOLD HARMLESS  
IFBC No. 23-TA004595SAM**

**Bidder must fully complete and return this form with its Bid.**

Bidder shall defend, indemnify and hold harmless the County and all of the County's officers, agents, employees, and volunteers from and against all claims, liability, loss and expense, including reasonable costs, collection expenses, attorneys' fees, and court costs which may arise because of the negligence (whether active or passive), misconduct, or other fault, in whole or in part (whether joint, concurrent, or contributing), of Respondent, its officers, employees, representatives and agents in performance or non-performance of its obligations under the Contract/Agreement. Bidder recognizes the broad nature of this indemnification and hold harmless clause, as well as the provision of a legal defense to the County when necessary, and voluntarily makes this covenant and expressly acknowledges the receipt of such good and valuable consideration provided by the County in support of these indemnification, legal defense and hold harmless contractual obligations in accordance with the laws of the State of Florida. This clause shall survive the termination of this Contract/Agreement. Compliance with any insurance requirements required elsewhere within this Contract/Agreement shall not relieve Bidder of its liability and obligation to defend, hold harmless and indemnify the County as set forth in this article of the Contract/Agreement.

Nothing herein shall be construed to extend the County's liability beyond that provided in section 768.28, Florida Statutes.

<b>PROJECT NUMBER AND/OR NAME</b>	
<b>INSURANCE AGENT</b>	
<b>RESPONDENT SIGNATURE</b>	<b>DATE</b>

Acknowledgement:

STATE OF \_\_\_\_\_ COUNTY OF \_\_\_\_\_

The foregoing instrument was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_,

20\_\_\_\_ by \_\_\_\_\_ [FULL LEGAL NAME], who is

personally known to me / has produced \_\_\_\_\_ as identification.

Notary Signature \_\_\_\_\_

Print Name \_\_\_\_\_

**APPENDIX H, INSURANCE STATEMENT**

IFBC No. 23-TA004595SAM

**Bidder must fully complete and return this form with its Bid.**

THE UNDERSIGNED has read and understands the insurance requirements of this IFBC applicable to any contract resulting from this solicitation and shall provide the insurances required by this Appendix within ten (10) days from the date of Notice of Intent to Award.

Bidder Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature  
(Authorized  
Official): \_\_\_\_\_

Printed  
Name/Title: \_\_\_\_\_

Insurance Agency: \_\_\_\_\_

Agent Name: \_\_\_\_\_ Agent Phone: \_\_\_\_\_

**APPENDIX I, ACKNOWLEDGMENT OF ADDENDA**

IFBC No. 23-TA004595SAM

The undersigned acknowledges receipt of the following addenda:

Addendum No. _____	Date Received:

Print or type Bidder's information below:

\_\_\_\_\_  
Name of Bidder Telephone Number

\_\_\_\_\_  
Street Address City/State/Zip

\_\_\_\_\_  
Email Address

\_\_\_\_\_  
Print Name & Title of Authorized Officer Signature of Authorized Official Date

**APPENDIX J, AFFIDAVIT OF NO CONFLICT**

IFBC No. 23-TA004595SAM

COUNTY OF \_\_\_\_\_  
STATE OF \_\_\_\_\_

BEFORE ME, the undersigned authority, this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ personally appeared, \_\_\_\_\_, a principal with full authority to bind \_\_\_\_\_ (hereinafter the "Affiant"), who being first duly sworn, deposes and says:

(a) is not currently engaged or will not become engaged in any obligations, undertakings or contracts that will require the Affiant to maintain an adversarial role against the County or that will impair or influence the advice, recommendations or quality of work provided to the County; and

(b) has provided full disclosure of all potentially conflicting contractual relationships and full disclosure of contractual relationships deemed to raise a question of conflict(s); and

(c) has provided full disclosure of prior work history and qualifications that may be deemed to raise possible question of conflict(s).

Affiant makes this affidavit for the purpose of inducing Manatee County, a political subdivision of the State of Florida, to enter into an Agreement for Improvements at Master Lift Station 39A.

If applicable, on a separate page Bidder shall disclose the name of any officer, director or agent of Bidder who is also an employee of the County and the name of any County employee who owns, directly or indirectly, any interest in the Bidder's firm or any of its branches. If no conflicts of interest are present, submit a statement to that affect.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

SUBSCRIBED to and sworn before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

[Notary Seal]

Notary Public

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Signature

\_\_\_\_\_  
Print Name

Personally known OR produced identification. Type of identification produced \_\_\_\_\_

\_\_\_\_\_.

**APPENDIX K, BID PRICING FORM**

IFBC No. 23-TA004595SAM, Improvements at Master Lift Station 39A

Total Bid Price/Offer for Bid 'A': \$ \_\_\_\_\_ Complete. Base on a completion time of 425 calendar days.

Total Bid Price/Offer for Bid 'B': \$ \_\_\_\_\_ Complete. Based on a completion time of 485 calendar days.

As Bidder, we understand that any Bid Pricing Form containing imbedded mathematical formulas provided with this IFBC are provided solely for the convenience of the Bidder. As such, we understand that to be considered responsive, it is our sole responsibility to provide unit prices for each line item on the subsequent pages of Appendix K, Bid Pricing Form and regardless of whether the Bid Pricing Form contains imbedded mathematical formulas the Bidder shall assume the responsibility and accuracy of the information input in the Bid Pricing Form. Additionally, Bidder understands that all Bids will be reviewed for Mathematical Errors in accordance with Article A.35 of the IFBC documents.

We, the undersigned, hereby declare that we have carefully reviewed the IFBC Documents and subsequent addendums in their entirety and with full knowledge and understanding of the Bid information and all its requirements, submit this Bid, which is complete in meeting each specification, term, and condition contained therein.

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

**Authorized Signature(s):** \_\_\_\_\_

**Name and Title of Above  
Signer(s):**  
\_\_\_\_\_

**Date:** \_\_\_\_\_

Appendix K, Bid Pricing Form				
IFBC NO. 23-TA004595SAM				
Improvements at Master Lift Station 39A (MLS 39A)				
BID FORM 'A' BASED ON 425 CALENDAR DAYS COMPLETION				
Bidders shall provide prices for each line item for their bid to be considered responsive. To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.				
ITEM	DESCRIPTION	QUANTITY	UNIT PRICE	AMOUNT
<b>I. MISCELLANEOUS</b>				
1	Mobilization	1	LS	
2	Project Signs	2	EA	
3	Preconstruction Video	1	LS	
4	Field Recognissance / Utility Locates & Coordination	1	LS	
5	Sanitary Sewer Bypass Pumping and Appurtenances	1	LS	
6	Pressure and Leakage Testing of Piping	1	LS	
8	Permitting	1	LS	
9	Record Drawings	1	LS	
10	Demobilization	1	LS	
				<b>SUBTOTAL</b>
<b>II. PROPOSED IMPROVEMENTS</b>				
<b>EARTHWORK</b>				
11	Temporary Erosion Control Measures	1	LS	
12	Import Fill and Place	12	CY	
13	Excavation and Disposal of Unsuitable Material	12	CY	
14	Seeding & Sodding	1	LS	
				<b>SUBTOTAL</b>
<b>CIVIL / DEMOLITION</b>				
15	Sidewalk	950	SF	
16	Concrete Paving	9	CY	
17	Concrete Drive	775	SF	

BIDDER NAME: \_\_\_\_\_

BIDDER SIGNATURE: \_\_\_\_\_

**Appendix K, Bid Pricing Form**

IFBC NO. 23-TA004595SAM

Improvements at Master Lift Station 39A (MLS 39A)

BID FORM 'A' BASED ON 425 CALENDAR DAYS COMPLETION

Bidders shall provide prices for each line item for their bid to be considered responsive.

To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.

18 Bollards	6 EA
19 HVAC Condensate Drain Sump	1 EA
20 Demolition of Miscellaneous Site Features (fencing, door landings, rain gauge, concrete pad to North of pump building	1 LS
21 Demolition - Miscellaneous Pump Building (sky lights, fans, doors, louvers)	1 LS
22 Demolition - Generator and Appurtenances inside Pump Building (including Exhaust)	1 LS
23 Demolition - Fuel Tank, including bollards, fuel lines, appurtenances and structural pad	1 LS
24 Demolition - Dry-pit Submersible Pumps	3 EA
25 Demolition - 14" gate valve	5 EA
26 Demolition - 12" gate valve	3 EA
27 Demolition - 12" check valve	3 EA
28 Demolition of Pump influent DIP piping (14")	1 LS
29 Demolition of Pump effluent DIP piping (8", 12")	3 EA
30 Demolition of electrical gear, including all appurtenances / conduits, inside Pump Building	1 LS
31 Protective Coatings (Piping / Appurtenances)	1 LS
<b>SUBTOTAL</b>	
<b>STRUCTURAL / ARCHITECTURAL</b>	
32 Prefabricated Electrical Building	1 LS
33 Pump Building - Roof Membrane System	1 LS
34 Pump Building Structural - Building Penetrations, CMU Infill, Doors, Stucco Recoat, Fascia	1 LS
35 Concrete Pad, including equipment pad (Condensing Unit)	2.5 CY
36 Concrete Pad (Generator)	13.5 CY
37 Concrete Pad (Electrical Building)	12 CY

BIDDER NAME: \_\_\_\_\_

BIDDER SIGNATURE: \_\_\_\_\_

<b>Appendix K, Bid Pricing Form</b>	
<b>IFBC NO. 23-TA004595SAM</b>	
<b>Improvements at Master Lift Station 39A (MLS 39A)</b>	
<b>BID FORM 'A' BASED ON 425 CALENDAR DAYS COMPLETION</b>	
<b>Bidders shall provide prices for each line item for their bid to be considered responsive.</b>	
<b>To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.</b>	
38 Pump / Pipe Supports	1 LS
39 Pump Building Architectural Finishing, including Stucco	1 LS
<b>SUBTOTAL</b>	
<b>MECHANICAL / HVAC</b>	
40 Pump Building Mechanical - Exhaust fans	
41 Dry Pit Submersible Pump (including all appurtenances)	3 EA
42 Pump Influent Piping, including Fittings, and Appurtenances (14" DIP)	1 LS
43 Pump Discharge Piping, including Fittings, and Appurtenances (12" DIP)	1 LS
44 14" Gate Valve	5 EA
45 12" Check Valve	3 EA
46 12" Gate Vale	3 EA
47 Engine Generator and Sub-base Fuel Tank	1 EA
48 HVAC Package (Air Handler including Supports, Condenser, and Piping....condensate, refrigerant, etc)	1 EA
49 HVAC Ducting including appurtenances (register/grille) and supports	1 LS
<b>SUBTOTAL</b>	
<b>ELECTRICAL / I&amp;C</b>	
50 Site electrical ductbanks (including conduit & circuits)	1 LS
51 VFDs	3 EA
52 Switchboard	1 EA
53 Power Panel	1 EA
54 Automatic Transfer Switch	1 EA
55 Manual Transfer Switch	1 EA

BIDDER NAME: \_\_\_\_\_  
 BIDDER SIGNATURE: \_\_\_\_\_

<b>Appendix K, Bid Pricing Form</b>	
<b>IFBC NO. 23-TA004595SAM</b>	
<b>Improvements at Master Lift Station 39A (MLS 39A)</b>	
<b>BID FORM 'A' BASED ON 425 CALENDAR DAYS COMPLETION</b>	
<b>Bidders shall provide prices for each line item for their bid to be considered responsive.</b> <b>To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.</b>	
56 Main Circuit Breaker	1 EA
57 Generator Docking Station	1 EA
58 Lighting Transformer / Lighting Panel	2 EA
59 Lighting Control Panel	1 EA
60 Pump Building (Upper and Lower Level) Lighting Fixtures	1 LS
61 Sump Pump Control Panel	1 LS
62 RTU Panel	1 EA
63 Pressure / level instruments	1 LS
<b>SUBTOTAL</b>	
<b>SUBTOTAL PRICE (Total of Miscellaneous, Earthwork, Civil / Demolition, Structural / Architectural, Mechanical / HVAC, and Electrical / I&amp;C)</b>	
64 CONSTRUCTION CONTINGENCY COUNTY AUTHORIZED USE ONLY (10% of Subtotal)	
<b>TOTAL BID PRICE (Subtotal Price plus the Construction Contingency)</b>	

BIDDER NAME: \_\_\_\_\_  
 BIDDER SIGNATURE: \_\_\_\_\_

Appendix K, Bid Pricing Form				
IFBC NO. 23-TA004595SAM				
Improvements at Master Lift Station 39A (MLS 39A)				
BID FORM 'B' BASED ON 485 CALENDAR DAYS COMPLETION				
Bidders shall provide prices for each line item for their bid to be considered responsive. To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.				
ITEM	DESCRIPTION	QUANTITY	UNIT PRICE	AMOUNT
<b>I. MISCELLANEOUS</b>				
1	Mobilization	1	LS	
2	Project Signs	2	EA	
3	Preconstruction Video	1	LS	
4	Field Recognissane / Utility Locates & Coordination	1	LS	
5	Sanitary Sewer Bypass Pumping and Appurtenances	1	LS	
6	Pressure and Leakage Testing of Piping	1	LS	
8	Permitting	1	LS	
9	Record Drawings	1	LS	
10	Demobilization	1	LS	
				<b>SUBTOTAL</b>
<b>II. PROPOSED IMPROVEMENTS</b>				
<b>EARTHWORK</b>				
11	Temporary Erosion Control Measures	1	LS	
12	Import Fill and Place	12	CY	
13	Excavation and Disposal of Unsuitable Material	12	CY	
14	Seeding & Sodding	1	LS	
				<b>SUBTOTAL</b>
<b>CIVIL / DEMOLITION</b>				
15	Sidewalk	950	SF	
16	Concrete Paving	9	CY	
17	Concrete Drive	775	SF	
18	Bollards	6	EA	
19	HVAC Condensate Drain Sump	1	EA	

BIDDER NAME: \_\_\_\_\_

BIDDER SIGNATURE: \_\_\_\_\_

<b>Appendix K, Bid Pricing Form</b>		
<b>IFBC NO. 23-TA004595SAM</b>		
<b>Improvements at Master Lift Station 39A (MLS 39A)</b>		
<b>BID FORM 'B' BASED ON 485 CALENDAR DAYS COMPLETION</b>		
<b>Bidders shall provide prices for each line item for their bid to be considered responsive. To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.</b>		
20 Demolition of Miscellaneous Site Features (fencing, door landings, rain gauge, concrete pad to North of pump building	1	LS
21 Demolition - Miscellaneous Pump Building (sky lights, fans, doors, louvers)	1	LS
22 Demolition - Generator and Appurtenances inside Pump Building (including Exhaust)	1	LS
23 Demolition - Fuel Tank, including bollards, fuel lines, appurtenances and structural pad	1	LS
24 Demolition - Dry-pit Submersible Pumps	3	EA
25 Demolition - 14" gate valve	5	EA
26 Demolition - 12" gate valve	3	EA
27 Demolition - 12" check valve	3	EA
28 Demolition of Pump influent DIP piping (14")	1	LS
29 Demolition of Pump effluent DIP piping (8", 12")	3	EA
30 Demolition of electrical gear, including all appurtenances / conduits, inside Pump Building	1	LS
31 Protective Coatings (Piping / Appurtenances)	1	LS
		<b>SUBTOTAL</b>
<b>STRUCTURAL / ARCHITECTURAL</b>		
32 Prefabricated Electrical Building	1	LS
33 Pump Building - Roof Membrane System	1	LS
34 Pump Building Structural - Building Penetrations, CMU Infill, Doors, Stucco Recoat, Fascia	1	LS
35 Concrete Pad, including equipment pad (Condensing Unit)	2.5	CY
36 Concrete Pad (Generator)	13.5	CY
37 Concrete Pad (Electrical Building)	12	CY
38 Pump / Pipe Supports	1	LS
39 Pump Building Architectural Finishing, including Stucco	1	LS
		<b>SUBTOTAL</b>
<b>MECHANICAL / HVAC</b>		

BIDDER NAME: \_\_\_\_\_

BIDDER SIGNATURE: \_\_\_\_\_

**Appendix K, Bid Pricing Form**

IFBC NO. 23-TA004595SAM

Improvements at Master Lift Station 39A (MLS 39A)

**BID FORM 'B' BASED ON 485 CALENDAR DAYS COMPLETION**

**Bidders shall provide prices for each line item for their bid to be considered responsive.  
To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.**

40 Pump Building Mechanical - Exhaust fans	
41 Dry Pit Submersible Pump (including all appurtenances)	3 EA
42 Pump Influent Piping, including Fittings, and Appurtenances (14" DIP)	1 LS
43 Pump Discharge Piping, including Fittings, and Appurtenances (12" DIP)	1 LS
44 14" Gate Valve	5 EA
45 12" Check Valve	3 EA
46 12" Gate Vale	3 EA
47 Engine Generator and Sub-base Fuel Tank	1 EA
48 HVAC Package (Air Handler including Supports, Condenser, and Piping....condensate, refrigerant, etc)	1 EA
49 HVAC Ducting including appurtenances (register/grille) and supports	1 LS

**SUBTOTAL****ELECTRICAL / I&C**

50 Site electrical ductbanks (including conduit & circuits)	1 LS
51 VFDs	3 EA
52 Switchboard	1 EA
53 Power Panel	1 EA
54 Automatic Transfer Switch	1 EA
55 Manual Transfer Switch	1 EA
56 Main Circuit Breaker	1 EA
57 Generator Docking Station	1 EA
58 Lighting Transformer / Lighting Panel	2 EA
59 Lighting Control Panel	1 EA
60 Pump Building (Upper and Lower Level) Lighting Fixtures	1 LS
61 Sump Pump Control Panel	1 LS

BIDDER NAME: \_\_\_\_\_

BIDDER SIGNATURE: \_\_\_\_\_

<b>Appendix K, Bid Pricing Form</b>	
IFBC NO. 23-TA004595SAM	
Improvements at Master Lift Station 39A (MLS 39A)	
BID FORM 'B' BASED ON 485 CALENDAR DAYS COMPLETION	
<p>Bidders shall provide prices for each line item for their bid to be considered responsive.          To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.</p>	
62 RTU Panel	1 EA
63 Pressure / level instruments	1 LS
<b>SUBTOTAL</b>	
<b>SUBTOTAL PRICE (Total of Miscellaneous, Earthwork, Civil / Demolition, Structural / Architectural, Mechanical / HVAC, and Electrical / I&amp;C)</b>	
64 CONSTRUCTION CONTINGENCY COUNTY AUTHORIZED USE ONLY (10% of Subtotal)	
<b>TOTAL BID PRICE (Subtotal Price plus the Construction Contingency)</b>	

BIDDER NAME: \_\_\_\_\_  
 BIDDER SIGNATURE: \_\_\_\_\_

**SECTION C, BID ATTACHMENTS**

## **BID ATTACHMENT 1, INSURANCE AND BOND REQUIREMENTS**

The CONTRACTOR will not commence work under the resulting Agreement until all insurance coverages indicated by an “X” herein have been obtained. The CONTRACTOR shall obtain and submit to the Procurement Division within ten (10) calendar days from the date of notice of intent to award, at its expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy): Work under this Agreement cannot commence until all insurance coverages indicated herein have been obtained on a standard ACORD form (inclusive of any amounts provided by an umbrella or excess policy):

### **Automobile Liability Insurance Required Limits**

Coverage must be afforded under a per occurrence policy form including coverage for all owned, hired and non-owned vehicles for bodily injury and property damage of not less than:

- \$2,000,000 Combined Single Limit; OR
- \$1,000,000 Bodily Injury and \$1,000,000 Property Damage
- \$10,000 Personal Injury Protection (No Fault)
- \$500,000 Hired, Non-Owned Liability
- \$10,000 Medical Payments

*This policy shall contain severability of interests' provisions.*

### **Commercial General Liability Insurance Required Limits (per Occurrence form only; claims-made form is not acceptable)**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- \$1,000,000 Single Limit Per Occurrence
- \$2,000,000 Aggregate
- \$2,000,000 Products/Completed Operations Aggregate
- \$1,000,000 Personal and Advertising Injury Liability
- \$100,000 Fire Damage Liability
- \$10,000 Medical Expense, and
- \$1,000,000, Third Party Property Damage
- \$ Project Specific Aggregate (Required on projects valued at over \$10,000,000)

*This policy shall contain severability of interests' provisions.*

### **Employer's Liability Insurance**

Coverage limits of not less than:

- \$100,000 Each Accident
- \$500,000 Disease Each Employee
- \$500,000 Disease Policy Limit

- Worker's Compensation Insurance**
- US Longshoremen & Harbor Workers Act**
- Jones Act Coverage**

Coverage limits of not less than:

- Statutory workers' compensation coverage shall apply for all employees in compliance with the laws and statutes of the State of Florida and the federal government.
- If any operations are to be undertaken on or about navigable waters, coverage must be included for the US Longshoremen & Harbor Workers Act and Jones Act.

Should 'leased employees' be retained for any part of the project or service, the employee leasing agency shall provide evidence of Workers' Compensation coverage and Employer's Liability coverage for all personnel on the worksite and in compliance with the above Workers' Compensation requirements. NOTE: Workers' Compensation coverage is a firm requirement. Elective exemptions are considered on a case-by-case basis and are approved in a very limited number of instances.

**Aircraft Liability Insurance Required Limits**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- \$ Each Occurrence Property and Bodily Injury with no less than \$100,000 per passenger each occurrence or a 'smooth' limit.
- \$ General Aggregate.

**Un-Manned Aircraft Liability Insurance (Drone)**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- \$ Each Occurrence Property and Bodily Injury; Coverage shall specifically include operation of Unmanned Aircraft Systems (UAS), including liability and property damage.
- \$ General Aggregate

**Installation Floater Insurance**

When the contract or agreement **does not** include construction of, or additions to, above ground building or structures, but does involve the installation of machinery or equipment, Installation Floater Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- 100% of the completed value of such addition(s), building(s), or structure(s)

**Professional Liability and/or Errors and Omissions (E&O) Liability Insurances**

Coverage shall be afforded under either an occurrence policy form or a claims-made policy form. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- \$ 1,000,000 Bodily Injury and Property Damage Each Occurrence
- \$ 2,000,000 General Aggregate

**Builder's Risk Insurance**

When the contract or agreement includes the construction of roadways and/or the addition of a permanent structure or building, including the installation of machinery and/or equipment, Builder's Risk Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- An amount equal to 100% of the completed value of the project, or the value of the equipment to be installed
- The policy shall not carry a self-insured retention/deductible greater than \$10,000

Coverage shall be for all risks and include, but not be limited to, storage and transport of materials, equipment, supplies of any kind whatsoever to be used on or incidental to the project, theft coverage, and Waiver of Occupancy Clause Endorsement, where applicable.

**Cyber Liability Insurance**

Coverage shall comply with Florida Statute 501.171, shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- \$ Security Breach Liability
- \$ Security Breach Expense Each Occurrence
- \$ Security Breach Expense Aggregate
- \$ Replacement or Restoration of Electronic Data
- \$ Extortion Threats
- \$ Business Income and Extra Expense
- \$ Public Relations Expense

NOTE: Policy must not carry a self-insured retention/deductible greater than \$25,000.

**Hazardous Materials Insurance (As Noted Below)**

Hazardous materials include all materials and substances that are currently designated or defined as hazardous by the law or rules of regulation by the State of Florida or federal government.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form, and the policy shall be endorsed and name 'Manatee County, a political subdivision of the

State of Florida' as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

***Pollution Liability***

Amount equal to the value of the contract, subject to a \$1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

***Asbestos Liability (If handling within scope of Contract)***

Amount equal to the value of the contract, subject to a \$1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

***Disposal***

When applicable, CONTRACTOR shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance covering liability.

- Amount equal to the value of the contract, subject to a \$1,000,000 minimum, for Liability for Sudden and Accidental Occurrences, each claim and an aggregate.
- Amount equal to the value of the contract, subject to a \$1,000,000 minimum, for Liability for Non-Sudden and Accidental Occurrences, each claim and an aggregate.

**Hazardous Waste Transportation Insurance**

CONTRACTOR shall designate the hauler and have the hauler furnish a Certificate of Insurance for Automobile Liability insurance with Endorsement MCS-90 for liability arising out of the transportation of hazardous materials. EPA identification number shall be provided.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form and the policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- Amount equal to the value of the contract, subject to a \$1,000,000 minimum, per accident.

**Liquor Liability Insurance**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- \$1,000,000 Each Occurrence and Aggregate

**Garage Keeper’s Liability Insurance**

Coverage shall be required if the maintenance, servicing, cleaning or repairing of any County motor vehicles is inherent or implied within the provision of the contract.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the lot or garage.

**Bailee’s Customer Liability Insurance**

Coverage shall be required for damage and/or destruction when County property is temporarily under the care or custody of a person or organization, including property that is on, or in transit to and from the person or organization’s premises. Perils covered should include fire, lightning, theft, burglary, robbery, explosion, collision, flood, earthquake and damage or destruction during transportation by a carrier.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the County asset(s) in the CONTRACTOR’S care, custody and control.

**Hull and Watercraft Liability Insurance**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- \$ Each Occurrence
- \$ General Aggregate
- \$ Fire Damage Liability
- \$10,000 Medical Expense, and
- \$ Third Party Property Damage
- \$ Project Specific Aggregate (Required on projects valued at over \$10,000,000)

**Other [Specify]**

## **BOND REQUIREMENTS**

### **Bid Bond**

A Bid Bond in the amount of \$\_\_\_\_\_ or 5% of the total offer. Bid bond shall be submitted with the sealed response and shall include project name, location, and / or address and project number. In lieu of the bond, the bidder may file an alternative form of security in the amount of \$\_\_\_\_\_ or 5% of the total offer. in the form of a money order, a certified check, a cashier's check, or an irrevocable letter of credit issued to Manatee County. NOTE: A construction project over \$200,000 requires a Bid Bond in the amount of 5% of the total bid offer.

### **Payment and Performance Bond**

A Payment and Performance Bond shall be submitted by Successful Bidder for 100% of the award amount and shall be presented to Manatee County within ten (10) calendar days of issuance of the notice of intent to award. NOTE: A construction project over \$200,000 requires a Payment and Performance Bond.

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## **INSURANCE REQUIREMENTS**

### **I. THE POLICIES BELOW ARE TO CONTAIN, OR BE ENDORSED TO CONTAIN, THE FOLLOWING PROVISIONS:**

#### **1. Commercial General Liability and Automobile Liability Coverages**

- a. **“Manatee County, a Political Subdivision of the State of Florida,” is to be named as an Additional Insured in respect to:** Liability arising out of activities performed by or on behalf of the successful Bidder, his agents, representatives, and employees; products and completed operations of the successful Bidder; or automobiles owned, leased, hired or borrowed by the successful Bidder. The coverage shall contain no special limitation(s) on the scope of protection afforded to the County, its officials, employees or volunteers.

In addition to furnishing a Certificate of Insurance, the successful Bidder shall provide the endorsement that evidences Manatee County being listed as an Additional Insured. This can be done in one of two ways: (1) an endorsement can be issued that specifically lists “Manatee County, a Political Subdivision of the State of Florida,” as Additional Insured; or, (2) an endorsement can be issued that states that all Certificate Holders are Additional Insured with respect to the policy.

- b. The successful Bidder's insurance coverage shall be primary insurance with respect to the County, its officials, employees and volunteers. Any insurance or self-insurance maintained by the County, its officials, employees or volunteers shall be excess of successful Bidder's insurance and shall be non-contributory.
- c. The insurance policies must be on an occurrence form.

#### **2. Workers' Compensation and Employers' Liability Coverages**

The insurer shall agree to waive all rights of subrogation against the County, its officials, employees and volunteers for losses arising from work performed by the successful Bidder for the County.

### **II. GENERAL INSURANCE PROVISIONS APPLICABLE TO ALL POLICIES:**

1. Prior to the execution of contract, or issuance of a Purchase Order, and then annually upon the anniversary date(s) of the insurance policy's renewal date(s) for as long as this contract remains in effect, successful Bidder shall furnish the County with a Certificate(s) of Insurance (using an industry accepted certificate form, signed by the Issuer, with applicable endorsements, and containing the solicitation or contract number, and title or description) evidencing the coverage set forth above and naming “Manatee County, a Political Subdivision of the State of Florida” as an Additional Insured on the applicable coverage(s) set forth above.

2. If the policy contains an aggregate limit, confirmation is needed in writing (letter, email, etc.) that the aggregate limit has not been eroded to procurement representative when supplying Certificate of Insurance.

In addition, when requested in writing from the County, successful Bidder will provide the County with a certified copy of all applicable policies. The address where such certificates and certified policies shall be sent or delivered is as follows:

**Manatee County, a Political Subdivision of the State of Florida**  
**Attn: Risk Management Division**  
**1112 Manatee Avenue West, Suite 969**  
**Bradenton, FL 34205**

3. The project's solicitation number and title shall be listed on each certificate.
4. successful Bidder shall provide thirty (30) days written notice to the Risk Manager of any cancellation, non-renewal, termination, material change, or reduction in coverage of any insurance policies to procurement representative including solicitation number and title with all notices.
5. successful Bidder agrees that should at any time successful Bidder fail to meet or maintain the required insurance coverage(s) as set forth herein, the County may terminate this contract.
6. The successful Bidder waives all subrogation rights against Manatee County, a Political Subdivision of the State of Florida, for all losses or damages which occur during the contract and for any events occurring during the contract period, whether the suit is brought during the contract period or not.
7. The successful Bidder has sole responsibility for all insurance premiums and policy deductibles.
8. It is the successful Bidder's responsibility to ensure that his agents, representatives and subcontractors comply with the insurance requirements set forth herein. successful Bidder shall include his agents, representatives, and subcontractors working on the project or at the worksite as insured under its policies, or successful Bidder shall furnish separate certificates and endorsements for each agent, representative, and subcontractor working on the project or at the worksite. All coverages for agents, representatives, and subcontractors shall be subject to all of the requirements set forth to the procurement representative.
9. All required insurance policies must be written with a carrier having a minimum A.M. Best rating of A- FSC VII or better. In addition, the County has the right to review the successful Bidder's deductible or self-insured retention and to require that it be reduced or eliminated.

- III.** Successful Bidder understands and agrees that the stipulated limits of coverage listed herein in this insurance section shall not be construed as a limitation of any potential liability to the County, or to others, and the County's failure to request evidence of this insurance coverage shall not be construed as a waiver of successful Bidder's obligation to provide and maintain the insurance coverage specified.
- IV.** The enclosed Hold Harmless Agreement shall be signed by the successful Bidder and shall become a part of the contract.
- V.** Successful Bidder understands and agrees that the County does not waive its immunity, and nothing herein shall be interpreted as a waiver of the County's rights, including the limitation of waiver of immunity, as set forth in Florida Statutes 768.28, or any other statutes, and the County expressly reserves these rights to the full extent allowed by law.
- VI.** No award shall be made until the Procurement Division has received the Certificate of Insurance and Hold Harmless Agreement in accordance with this section.

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**BID ATTACHMENT 2, TECHNICAL SPECIFICATIONS**

**MANATEE COUNTY MLS 39-A  
PROJECT SPECIFICATIONS VOL 2  
100% SUBMITTAL  
BLACK & VEATCH SUPPLEMENTAL SPECIFICATIONS**

B&V PROJECT NO. 402142  
B&V FILE NO. 50.2001

PREPARED FOR



16 SEPTEMBER 2022



Manatee County, MLS 39-A  
 County Project Number 6017983 & 6017984  
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01045	Cutting and Patching .....	1 - 2
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02276	Temporary Erosion and Sedimentation Control .....	1 - 2
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Manatee County, MLS 39-A  
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Manatee County, MLS 39-A  
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**This specification includes by reference the Manatee County Public Works Standards, Part I Utilities Standards Manual approved February 25, 2020.**

**All items and/or materials furnished and installed shall conform to the Manatee County Approved Products List. All items listed in the submittal requirements under each section shall be required to be submitted for review and/or acceptance.**

# Manatee County Master Lift Station Improvements

Black & Veatch Project No. 402142

## **Engineer of Record Specifications**

Florida Professional Engineer Certification Statement: *I hereby certify that the work contained herein was prepared under my direct supervision and complies with the requirements of Chapter 471, Florida Statutes and Chapter 61G15, F.A.C.*

### Specification Sections

01610	General Equipment Stipulations
01650	Startup Requirements
01739	Equipment Installation
02050	Demolition
09940	Protective Coatings
09940-1	Protective Coatings Fig 1
09940-2	Protective Coatings Fig 2
11150	Submersible Pumps
11911	Reclassification and Modification of Existing Engine-Generators
15020	Miscellaneous Piping and Accessories Installation
15064	Stainless Steel Pipe Spec
15065	Miscellaneous Steel Pipe, Tubing, and Accessories
15067	Miscellaneous Plastic Pipe, Tubing, and Accessories

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Michael Tache, P.E.  
FL PE No. 83893  
Black & Veatch

# Manatee County Master Lift Station Improvements

Black & Veatch Project No. 402142

## **Registered Architect Specifications**

Florida Registered Architect Certification Statement: *I hereby certify that the work contained herein was prepared under my direct supervision and complies with the requirements of Chapter 471, Florida Statutes and Chapter 61G15, F.A.C.*

### Specification Sections

07535	TPO Roofing
07600	Flashing and Sheet Metal
07900	Joint Sealants
08410	Flush Aluminum Doors and Frames
08710	Finish Hardware
13140	Prefabricated FRP Building

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Philip Rishel, R.A.  
FL RA No. 101040  
Black & Veatch Architects, PLLC

# Manatee County Master Lift Station Improvements

Black & Veatch Project No. 402142

## **Engineer of Record Specifications**

Florida Professional Engineer Certification Statement: *I hereby certify that the work contained herein was prepared under my direct supervision and complies with the requirements of Chapter 471, Florida Statutes and Chapter 61G15, F.A.C.*

### Specification Sections

01611	Meteorological and Seismic Design Criteria
03600	Grouting
03920	Concrete Surface Repair
03930	Concrete Crack Repair
05550	Anchorage in Concrete and Masonry

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Julia Gloss, P.E.  
FL PE No. 86822  
Black & Veatch

# **Manatee County Master Lift Station Improvements**

Black & Veatch Project No. 402142

## **Engineer of Record Specifications**

Florida Professional Engineer Certification Statement: *I hereby certify that the work contained herein was prepared under my direct supervision and complies with the requirements of Chapter 471, Florida Statutes and Chapter 61G15, F.A.C.*

### Specification Sections

- 15050 Basic Mechanical Building Systems Materials and Methods
- 15070 Copper Tubing
- 15500 Heating, Ventilating, and Air Conditioning
- 15650 Refrigeration Systems
- 15990 Testing, Adjusting, and Balancing
- 15250 Mechanical Insulation

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Michele Roth, P.E.  
FL PE No. 82002  
Black & Veatch

# Manatee County Master Lift Station Improvements

Black & Veatch Project No. 402142

## **Engineer of Record Specifications**

Florida Professional Engineer Certification Statement: *I hereby certify that the work contained herein was prepared under my direct supervision and complies with the requirements of Chapter 471, Florida Statutes and Chapter 61G15, F.A.C.*

### Specification Sections

16050	Electrical
16100	Electrical Equipment Installation
16220	General Purpose Induction Motors
16346	Low-Voltage Switchgear
16425	Switchboards
16491	Bypass-Isolation Automatic Transfer Switch
16670	Lightning Protection System

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Ryan Binkley, P.E.  
FL PE No. 89014  
Black & Veatch

# Manatee County Master Lift Station Improvements

Black & Veatch Project No. 402142

## Engineer of Record Specifications

Florida Professional Engineer Certification Statement: *I hereby certify that the work contained herein was prepared under my direct supervision and complies with the requirements of Chapter 471, Florida Statutes and Chapter 61G15, F.A.C.*

### Specification Sections

13500	Instrumentation and Control Systems
13500-A	Instrument Device Schedule - Legend/Description Sheet
13540	MAS Radio Equipment
13540-A	Input Output Device Schedule - Legend/Description Sheet
13563	Pressure and Level Instruments
13570	Panels Consoles and Appurtenances

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Larry Brouillette, P.E.  
FL PE No. 57973  
Black & Veatch

## DIVISION 1 GENERAL REQUIREMENTS

### SECTION 01005 GENERAL REQUIREMENTS

#### PART 1 GENERAL

##### 1.01 SCOPE AND INTENT

###### A. Description

The work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all work included in this Contract.

###### B. Work Included

The Contractor shall furnish all labor, superintendence, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, shop drawings, working drawings and other means of construction necessary or proper for performing and completing the work. He shall obtain and pay for all required permits necessary for the work, other than those permits such as the DEP permit and railroad permit, which may have already been obtained. He shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the County, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all incidental costs. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.

The cost of incidental work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made.

The Contractor shall be solely responsible for the adequacy of his workmanship, materials and equipment.

###### C. Public Utility Installations and Structures

Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto.

The Contractor shall protect all installations and structures from damage during the work. Access across any buried public utility installation or structure shall be made only in such locations and by means approved by the County. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor, which are shown on the Plans or have been located in the field by the utility, shall be repaired by the Contractor, at his expense, as approved by the County. No separate payment shall be made for such protection or repairs to public utility installations or structures.

Public utility installations or structures owned or controlled by the County or other governmental body, which are required by this contract to be removed, relocated, replaced or rebuilt by the Contractor not identified in any separate bid item shall be considered as a part of the general cost of doing the work and shall be included in the prices bid for the various contract items. No separate payment shall be made.

Where public utility installations or structures owned or controlled by the County or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the County, removal, relocation, replacement or rebuilding is necessary to complete the work under this Contract, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the County, for the contractor to accomplish. If such work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be in accordance with the General and Supplemental General Conditions.

The Contractor shall give written notice to County and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the "Sunshine State One-Call of Florida, Inc. Call Center ("Call Sunshine") and per all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).

The maintenance, repair, removal, relocation or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the County.

**1.02 PLANS AND SPECIFICATIONS**

**A. Plans**

When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions, and large-scale drawings in preference to small-scale drawings.

**B. Copies Furnished to Contractor**

The Contractor shall furnish each of the subcontractors, manufacturers, and material men such copies of the Contract Documents as may be required for their work. Additional copies of the Plans and Specifications, when requested, may be furnished to the Contractor at cost of reproduction.

**C. Supplementary Drawings**

When, in the opinion of the County, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may

be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the County and five paper prints thereof will be given to the Contractor.

D. Contractor to Check Plans and Data

The Contractor shall verify all dimensions, quantities and details shown on the Plans, Supplementary Drawings, Schedules, Specifications or other data received from the County, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the County, should such errors or omissions be discovered. All schedules are given for the convenience of the County and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

E. Specifications

The Technical Specifications consist of three parts: General, Products and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these by detailed requirements for the work and shall always govern whenever there appears to be a conflict.

F. Intent

All work called for in the Specifications applicable to this Contract, but not shown on the Plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Plans or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

The inclusion of the Related Requirements (or work specified elsewhere) in the General part of the specifications is only for the convenience of the Contractor, and shall not be interpreted as a complete list of related Specification Sections.

**1.03 MATERIALS AND EQUIPMENT**

**A. Manufacturer**

All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the County, that the manufacturer or subcontractor deal directly with the County. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.

Any two or more pieces or material or equipment of the same kind, type or classification, and being used for identical types of services, shall be made by the same manufacturer.

**B. Delivery**

The Contractor shall deliver materials in ample quantities to insure the most speedy and uninterrupted progress of the work so as to complete the work within the allotted time. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.

**C. Tools and Accessories**

The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind or size of equipment, one complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

Spare parts shall be furnished as specified.

Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight and principal rating data.

**D. Installation of Equipment.**

The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.

Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the County during installation. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.

The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by

the County and made of ample size and strength for the purpose intended. Substantial templates and working drawings for installation shall be furnished.

The Contractor shall furnish all materials and labor for, and shall properly bed in non-shrink grout, each piece of equipment on its supporting base that rests on masonry foundations.

Grout shall completely fill the space between the equipment base and the foundation. All metal surfaces coming in contact with concrete or grout shall receive a coat of coal tar epoxy equal to Koppers 300M or provide a 1/32-inch neoprene gasket between the metal surface and the concrete or grout.

E. Service of Manufacturer's Engineer

The Contract prices for equipment shall include the cost of furnishing (as required by equipment specifications sections) a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation the equipment in conformity with the Contract Documents. After the equipment is placed in permanent operation by the County, such engineer or superintendent shall make all adjustments and tests required by the County to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the County in the proper operation and maintenance of such equipment.

**1.04 INSPECTION AND TESTING**

A. General

Inspection and testing of materials will be performed by the County unless otherwise specified.

For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Three (3) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the County as a prerequisite for the acceptance of any material or equipment.

If, in the making of any test of any material or equipment, it is ascertained by the County that the material or equipment does not comply with the Contract, the Contractor will be notified thereof and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to the County.

Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for

damage which may occur to equipment prior to the time when the County formally takes over the operation thereof.

B. Costs

All inspection and testing of materials furnished under this Contract will be performed by the County or duly authorized inspection engineers or inspections bureaus without cost to the Contractor, unless otherwise expressly specified.

The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the Contract price.

Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the County for compliance. The Contractor shall reimburse the County for the expenditures incurred in making such tests on materials and equipment which are rejected for non-compliance.

C. Inspections of Materials

The Contractor shall give notice in writing to the County, at least two weeks in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the County will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or he will notify the Contractor that the inspection will be made at a point other than the point of manufacture, or he will notify the Contractor that inspection will be waived. The Contractor must comply with these provisions before shipping any material. Such inspection shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

D. Certificate of Manufacture

When inspection is waived or when the County so requires, the Contractor shall furnish to him authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

E. Shop Tests of Operating Equipment

Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No

such equipment shall be shipped to the work until the County notifies the Contractor, in writing, that the results of such tests are acceptable.

The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

F. Preliminary Field Tests

As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make preliminary field tests of equipment. If the preliminary field tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to the acceptance tests, make all changes, adjustments and replacements required. The furnishing Contractor shall assist in the preliminary field tests as applicable.

G. Final Field Tests

Upon completion of the work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance tests as specified or required to prove compliance with the Contract Documents.

The Contractor shall furnish labor, fuel, energy, water and all other materials, equipment and instruments necessary for all acceptance tests, at no additional cost to the County. The Supplier shall assist in the final field tests as applicable.

H. Failure of Tests

Any defects in the materials and equipment or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the Contractor. The decision of the County as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to make these corrections or if the improved materials and equipment, when tested, shall again fail to meet the guarantees of specified requirements, the County, notwithstanding its partial payment for work, and materials and equipment, may reject the materials and equipment and may order the Contractor to remove them from the site at his own expense.

In case the County rejects any materials and equipment, then the Contractor shall replace the rejected materials and equipment within a reasonable time. If he fails to do so, the County may, after the expiration of a period of thirty (30) calendar days after giving him notice in writing, proceed to replace such rejected materials and equipment, and the cost thereof shall be deducted from any compensation due or which may become due the Contractor under his Contract.

I. Final Inspection

During such final inspections, the work shall be clean and free from water. In no case will the final pay application be prepared until the Contractor has complied with all requirements set forth and the County has made his final inspection of the

entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Document.

## **1.05 TEMPORARY STRUCTURES**

### **A. Temporary Fences**

If, during the course of the work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall, at his own expense, if so ordered by the County, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced. The County shall be solely responsible for the determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

## **1.06 TEMPORARY SERVICES**

### **A. First Aid**

The Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when people are employed on the work.

## **1.07 LINES AND GRADES**

### **A. Grade**

All work under this Contract shall be constructed in accordance with the lines and grades shown on the Plans, or as given by the County. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

### **B. Safeguarding Marks**

The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or removing without authorization such established points, stakes and marks.

The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

### **C. Datum Plane**

All elevations indicated or specified refer to the Mean Sea Level Datum of the NAVD 1988 and/or NGVD 1929.

## 1.08 ADJACENT STRUCTURES AND LANDSCAPING

### A. Responsibility

The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payments will be made therefore. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion of the County, additional work is deemed necessary to avoid interference with the work, payment therefore will be made as provided for in the General Conditions.

Contractor is expressly advised that the protection of buildings, structures, tunnels, tanks, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility. Conditional inspection of buildings or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the Contractor.

Contractor shall, before starting operations, make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the County. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be given to the County.

Prior to the beginning of any excavations, the Contractor shall advise the County of all buildings or structures on which he intends to perform work or which performance of the project work will affect.

### B. Protection of Trees

1. All trees and shrubs shall be adequately protected by the Contractor with boxes and otherwise and in accordance with ordinances governing the protection of trees. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by him with new stock of similar size and age, at the proper season and at the sole expense of the Contractor.
2. Beneath trees or other surface structures, where possible, pipelines may be built in short tunnels, backfilled with excavated materials, except as otherwise specified, or the trees or structures carefully supported and protected from damage.

3. The County may order the Contractor, for the convenience of the County, to remove trees along the line or trench excavation. If so ordered, the County will obtain any permits required for removal of trees. Such tree removal ordered shall be paid for under the appropriate Contract Items.

C. Lawn Areas

Lawn areas shall be left in as good condition as before the starting of the work. Where sod is to be removed, it shall be carefully removed, and later replaced, or the area where sod has been removed shall be restored with new sod.

D. Restoration of Fences

Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the County. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or items, or if no specific Item is provided therefore, as part of the overhead cost of the work, and no additional payment will be made therefore.

## 1.09 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights

During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public, in accordance with state and local requirements.

B. Smoke Prevention

A strict compliance with ordinances regulating the production and emission of smoke will be required. No open fires will be permitted.

C. Noise

The Contractor shall eliminate noise to as great an extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all engines or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The Contractor shall strictly observe all local regulations and ordinances covering noise control.

D. Access to Public Services

Neither the materials excavated nor the materials or plant used in the construction of the work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.

E. Dust prevention

The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the roads and/or construction areas sprinkled with water at all times.

**1.10 CUTTING AND PATCHING**

The Contractor shall do all cutting, fitting or patching of his portion of the work that may be required to make the several parts thereof join and coordinate in a manner satisfactory to the County and in accordance with the Plans and Specifications. The work must be done by competent workmen skilled in the trade required by the restoration.

**1.11 CLEANING**

A. During Construction

During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the County, such material, debris, or rubbish constitutes a nuisance or is objectionable. The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefore develops.

B. Final Cleaning

At the conclusion of the work, all equipment, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.

The Contractor shall thoroughly clean all equipment and materials installed by him and shall deliver such materials and equipment undamaged in a bright, clean, polished and new operating condition.

**1.12 MISCELLANEOUS**

A. Protection Against Siltation and Bank Erosion

1. The Contractor shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches.

2. The Contractor, at his own expense, shall remove any siltation deposits and correct any erosion problems as directed by the County which results from his construction operations.

B. Protection of Wetland Areas

The Contractor shall properly dispose of all surplus material, including soil, in accordance with Local, State and Federal regulations. Under no circumstances shall surplus material be disposed of in wetland areas as defined by the Florida Department of Environmental Protection or Southwest Florida Water Management District.

C. Existing Facilities

The work shall be so conducted to maintain existing facilities **in operation for the duration of the Project, insofar as is possible.** Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in the Division 01 Specifications. Contractor is required to provide temporary bypass pumping, as required to maintain continuous operation of the Master Lift Station, in accordance with the Contract Documents.

D. Use of Chemicals

All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

**1.13 TAGGING**

A. Valve Tags

All valves shall be provided with a permanent stainless steel tag. Tags shall be permanently attached to the valve with stainless steel mechanical fasteners or with stainless steel chains. **The valve number shall be engraved in the tag with the lettering and numerals at least ½ inch high. Contractor shall request valve tag numbers for the County as required.**

B. Valve Plates

All buried valves shall be tagged with a brass plate cast into a 6-inch by 6-inch concrete pad at grade next to the valve box. The valve number shall be engraved in the brass plate with lettering and numerals at least 1 inch high. Contractor shall request valve tag numbers from the County.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01010 SUMMARY OF WORK

### PART 1 GENERAL

#### 1.01 WORK COVERED BY CONTRACT DOCUMENTS/REQUIREMENTS INCLUDED

- A. The work included in this contract consists of the following:

Project includes the rehabilitation of Master Lift Station 39A (MLS 39A). Work includes replacing the existing pumps and associated valves upstream and downstream of each pump, as noted on the drawings. Project involves significant site work. Project includes installing a new prefabricated building for use as the new electrical room. Existing electrical equipment, including VFDs, shall be demolished from the existing pump building and new equipment located inside the new electrical room. Project also involves the addition of a new diesel generator to replace existing. The existing generator will be salvaged as required by the Contract.

Contractor is required to provide bypass pumping as required to maintain operation of MLS 39A for the Project duration.

- B. The Contractor shall furnish all shop drawings, working drawings, labor, materials, equipment, tools, services and incidentals necessary to complete all work required by these Specifications and as shown on the Contract Drawings.
- C. The Contractor 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 the County.
- D. The Contractor 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 Contract Documents or not.

#### 1.02 CONTRACTS

Construct all the Work under a single contract.

#### 1.03 WORK SEQUENCE

- A. All work done under this Contract shall be done with a minimum of inconvenience to the users of the system or facility. The Contractor shall coordinate his work with private property owners such that existing utility services are maintained to all users to the maximum extent possible.
- B. The Contractor shall, if necessary and feasible, construct the work in stages to accommodate the County's use of the premises during the construction period; coordinate the construction schedule and operations with the County's Representative.
- C. The Contractor shall, where feasible, construct the Work in stages to provide for public

convenience and not close off public use of any facility until completion of construction to provide alternative usage.

D. **Project sequencing and construction constraints are detailed in Specification 01310.**

#### 1.04 CONSTRUCTION AREAS

- A. The Contractor shall: Limit his use of the construction areas for work and for storage, to allow for:
1. Work by other Contractors.
  2. County's Use.
  3. Public Use.
- B. Coordinate use of work site under direction of County's Representative.
- C. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.
- D. Move any stored products under the Contractor's control, which interfere with operations of the County or separate contractor.
- E. Obtain and pay for the use of additional storage of work areas needed for Contractor operations. **Product storage requirements are detailed in Specification 01620.**

#### 1.05 COUNTY OCCUPANCY

- A. It is assumed that portions of the Work will be completed prior to completion of the entire Work. Upon completion of construction of each individual facility, including testing, if the County, at its sole discretion, desires to accept the individual facility, the Contractor will be issued a dated certificate of completion and acceptance for each individual facility. The County will assume ownership and begin operation of the individual facility on that date and the three-year guaranty period shall commence on that date. The County has the option of not accepting the entire work as a whole until it is completed, tested and approved by the County.

#### 1.06 PARTIAL COUNTY OCCUPANCY

The Contractor shall schedule his operations for completion of portions of the Work, as designated, for the County's occupancy prior to substantial completion of the entire work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**END OF SECTION**

## SECTION 01015 CONTROL OF WORK

### PART 1 GENERAL

#### 1.01 WORK PROGRESS

The Contractor shall furnish personnel and equipment which will be efficient, appropriate and adequately sized to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Contract. If at any time such personnel appears to the County to be inefficient, inappropriate, or insufficient for securing the quality of work required for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character, or increase the personnel and equipment and the Contractor shall conform to such order. Failure of the County to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

#### 1.02 PRIVATE LAND

The Contractor shall not enter or occupy private land outside of easements, except by permission of the affected property owner.

#### 1.03 WORK LOCATIONS

Work shall be located substantially as indicated on the drawings, but the County reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons.

#### 1.04 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the County may require special construction procedures such as limiting the length of open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.
- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be barricaded and well lighted at all times when construction is not in progress.

#### 1.05 DISTRIBUTION SYSTEMS AND SERVICES

- A. The Contractor shall avoid interruptions to water, telephone, cable TV, sewer, gas, or other related utility services. He shall notify the County and the appropriate agency well in advance of any requirement for dewatering, isolating, or relocating a section of a utility, so that necessary arrangements may be made.
- B. If it appears that utility service will be interrupted for an extended period, the County may order the Contractor to provide temporary service lines at the Contractor's expense.

Inconvenience of the users shall be kept to the minimum, consistent with existing conditions. The safety and integrity of the systems are of prime importance in scheduling work.

#### **1.06 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES**

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures and utilities, public or private, including poles, signs, services to building utilities, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables and other similar facilities, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operation shall be repaired by the Contractor at his expense.
- B. The Contractor shall bear full responsibility for obtaining locations of all underground structures and utilities (including existing water services, drain lines and sewers). Services to buildings shall be maintained and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit prices established in the Bid.
- D. If, in the opinion of the County, permanent relocation of a utility owned by the County is required, the County may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work as classified in the General Conditions. If relocation of a privately owned utility is required, the County will notify the utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the County and utility and shall have no claim for delay due to such relocation. The Contractor shall notify public utility companies in writing at least 48 hours (excluding Saturdays, Sundays and legal holidays) before excavating near their utilities.

#### **1.07 TEST PITS**

Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor immediately after the utility location and the surface shall be restored in a manner equal or better than the original condition. No separate payment will be made.

#### **1.08 CARE AND PROTECTION OF PROPERTY**

- A. The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition equal or better to that existing before the damage was done, or he shall make good the damage in another manner acceptable to the County.
- B. All sidewalks which are disturbed by the Contractor's operations shall be restored to their original or better condition by the use of similar or comparable materials. All curbing shall be restored in a condition equal to the original construction and in accordance with the best modern practice.
- C. Along the location of this work, all fences, walks, bushes, trees, shrubbery and other

physical features shall be protected and restored in a thoroughly workmanlike manner unless otherwise shown on the drawings. Fences and other features removed by the Contractor shall be replaced in the location indicated by the County as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be regraded and sodded to equal or exceed original conditions.

- D. Trees close to the work which drawings do not specify to be removed, shall be boxed or otherwise protected against injury. The Contractor shall trim all branches that are liable to damage because of his operations, but in no case shall any tree be cut or removed without prior notification to the County. All injuries to bark, trunk, limbs and roots of trees shall be repaired by dressing, cutting and painting according to approved methods, using only approved tools and materials.
- E. The protection, removal and replacement of existing physical features along the line of work shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit and/or lump sum prices established under the items in the Bid.

#### **1.09 MAINTENANCE OF TRAFFIC**

- A. Open pits, trenches, unpaved streets, debris, or other obstructions due to construction that will prevent the normal flow of traffic during an extended construction stoppage, for any reason, shall be minimized. In the event an extended construction stoppage is found to be necessary, Contractor shall, at his own expense, provide normal traffic flow during extended construction stoppage. Extended stoppage will be defined by the County.
- B. All excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he shall repair the road surface, provide temporary roadways, erect wheel guards or fences, or take other safety measures which are satisfactory to the County.
- C. Any changes to the traffic pattern require a Traffic Control Plan as detailed in section 01570 of this specification..

#### **1.10 WATER FOR CONSTRUCTION PURPOSES**

- A. In locations where public water supply is available, the Contractor may purchase water for all construction purposes.
- B. The Contractor shall be responsible for paying for all water tap fees incurred for the purpose of obtaining a potable water service or temporary use meter.

#### **1.11 MAINTENANCE OF FLOW**

The Contractor shall at his own cost, provide for the flow of sewers, drains and water courses interrupted during the progress of the work and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the County well in advance of the interruption of any flow.

#### **1.12 CLEANUP**

During the course of the work, the Contractor shall keep the site of his operations in as clean and neat a condition as is possible. He shall dispose of all residue resulting from the

construction work and at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.

**1.13 COOPERATION WITHIN THIS CONTRACT**

- A. All firms or person authorized to perform any work under this Contract shall cooperate with the General Contractor and his subcontractors or trades and shall assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the County.

**1.14 PROTECTION OF CONSTRUCTION AND EQUIPMENT**

- A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the Contractor at his own expense.
- B. All structures shall be protected in a manner approved by the County. Should any of the floors or other parts of the structures become heaved, cracked, or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor, at his own expense and to the satisfaction of the County. If, in the final inspection of the work, any defects, faults, or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the warranty period described in the Contract.
- C. Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the County.

**1.15 CONSTRUCTION WITHIN RIGHT-OF-WAY**

Where pipe lines are installed within FDOT right-of-way, all excavation backfill and compaction for the purpose of reconstructing roadways and/or adjacent slopes contiguous thereto shall be in accordance with FDOT or Manatee County Standards and Specifications, whichever is applicable. Contractor shall satisfy the authorized representative of the FDOT with respect to proper safety procedures, construction methods, required permitting, etc., within the FDOT right-of-way.

**PART 2 PRODUCTS (NOT USED)**  
**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01030 SPECIAL PROJECT PROCEDURES

### PART 1 GENERAL

#### 1.01 PERMITS

Upon notice of award, the Contractor shall immediately apply for all applicable permits not previously obtained by the County to do the work from the appropriate governmental agency or agencies. No work shall commence until all applicable permits have been obtained and copies delivered to the County. The costs for obtaining all permits shall be borne by the Contractor.

#### 1.02 CONNECTIONS TO EXISTING SYSTEM

The Contractor shall perform all work necessary to locate, excavate and prepare for connections to the existing systems all as shown on the Drawings or where directed by the County. The cost for this work and for the actual connection shall be included in the price bid for the project and shall not result in any additional cost to the County. The termination point for each contract shall be as shown on the Contract Drawings.

**Contractor shall receive permission from the County and Engineer prior to connecting to existing facilities. This cannot be completed until the new facilities have successfully been tested and commissioned. Contractor shall protect existing facilities from deleterious substances and damage.**

**Connection to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously, as necessary, to complete connections in the minimum amount of time. Operation of existing equipment, valves, or other appurtenances, when required, shall be by or under the direct supervision of the County.**

#### 1.03 RELOCATIONS

The Contractor shall be responsible for the coordination of the relocation of structures, including but not limited to light poles, power poles, signs, sign poles, fences, piping, conduits and drains that interfere with the positioning of the work as set out on the Drawings. No relocation of the items under this Contract shall be done without approval from the County.

#### 1.04 EXISTING UNDERGROUND PIPING, STRUCTURES AND UTILITIES

- A. The attention of the Contractor is drawn to the fact that during excavation, the possibility exists of the Contractor encountering various utility lines not shown on the Drawings. The Contractor shall exercise extreme care before and during excavation to locate and flag these lines as to avoid damage to the existing lines. **The Contractor is required to verify the exact horizontal and vertical location of underground utilities in the area of construction prior to proceeding with the work. The Contractor shall be responsible for any and all damage which might result from**

**his failure to adequately locate and protect any and all utilities, whether above or below grade. Any damage shall be repaired at no additional cost to the County. Contractor shall perform field reconnaissance in advance of starting the work and notify Engineer of any discrepancies with the drawings, so that design modifications can be made before materials are ordered.**

- B. It is the responsibility of the Contractor to ensure that all utility or other poles, the stability of which may be endangered by the close proximity of excavation, are temporarily stayed in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice.
- C. The existing utility locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered. The Contractor shall be responsible for notifying the various utility companies to locate their respective utilities in advance of construction in conformance with all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).
- D. The existing piping and utilities that interfere with new construction shall be rerouted as shown, specified, or required. Before any piping and utilities not shown on the Drawings are disturbed, the Contractor shall notify the County and shall provide suggestions on how best to resolve the issue.
- E. The Contractor shall exercise care in any excavation to locate all existing piping and utilities. All utilities which do not interfere with complete work shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at his expense as directed by the County.
- F. It is intended that wherever existing utilities such as water, sewer, gas, telephone, electrical, or other service lines must be crossed, deflection of the pipe within recommended limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated in the Drawings. However, when in the opinion of the County this procedure is not feasible, he may direct the use of fittings for a utilities crossing as detailed on the Drawings. No deflections will be allowed in gravity sanitary sewer lines or in existing storm sewer lines.

**1.05 SUSPENSION OF WORK DUE TO WEATHER**

Refer to FDOT Standards and Specifications Book, Section 8.

**1.06 HURRICANE PREPAREDNESS PLAN**

- A. Within 30 days of the date of Notice to Proceed, the Contractor shall submit to the County a Hurricane Preparedness Plan. The plan should outline the necessary measures which the Contractor proposes to perform at no additional cost to the County in case of a hurricane warning. **The plan should include emergency contacts and a list of subcontractors and vendors with representatives' contact information.**

- B. In the event of inclement weather, or whenever County shall direct, Contractor shall insure that he and his Subcontractors shall carefully protect work and materials against damage or injury from the weather. If, in the opinion of the County, any portion of work or materials is damaged due to the failure on the part of the Contractor or Subcontractors to protect the work, such work and materials shall be removed and replaced at the expense of the Contractor.

**1.07 POWER SUPPLY**

Electricity as may be required for construction and permanent power supply shall be secured and purchased by the Contractor.

**1.08 SALVAGE**

Any existing equipment or material, including, but not limited to, valves, pipes, fittings, couplings, etc., which is removed or replaced as a result of construction under this project may be designated as salvage by the County and if so shall be protected for a reasonable time until picked up by the County. Any equipment or material not worthy of salvaging, as directed by the County, shall be disposed of by the Contractor at no additional cost.

**1.09 DEWATERING**

- A. The Contractor shall do all groundwater pumping necessary to prevent flotation of any part of the work during construction operations with his own equipment.
- B. The Contractor shall pump out water and wastewater which may seep or leak into the excavations for the duration of the Contract and with his own equipment. He shall dispose of this water in an appropriate manner.
- C. Refer to Division 02 Specifications for additional dewatering requirements.

**1.10 ADDITIONAL PROVISIONS**

- A. Before commencing work on any of the existing pipelines, structures or equipment, the Contractor shall notify the County, in writing, at least 10 calendar days in advance of the date he proposes to commence such work. **Contractor shall notify County at least 21 days in advance of tie-in to existing facilities / piping.**

**Operation of existing facilities or shutdown of facilities, as required, must be coordinated with the County. The County's personnel will be responsible for operating existing infrastructure.**

**The County's operation and maintenance personnel will cooperate in every way that is practical to facilitate Contractor's operation. However, certain shutdowns and connections may only be permissible at times other than normal working hours such as nights and weekends. No additional payment will be made to the Contractor for overtime / holiday work.**

**If it becomes necessary for the proper operation or maintenance of portions of the infrastructure, the County may require the Contractor to reschedule approved**

shutdowns or tie-ins. The Contractor shall then reschedule its operations accordingly. The Contractor, shall within 2 days of notice by the Owner that a rescheduled shutdown / tie-in is necessary, furnish the County a revised outage request and a plan for rescheduling the shutdown / tie-in in accordance with the requirements of the construction schedule.

- B. The Contractor shall provide, at his own expense, all necessary temporary facilities for access to and for protection of, all existing facilities. The County's personnel must have ready access at all times to the existing facilities. The Contractor is responsible for all damage to existing structures, equipment and facilities caused by his construction operations and must repair all such damage when and as ordered by the County.

A sequencing plan must be developed by the Contractor, to demonstrate how construction will occur without impacting operations of the existing Master Lift Station. Costs for the design, provision, operation, and removal of temporary facilities and piping, as needed to complete the work defined in the drawings and specifications, shall be part of the Contractor's work.

## 1.11 CONSTRUCTION CONDITIONS

The Contractor shall strictly adhere to the specific requirements of the governmental unit(s) and/or agency(ies) having jurisdiction over the work. Wherever there is a difference in the requirements of a jurisdictional body and these Specifications, the more stringent shall apply.

## 1.12 PUBLIC NUISANCE

- A. The Contractor shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, excessive noise or dust.
- B. Sound levels must meet Manatee County Ordinance #87-34, (which amends Ordinance 81-3, The Manatee County Noise Control Ordinance). Sound levels in excess of such ordinance are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the County for excessive noise shall not relieve the Contractor of the other portions of this specification.
- C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

## 1.13 WARRANTIES

- A. All material supplied under these Specifications shall be warranted by the Contractor and the manufacturers for a period of three (3) years. Warranty period shall commence on the date of County acceptance.
- B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it

shall be replaced at no expense to the County. All material and installation costs shall be 100% borne by the Contractor.

- C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty or guarantee period. No exception to this provision shall be allowed. The Contractor shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications,
- D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of County acceptance, the Contractor shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the Contractor of the three-year warranty starting at the time of County acceptance of the equipment.

**1.14 FUEL STORAGE & FILLING**

- A. If the contractor is storing fuel on site, or doing his own fuel filling of portable equipment (other than hand-held equipment), he is responsible for any required response, clean-up or reporting required, at no additional cost to the county.
- B. The Contractor shall prepare and submit a fuel storage / spill abatement plan prior to start of construction if required.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01045 CUTTING AND PATCHING**

### **PART 1 GENERAL**

#### **1.01 REQUIREMENTS INCLUDED**

- A. The Contractor shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the work or to:
  - 1. Make its several parts fit together properly.
  - 2. Uncover portions of the work to provide for installation of ill-timed work.
  - 3. Remove and replace defective work.
  - 4. Remove and replace work not conforming to requirements of Contract Documents.
  - 5. Provide penetrations of non-structural surfaces for installation of piping and electrical conduit.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

Comply with specifications and standards for each specific product involved.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION**

- A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to County. Do not proceed with work until County has provided further instructions.

#### **3.02 PREPARATION**

- A. Provide adequate temporary support as necessary to assure structural value to integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of project from damage.
- C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work and maintain excavations free from water.

#### **3.03 PERFORMANCE**

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

- C. Fit and adjust products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- D. Restore work which has been cut or removed; install new products to provide completed work in accordance with the requirements of the Contract Documents.
- E. Replace surfaces airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

**END OF SECTION**

## SECTION 01050 FIELD ENGINEERING AND SURVEYING

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall provide and pay for any field surveying service required ~~for~~ to execute the project.
- B. The Contractor shall furnish and set all necessary stakes to establish the lines and grades as to complete the work shown on the Contract Drawings and layout each portion of the Work of the Contract.
- C. As noted elsewhere, the existing drawings are only as good as the available record drawings. Contractor shall perform field reconnaissance work as necessary to confirm location of existing facilities and below grade infrastructure (both shown and not shown on the drawings). A bid item is included in the bid form for this work. Any deviations noted shall be brought to the immediate attention of the Engineer.

#### 1.02 QUALIFICATION OF SURVEYOR AND ENGINEER

All construction staking shall be conducted by or under the supervision of a Florida Registered Professional Surveyor and Mapper. The Contractor shall be responsible for the layout of all such lines and grades, which will be subject to verification by the County.

#### 1.03 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are designated on the Contract Drawings.
- B. Locate and protect all survey monumentation, property corners and project control points prior to starting work and preserve all permanent reference points during construction. All costs associated with the replacement of all survey monumentation, property corners and project control points shall be borne by the Contractor.

Make no changes or relocations without prior written notice to County.

Report to County when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

Require surveyor to replace project control points which may be lost or destroyed.

Establish replacements based on original survey control.

#### 1.04 PROJECT SURVEY REQUIREMENTS

The Contractor shall establish temporary bench marks as needed, referenced to data established by survey control points.

**1.05 RECORDS**

The Contractor shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings per Section 01720.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01090 REFERENCE STANDARDS

### PART 1 GENERAL

#### 1.01 REQUIREMENTS

Abbreviations and acronyms used in Contract Documents to identify reference standards.

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes established stricter standards.
- B. Publication Date: The most recent publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

#### 1.03 ABBREVIATIONS, NAMES AND ADDRESSES OR ORGANIZATIONS

Obtain copies of reference standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16th Street NW Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329

ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
AWS	American Welding Society 2501 N.W. 7th Street Miami, FL 33125
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
FDEP	Florida Department of Environmental Protection 3900 Commonwealth Blvd. Tallahassee, Florida 32399
FDOT	Florida Department of Transportation Standards Specifications for Road and Bridge Construction Maps & Publication Sales - Mail Station 12 605 Suwannee St. Tallahassee, FL 32399-0450
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407
MCPW UTIL STD	Manatee County Utility Engineering 4410-B 66th St. W. Bradenton, FL 34210
MLSFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
MMA	Monorail Manufacturer's Association 1326 Freeport Road Pittsburgh, PA 15238
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NEMA	National Electrical Manufacturer's Assoc.

2101 L Street N.W.  
Washington, DC 20037

- OHSA Occupational Safety and Health Assoc.  
5807 Breckenridge Pkwy., Suite A  
Tampa, FL 33610-4249
- PCA Portland Cement Association  
5420 Old Orchard Road  
Skokie, IL 20076
- PCI Prestressed Concrete Institute  
20 North Wacker Drive  
Chicago, IL 60606
- SDI Steel Door Institute  
712 Lakewood Center North  
Cleveland, OH 44107
- SMACNA Sheet Metal and Air Conditioning Contractor's National Association  
8224 Old Court House Road  
Vienna, VA 22180
- SSPC Steel Structures Painting Council  
402 24<sup>th</sup> Street, Suite 600  
Pittsburgh, PA 15213
- SWFWMD Southwest Florida Water Management District  
2379 Broad Street  
Brooksville, FL 34604-6899
- UL Underwriter's Laboratories, Inc.  
333 Pfingston Road  
Northbrook, IL 60062

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01150 MEASUREMENT AND PAYMENT**

### **PART 1 GENERAL**

#### **1.01 SCOPE**

- A. The scope of this section of the Contract Documents 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 shop drawings, working drawings, labor, materials, tools, equipment and incidentals necessary to complete the construction as shown on the Drawings and/or as specified in the Contract Documents 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 shown and/or specified to be performed under this Contract.

#### **1.02 ESTIMATED QUANTITIES**

The quantities shown are approximate and are given only as a basis of calculation upon which the award of the Contract is to be made. The County does not assume any responsibility for the final quantities, nor shall the Contractor claim misunderstanding because of such estimate of quantities. Final payment will be made only for satisfactorily completed quantity of each item.

#### **1.03 WORK OUTSIDE AUTHORIZED LIMITS**

No payment will be made for work constructed outside the authorized limits of work.

#### **1.04 MEASUREMENT STANDARDS**

Unless otherwise specified for the particular items involved, all measurements of distance shall be taken horizontally or vertically.

#### **1.05 AREA MEASUREMENTS**

In the measurement of items to be paid for on the basis of area of finished work, the lengths and/or widths to be used in the calculations shall be the final dimensions measured along the surface of the completed work within the neat lines shown or designated.

#### **1.06 LUMP SUM ITEMS**

## Measurement and Payment

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 items shall contain all costs, including labor, materials, and equipment needed to complete the work. Lump sum contracts shall be complete, tested and fully operable prior to request for final payment. Contractor may be required to provide a break-down of the lump sum totals.

Lump sum items are specifically described in the drawings and specifications, and noted in the Bid Form, include:

- Mobilization
- Preconstruction Video
- Field Reconnaissance / Utility Locates & Coordination
- Sanitary Sewer Bypass Pumping and Appurtenances
- Pipeline Testing
- Permitting
- Record Drawings
- Demobilization
- Temporary Erosion Control Measures
- Seeding & Sodding
- Demolition
- Protective Coatings
- Prefabricated Electrical Building
- Pump Building - Roof Membrane System
- Pump Building Structural
- Pump Building Architectural
- Pump Building Mechanical
- Pump Suction Piping, including fittings and appurtenances
- Pump Discharge Piping, including fittings and appurtenances
- HVAC Package
- Site Electrical Ductbanks
- Pump Building Lighting Fixtures
- Sump Pump Control Panel
- Instrumentation & Control Package

### 1.06 UNIT PRICE ITEMS

Separate payment will be made for the items of work described herein and listed on the Bid Form. 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.

Measurement and Payment

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.

1. Project Signs
2. Import Fill and Placement
3. Excavation and Disposal of Unsuitable Material
4. Sidewalk
5. Concrete Paving
6. Concrete Drive
7. Concrete Pads
8. Bollards
9. Dry Pit Submersible Pump
10. Engine Generator and Sub-base Fuel Tank
11. 14" Gate Valves
12. 12" Gate Valves
13. 12" Check Valves
14. HVAC System
15. Variable Frequency Drives
16. Switchboard
17. Power Panel
18. Automatic Transfer Switch
19. Main Circuit Breaker
20. Generator Docking Station
21. Lighting Transformer
22. Lighting Control Panel
23. Pump Building Lighting Fixtures
24. Sump Pump Control Panel

**BID ITEM NO.: MOBILIZATION / DEMOBILIZATION**

Measurement and payment for this 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 the Contractor's mobilization and demobilization costs as shown in the Bid Form. Mobilization includes, but it not limited to: preparation and movement of personnel, equipment, supplies and incidentals such as safety and sanitary supplies/ facilities

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%).

Partial payments for this Bid Item will be made in accordance with the following schedule:

Percent of Original Contract Amount:	Percent Allowable Payment of Mobilization/Demobilization Bid Item Price:
5	25

Measurement and Payment

10	35
25	45
50	50
75	75
100	100

These payments will be subject to the standard retainage provided in the Contract. Payment of the retainage will be made after completion of the work and demobilization.

**BID ITEM NO.: FIELD RECONNAISSANCE / UTILITY LOCATES & COORDINATION**

Payment for all work included in these Bid Items will be made at the applicable Contract unit price bid for field work performed by Contractor at time of mobilization to confirm drawings match field conditions. This includes verifying accuracy of below grade piping and appurtenances. Any deviations should immediately be brought to the attention of the Engineer. This Bid item includes all labor, materials, and equipment required to complete these Bid Items.

**BID ITEM NO.: SANITARY SEWER BYPASS PUMPING**

Payment for all work included in these Bid Items will be made at the applicable Contract unit price bid for installing the temporary equipment needed to bypass the lift station as necessary to perform the work described in the contract. The lift station operations may not be impacted for the project duration. This Bid item includes all labor, materials, and equipment required to complete these Bid Items.

**BID ITEM NO.: TEMPORARY EROSION CONTROL MEASURES**

Payment for all work included in these Bid Items will be made at the applicable Contract unit price bid for installing the temporary erosion control measures as required by the Contract. This Bid item includes all labor, materials, and equipment required to complete these Bid Items.

**BID ITEM NO.: SEEDING & SODDING**

Payment for all work included under this Bid Item shall be made at the Contract lump sum price bid listed in the Bid Form and shall represent full compensation for all labor, materials and equipment required to install the sod, alive and growing.

The lump sum price shall include, but is not limited to, cutting down the existing ground to accept sod, installation, watering, and all labor, materials, necessary equipment, and incidentals necessary to complete this bid item, ready for approval and acceptance by the County.

**BID ITEM NO.: SIDEWALK, CONCRETE PAVING, CONCRETE DRIVE**

Payment for all work included in these Bid Items will be made at the applicable Contract unit price bid per square foot of sidewalk and concrete paving as listed on the Bid Form. Measurement of concrete paving and drive work will be per the actual unit quantity installed. Payment shall represent full compensation for all labor, materials and equipment for cutting the edges of existing sidewalk, compacting subgrade, furnishing and installing subgrade as well as all incidentals necessary to complete the sidewalk, concrete paving, and concrete drive as shown on the Contract Drawings and included in the Specifications, all ready for approval and acceptance by the County.

**BID ITEM NO.: DEMOLITION**

Payment for all work included in these Bid Items will be made at the applicable Contract price of demolition as listed on the Bid Form. Payment shall represent full compensation for all labor, materials and equipment to complete the demolition as required under the Contract, all ready for approval and acceptance by the County.

The following items are to be demolished as part of the work under the Contract for Master Lift Station 39A:

- Miscellaneous Site Features (fencing, door landings, rain gauge, concrete pad to North of pump building)
- Miscellaneous Pump Building (sky lights, fans, doors, louvers)
- Generator and Appurtenances inside Pump Building (including Exhaust)
  - Generator and Appurtenances shall be turned over to the County
- Fuel Tank, including bollards, fuel lines, appurtenances and structural pad
- Drypit Submersible Pumps
- 14" Gate Valve
- 12" Gate Valve
- 12" Check Valve
- Pump Suction DIP Piping (14")
- Pump Discharge DIP Piping (8", 12")
- Electrical gear, including all appurtenances / conduits, inside Pump Building
- Relocation of Rain Gauge (to be Coordinated with the County)

**BID ITEM NO.: MISCELLANEOUS CONCRETE**

Payment for all work under this Bid Item shall be made at the applicable Contract unit price bid per cubic yard of concrete as shown on the Bid Form for furnishing, placing and installing the miscellaneous concrete, measured in place, within the lines and grades as shown on the Contract Drawings and as described in the Specifications. All concrete placed outside these lines and grades to fill unauthorized excavation and all concrete for replacing defective work shall be at the expense of the Contractor. Concrete specifically included under any other Bid Item will not be measured or paid for under this Bid Item.

Measurement for miscellaneous concrete shall be per actual cubic yard of concrete furnished, placed and installed as shown on the Contract Drawings or as ordered by the County in writing. Payment shall represent full compensation for all labor,

materials, and equipment for mixing, placing, forming and curing of the concrete and all incidentals necessary to complete the concrete work, ready for approval and acceptance by the County.

This bid item includes the new concrete pads for the condensing unit, generator, and electrical building at the MLS 39A site.

**BID ITEM NO.: PROTECTIVE COATINGS**

Payment for all work included in this Bid Item shall be made at the applicable Contract price for the field protective coatings applied to piping, equipment, and structures as required by this contract. Payment shall represent full compensation for all labor, materials, testing and equipment required to complete these Bid Items.

**BID ITEM NO.: ENGINE GENERATOR AND SUB-BASE FUEL TANK**

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary for the engine generator and sub-base fuel tank. Bid item does not include foundation.

**BID ITEM NO.: HVAC PACKAGE**

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary for the HVAC system. This includes air handler with supports, condenser, ducting and supports, and piping / appurtenances.

**BID ITEM NO.: PREFABRICATED ELECTRICAL BUILDING**

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary for the new prefabricated concrete building. This bid item should include all costs associated with the building except the foundation, HVAC package, and the electrical gear inside of the building.

**BID ITEM NO.: PUMP BUILDING STRUCTURAL**

Payment for all work included in this Bid Item shall be made at the applicable Contract price for the structural work at the existing pump building. This includes structural penetrations, doors, CMU infill, stucco, fascia, etc. Payment shall represent full compensation for all labor, materials, testing and equipment required to complete these Bid Items.

**BID ITEM NO.: PUMP BUILDING ARCHITECTURAL**

Payment for all work included in this Bid Item shall be made at the applicable Contract price for the architectural work at the existing pump building. This includes miscellaneous finishing (painting, stucco, etc), fascia, and other work shown in the

contract documents. Payment shall represent full compensation for all labor, materials, testing and equipment required to complete these Bid Items.

**BID ITEM NO.: PUMP BUILDING MECHANICAL**

Payment for all work included in this Bid Item shall be made at the applicable Contract price for the mechanical work at the existing pump building. This includes new ventilation fans as well as other mechanical work shown in the contract documents. Payment shall represent full compensation for all labor, materials, testing and equipment required to complete these Bid Items.

**BID ITEM NO.: PUMP BUILDING - ROOF MEMBRANE SYSTEM**

Payment for all work included in this Bid Item shall be made at the applicable Contract price for the sing-ply roof membrane system at the existing pump building. Payment shall represent full compensation for all labor, materials, testing and equipment required to complete these Bid Items.

**BID ITEM NO.: DUCTILE IRON PIPE AND FITTINGS (PUMP SUCTION / DISCHARGE PIPING)**

Payment for all work included in these Bid Items will be made at the applicable Contract unit price bid for furnishing and installing each listed ductile iron pipe and fitting as shown on the Contract Drawings and listed on the Bid Form. Payment will be made for each fitting installed and will represent full compensation for all labor, material, pipe supports, excavation, including rock, bedding, backfill, compaction, testing and equipment required to complete these Bid Items.

**BID ITEM NO.: DRY PIT SUBERSIBLE PUMPS**

Payment for all work included in this Bid Item shall be made at the applicable Contract unit price bid per each pump, including pump supports, shown on the Contract Drawings and listed on the Bid Form. Payment shall represent full compensation for all labor, materials, testing and disinfection and equipment required to complete these Bid Items.

**BID ITEM NO.: GATE AND CHECK VALVES**

Payment for all work included in this Bid Item shall be made at the applicable Contract unit price bid per each valve for furnishing and installing the listed diameter valve shown on the Contract Drawings and listed on the Bid Form. Payment shall represent full compensation for all labor, materials, testing and disinfection and equipment required to complete these Bid Items.

**BID ITEM NO.: ELECTRICAL/ INSTRUMENTATION & CONTROLS**

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary for

the replacement of the electrical distribution and pump control equipment. Existing building lighting shall remain along with receptacle circuits; however, the receptacles and switches themselves will be replaced with corrosion resistant devices.

**BID ITEM NO.: INSTRUMENTATION & CONTROL PACKAGE**

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary for all I&C work required by this contract. This includes, but is not limited to, the RTU panel, pressure instruments, level instruments. Payment shall represent full compensation for all labor, material, and equipment required to complete these Bid Items.

**BID ITEM NO. : SITE ELECTRICAL DUCTBANKS**

Payment for all work included under this Bid Item shall be made at the Contract lump sum price bid listed in the Bid Form and shall represent full compensation for all labor, materials and equipment required for the new electrical ductbank including junction boxes, conduit, wiring/cabling, cable trays, etc.

**BID ITEM NO. : RECORD DRAWINGS**

Payment for all work included under this Bid Item shall be made at the Contract lump sum price bid listed in the Bid Form and shall represent full compensation for all labor, materials and equipment required to generate and provide record drawings approved and accepted by the County. Record drawings shall be in strict accordance with Section 1.14 of the Manatee County Public Work Utility Standards.

**BID ITEM NO.: CONTRACT CONTINGENCY**

Payment for all work under this Bid Item shall be made only at the County's discretion. This Bid Item shall not exceed 10% of the Bidders Total Base Bid. The Bidder shall calculate and enter a dollar amount for this Bid Item.

**PART 2        PRODUCTS (NOT USED)**

**PART 3        EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01152 REQUESTS FOR PAYMENT

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

Submit Applications for Payment to the Project Manager or as directed at the preconstruction meeting, in accordance with the schedule established by Conditions of the Contract and Agreement between County and Contractor.

#### 1.02 FORMAT AND DATA REQUIRED

- A. Submit payment requests in the form provided by the County with itemized data typed in accordance with the Bid Form.
- B. Provide construction photographs in accordance with Contract Documents. Photographs from the current payment period must accompany the payment request in order to be processed.
- C. Provide updated construction schedule in accordance with Contract Documents. An updated schedule reflecting dates and durations of completed activities must accompany the payment request in order to be processed.

#### 1.03 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. Provide substantiating data in accordance with Contract Documents. Substantiating data must accompany the payment request in order to be processed. When the County requires substantiating data, Contractor shall submit suitable information with a cover letter.
- B. Submit one copy of data and cover letter for each copy of application.

#### 1.04 PREPARATION OF APPLICATION FOR FINAL PAYMENT

Fill in application form as specified for progress payments.

#### 1.05 SUBMITTAL PROCEDURE

- A. Submit applications for payment at the times stipulated in the Agreement.
- B. Number: Three (3) copies of each application; all signed and certified by the Contractor.

### PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION (NOT USED)

END OF SECTION

## SECTION 01153 CHANGE ORDER PROCEDURES

### PART 1 GENERAL

#### 1.01 DEFINITION

- A. Change Order: A written order signed by the Owner, the Architect/Engineer and the Contractor authorizing a change in the Project Plans and/or Specifications and, if necessary, a corresponding adjustment in the Contract Sum and/or Contract Time, pursuant to Article V of the General Conditions of the Construction Agreement.
- B. Administrative Change Adjustment: Minor change order under 10% of project cost or 20% time, does not have to be Board approved.
- C. Field Directive: A written order issued by Owner which orders minor changes in the Work not involving a change in Contract Time, to be paid from the Owner's contingency funds.
- D. Field Order: Minor change to contract work that does not require adjustment of contract sum or expected date of completion.

#### 1.02 REQUIREMENTS INCLUDED

- A. The Contractor shall promptly implement change order procedures:
  - 1. Provide full written data required to evaluate changes.
  - 2. Maintain detailed records of work done on a time-and-material/force account basis.
  - 3. Provide full documentation to County on request.
- B. The Contractor shall designate a member of the Contractor's organization who:
  - 1. Is authorized to accept changes to the Work.
  - 2. Is responsible for informing others in the Contractor's employ of the authorized changes into the Work.

#### 1.03 PRELIMINARY PROCEDURES

- A. Project Manager may initiate changes by submitting a Request to Contractor. Request will include:
  - 1. Detailed description of the change, products, costs and location of the change in the Project.
  - 2. Supplementary or revised Drawings and Specifications.
  - 3. The projected time extension for making the change.
  - 4. A specified period of time during which the requested price will be considered valid.
  - 5. Such request is for information only and is not an instruction to execute the changes, nor to stop work in progress.
- B. Contractor may initiate changes by submitting a written notice to the Project Manager, containing:
  - 1. Description of the proposed changes.
  - 2. Statement of the reason for making the changes.
  - 3. Statement of the effect on the Contract Sum and the Contract Time.

4. Statement of the effect on the work of separate contractors.
5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

#### **1.04 FIELD ORDER CHANGE**

- A. In lieu of a Change Order, the Project Manager may issue a Field Order for the Contractor to proceed with additional work within the original intent of the Project.
- B. Field Order will describe changes in the work, with attachments of backup information to define details of the change.
- C. Contractor must sign and date the Field Order to indicate agreement with the terms therein.

#### **1.05 DOCUMENTATION OF PROPOSALS AND CLAIMS**

- A. Support each quotation for a lump sum proposal and for each unit price which has not previously been established, with sufficient substantiating data to allow the County to evaluate the quotation.
- B. On request, provide additional data to support time and cost computations:
  1. Labor required.
  2. Equipment required.
  3. Products required.
    - a. Recommended source of purchase and unit cost.
    - b. Quantities required.
  4. Taxes, insurance and bonds.
  5. Credit for work deleted from Contract, similarly documented.
  6. Overhead and profit.
  7. Justification for any change in Contract Time.
- C. Support each claim for additional costs and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal.
  1. Name of the County's authorized agent who ordered the work and date of the order.
  2. Date and time work was performed and by whom.
  3. Time record, summary of hours work and hourly rates paid.
  4. Receipts and invoices for:
    - a. Equipment used, listing dates and time of use.
    - b. Products used, listing of quantities.
    - c. Subcontracts.

#### **1.06 PREPARATION OF CHANGE ORDERS**

- A. Project Manager will prepare each Change Order.
- B. Change Order will describe changes in the Work, both additions and deletions, with attachments as necessary to define details of the change.
- C. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

**1.07 LUMP SUM/FIXED PRICE CHANGE ORDER**

- A. Project Manager initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by the Contractor, or requests from the County, or both.
- B. Once the form has been completed, all copies should be sent to Contractor for approval. After approval by Contractor, all copies should be sent to County for approval. The County will distribute executed copies after approval by the Board of County Commissioners.

**1.08 UNIT PRICE CHANGE ORDER**

- A. Contents of Change Orders will be based on, either:
  - 1. County's definition of the scope of the required changes.
  - 2. Contractor's Proposal for a change, as approved by the County.
  - 3. Survey of completed work.
- B. The amounts of the unit prices to be:
  - 1. Those stated in the Agreement.
  - 2. Those mutually agreed upon between County and Contractor.

**1.09 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE AUTHORIZATION**

- A. Refer to Article V.5.6 of the General Conditions of the Construction Agreement.

**1.10 CORRELATION WITH CONTRACTOR'S SUBMITTALS**

- A. Periodically revise Schedule of Values and Application for Payment forms to record each change as a separate item of work, and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time. Revise sub schedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01200 PROJECT MEETINGS

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. The County shall schedule the pre-construction meeting, periodic progress meetings and special meetings, if required, throughout progress of work.
- B. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Contractor shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

#### 1.02 PRE-CONSTRUCTION MEETING

- A. Attendance:
  - 1. County's Engineer.
  - 2. County's Project Manager
  - 3. Contractor.
  - 4. Resident Project Representative.
  - 5. Related Labor Contractor's Superintendent.
  - 6. Major Subcontractors.
  - 7. Major Suppliers.
  - 8. Others as appropriate.
- B. Suggested Agenda:
  - 1. Distribution and discussion of:
    - a. List of major subcontractors.
    - b. Projected Construction Schedules.
    - c. Coordination of Utilities
  - 2. Critical work sequencing.
  - 3. Project Coordination.
    - a. Designation of responsible personnel.
    - b. Emergency contact persons with phone numbers.
  - 4. Procedures and processing of:
    - a. Field decisions.
    - b. Submittals.
    - c. Change Orders.
    - d. Applications for Payment.
  - 5. Procedures for maintaining Record Documents.
  - 6. Use of premises:
    - a. Office, work and storage areas.
    - b. County's REQUIREMENTS.
  - 7. Temporary utilities.
  - 8. Housekeeping procedures.
  - 9. Liquidated damages.
  - 10. Equal Opportunity Requirements.
  - 11. Laboratory testing.
  - 12. Project / Job meetings: Progress meeting, other special topics as needed.

**PART 2      PRODUCTS (NOT USED)**

**PART 3      EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01310 CONSTRUCTION SCHEDULE & PROJECT RESTRAINTS

### PART 1 GENERAL

#### 1.01 GENERAL

- A. Construction under this contract must be coordinated with the County and accomplished in a logical order to maintain utilization and flow through existing facilities and public properties and rights-of-way and to allow construction to be completed within the time allowed by Contract Documents and in the manner set forth in the Contract.

#### 1.02 CONSTRUCTION SCHEDULING GENERAL PROVISIONS

- A. No work shall be done between 7:00 p.m. and 7:00 a.m. nor on weekends or legal holidays without written permission of the County. However, emergency work may be done without prior permission.
- B. Night work may be established by the Contractor as regular procedure with the written permission of the County. Such permission, however, may be revoked at any time by the County if the Contractor fails to maintain adequate equipment and supervision for the proper execution and control of the work at night.
- C. Due to potential health hazards and requirements of the State of Florida and the U.S. Environmental Protection Agency, existing facilities must be maintained in operation.
- D. The Contractor shall be fully responsible for providing all temporary piping, plumbing, electrical hook-ups, lighting, temporary structure, or other materials, equipment and systems required to maintain the existing facility's operations. All details of temporary piping and temporary construction are not necessarily shown on the Drawings or covered in the Specifications. However, this does not relieve the Contractor of the responsibility to insure that construction will not interrupt proper facility operations.
- E. The Contractor shall designate an authorized representative of his firm who shall be responsible for development and maintenance of the schedule and of progress and payment reports. This representative of the Contractor shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the commitments of the Contractor's schedule.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. The Contractor shall submit a critical path schedule as described herein.
- B. The planning, scheduling, management and execution of the work is the sole responsibility of the Contractor. The progress schedule requirement is established to allow County to review Contractor's planning, scheduling, management and

execution of the work; to assist County in evaluating work progress and make progress payments and to allow other contractors to cooperate and coordinate their activities with those of the Contractor.

## 2.02 FORM OF SCHEDULES

- A. Prepare schedules using the latest version of Microsoft Project, or other County approved software, in the form of a horizontal bar chart diagram. The diagram shall be time-scaled and sequenced by work areas. Horizontal time scale shall identify the first work day of each week.
- B. Activities shall be at least as detailed as the Schedule of Values. Activity durations shall be in whole working days. In addition, man-days shall be shown for each activity or tabulated in an accompanying report.

**Project Calendars shall use workdays and calendar days as the planning unit for the schedule. Use of Global Calendars is reserved for the County. Each calendar shall be set to start on Mondays with holidays in accordance with County policy. The following calendar shall be used for each activity except as otherwise accepted by the County:**

**5-Day x 8 Hour Workweek (with holidays) shall be used for 5-day 40-hour workweek activities: Monday through Friday. All holidays and non-work days shall be assigned to this calendar. This calendar shall be used for all normal work activities, submittals, and fabricate and delivery activities. This calendar shall be the default calendar for the project unless otherwise specified.**

**The work day to calendar day correlation shall be based on a single shift and 5-day work week with adequate allowance for holidays, adverse weather and all other special requirements of the Work. As noted in the drawings, certain activities (e.g. tie-ins with existing piping) shall be done on the weekend, unless otherwise approved by the County. Under no circumstances will a schedule be accepted which allows regularly scheduled work on weekends.**

- C. Diagrams shall be neat and legible and submitted on sheets at least 8-1/2 inches by 11 inches suitable for reproduction. Scale and spacing shall allow space for notations and future revisions.

## 2.03 CONTENT OF SCHEDULES

- A. Each monthly schedule shall be based on data as of the last day of the current pay period.
- B. Description for each activity shall be brief, but convey the scope of work described.
- C. Activities shall identify all items of work that must be accomplished to achieve substantial completion, such as items pertaining to Contractor's installation and testing activities; items pertaining to the approval of regulatory agencies; contractor's time required for submittals, fabrication and deliveries; the time required by County to review all submittals as set forth in the Contract Documents;

items of work required of County to support pre-operational, startup and final testing; time required for the relocation of utilities. Activities shall also identify interface milestones with the work of other contractors performing work under separate contracts with County.

- D. Schedules shall show the complete sequence of construction by activities. Dates for beginning and completion of each activity shall be indicated as well as projected percentage of completion for each activity as of the first day of each month.
- E. Submittal schedule for shop drawing review, product data, and samples shall show the date of Contractor submittal and the date approved submittals will be required by the County, consistent with the time frames established in the Specifications.
- F. For Contract change orders granting time extensions, the impact on the Contract date(s) shall equal the calendar-day total time extension specified for the applicable work in the Contract change orders.
- G. For actual delays, add activities prior to each delayed activity on the appropriate critical path(s). Data on the added activities of this type shall portray all steps leading to the delay and shall further include the following: separate activity identification, activity description indicating cause of the delay, activity duration consistent with whichever set of dates below applies, the actual start and finish dates of the delay or, if the delay is not finished, the actual start date and estimated completion date.
- H. For potential delays, add an activity prior to each potentially delayed activity on the appropriate critical path(s). Data for added activities of this type shall include alternatives available to mitigate the delay including acceleration alternatives and further show the following: separate activity identification, activity description indicating cause of the potential delay and activity duration equal to zero work days.
- I. **Additional positive total Float in the Progress Schedule generated by efficiencies of Owner or Contractor is a shared commodity to be reasonably used by either party and belongs exclusively to the Project. Contractor is not entitled to any additional compensation for completion of the project prior to expiration of the Contract Times.**

**Contractor shall not use Float suppression techniques, including preferential sequencing (arranging critical path through activities more susceptible to Owner caused delay); lag logic restraints; zero total or free Float constraints; extended activity times; or imposing constraint dates other than as required by the Contract. Float suppression will be cause for rejection of the preliminary Progress Schedule or full Progress Schedule and its updates.**

- J. **Owner initiated changes to the Work that absorb Float time will not be considered for an extension of time. Owner-initiated changes that affect the critical path of the Progress Schedule shall be grounds for extending or shortening completion dates. Use of Float time for Contractor initiated changes will require Owner's concurrence. Contractor's changes, however, shall give way to Owner-initiated changes competing for the same Float time.**

- K. Events outside of Contractor's control that affect the critical path of the Progress Schedule will be considered for an extension or reduction of the Contract Times.

Owner will determine Contractor's entitlement to an extension of the Contract Times as a result of weather delays, based on the flow chart in Figure 1-01310 and the data included in Tables 1 and 2. Extensions of time will be granted at the discretion of Owner for circumstances not covered by the flow chart.

Any weather-related extension of Contract Times shall be non-compensable. Efficiencies gained as a result of favorable weather within a calendar month, where the number of days of normally anticipated weather days is less than expected, shall contribute to the project Float and shall not affect the Contract Times.

Application for a weather-related extension of time shall be submitted to Owner and shall state the extension requested and be supported by the relevant weather data.

Table 1 Average Monthly Precipitation (inches) 10 year average 2007 - 2017 NOAA National Data Center, Annual Climatological Summaries											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.10	2.94	3.04	3.23	3.92	7.39	7.39	7.93	6.23	3.19	1.96	2.63

Table 2 Average Number of Calendar Days with Precipitation of 0.50 Inches or More in a Single 24-hour Period 10 year average 2002 - 2011 NOAA National Data Center, Annual Climatological Summaries											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	1	2	2	1	4	5	5	4	2	1	2

## 2.04 SUPPORTING NARRATIVE

- A. Status and scheduling reports identified below shall contain a narrative to document the project status, to explain the basis of Contractor's determination of durations, describe the Contract conditions and restraints incorporated into the schedule and provide an analysis pertaining to potential problems and practical steps to mitigate them.

- B. The narrative shall specifically include:
1. Actual completion dates for activities completed during the monthly report period and actual start dates for activities commenced during the monthly report period.
  2. Anticipated start dates for activities scheduled to commence during the following monthly report period.
  3. Changes in the duration of any activity and minor logic changes.
  4. The progress along the critical path in terms of days ahead or behind the Contract date.
  5. If the Monthly Status Report indicates an avoidable delay to the Contract completion date or interim completion dates as specified in the Agreement, Contractor shall identify the problem, cause and the activities affected and provide an explanation of the proposed corrective action to meet the milestone dates involved or to mitigate further delays.
  6. If the delay is thought to be unavoidable, the Contractor shall identify the problem, cause, duration, specific activities affected and restraints of each activity.
  7. The narrative shall also discuss all change order activities whether included or not in the revised/current schedule of legal status. Newly introduced change order work activities and the CPM path(s) that they affect, must be specifically identified. All change order work activities added to the schedule shall conform with the sequencing and Contract Time requirements of the applicable Change Order.
  8. Original Contract date(s) shall not be changed except by Contract change order. A revision need not be submitted when the foregoing situations arise unless required by County. Review of a report containing added activities will not be construed to be concurrence with the duration or restraints for such added activities; instead the corresponding data as ultimately incorporated into the applicable Contract change order shall govern.
  9. Should County require additional data, this information shall be supplied by Contractor within 10 calendar days.

## **2.05 SUBMITTALS**

- A. Contractor shall submit estimated and preliminary progress schedules (as identified in the Terms and Conditions of the Contract and the General Conditions), monthly status reports, a start-up schedule and an as-built schedule report all as specified herein.
- B. All schedules, including estimated and preliminary schedules, shall be in conformance with the Contract Documents.
- C. The finalized progress schedule discussed in the Contract Documents shall be the first monthly status report and as such shall be in conformance with all applicable specifications contained herein.
- D. Monthly Status Report submittals shall include a time-scaled (days after notice to proceed) diagram showing all contract activities and supporting narrative. The initial detailed schedule shall use the notice to proceed as the start date. The

finalized schedule, if concurred with by County, shall be the work plan to be used by the contractor for planning, scheduling, managing and executing the work.

- E. The schedule diagram shall be formatted as above. The diagram shall include (1) all detailed activities included in the preliminary and estimated schedule submittals, (2) calendar days prior to substantial completion, (3) summary activities for the remaining days. The critical path activities shall be identified, including critical paths for interim dates, if possible.
- F. The Contractor shall submit progress schedules with each application for payment.

## **2.06 MONTHLY STATUS REPORTS**

- A. Contractor shall submit detailed schedule status reports on a monthly basis with the Application for Payment. The first such status report shall be submitted with the first Application for Payment and include data as of the last day of the pay period. The Monthly Report shall include a "marked-up" copy of the latest detailed schedule of legal status and a supporting narrative including updated information as described above. The Monthly Report will be reviewed by County and Contractor at a monthly schedule meeting and Contractor will address County's comments on the subsequent monthly report. Monthly status reports shall be the basis for evaluating Contractor's progress.
- B. The "marked-up" diagram shall show, for the latest detailed schedule of legal status, percentages of completion for all activities, actual start and finish dates and remaining durations, as appropriate. Activities not previously included in the latest detailed schedule of legal status shall be added, except that contractual dates will not be changed except by change order. Review of a marked-up diagram by County will not be construed to constitute concurrence with the time frames, duration, or sequencing for such added activities; instead the corresponding data as ultimately incorporated into an appropriate change order shall govern.

## **2.07 STARTUP SCHEDULE**

- A. At least 60 calendar days prior to the date of substantial completion, Contractor shall submit a time-scaled (days after notice to proceed) diagram detailing the work to take place in the period between 60 days prior to substantial completion, together with a supporting narrative. County shall have 10 calendar days after receipt of the submittal to respond. Upon receipt of County's comments, Contractor shall make the necessary revisions and submit the revised schedule within 10 calendar days. The resubmittal, if concurred with by County, shall be the Work Plan to be used by Contractor for planning, managing, scheduling and executing the remaining work leading to substantial completion.
- B. The time-scaled diagram shall use the latest schedule of legal status for those activities completed ahead of the last 60 calendar days prior to substantial completion and detailed activities for the remaining 60-day period within the time frames outlined in the latest schedule of legal status.

- C. Contractor will be required to continue the requirement for monthly reports, as outlined above. In preparing this report, Contractor must assure that the schedule is consistent with the progress noted in the startup schedule.

## 2.08 REVISIONS

- A. All revised Schedule Submittals shall be made in the same form and detail as the initial submittal and shall be accompanied by an explanation of the reasons for such revisions, all of which shall be subject to review and concurrence by County. The revision shall incorporate all previously made changes to reflect current as-built conditions. Minor changes to the approved submittal may be approved at monthly meetings; a minor change is not considered a revision in the context of this paragraph.
- B. A revised schedule submittal shall be submitted for review when required by County.

## PART 3 EXECUTION

**Contractor shall schedule and sequence the construction to ensure the continuous operation of the Master Lift Station, unless written authorization for a shutdown is provided from the County. The Contractor's scheduling shall be developed to include proper construction sequencing so that the Work will not adversely impact the County's operations and to ensure that the County maintains full capabilities. Contractor is responsible for pre-assembling piping/appurtenances in advance of each tie-in, as required, to minimize the potential for any issues during installation. The Contractor shall submit detailed plans for each tie-in.**

**The Contractor is required to have the temporary bypassing pumping system in operation before taking any of the existing pumps and appurtenances offline, which would impact MLS 39A operations. The temporary bypass pumping system must remain in operation, until MLS 39A is returned to service. All temporary pumps, piping, and appurtenances are the responsibility of the Contractor.**

END OF SECTION

## SECTION 01340 SHOP DRAWINGS, PROJECT DATA AND SAMPLES

### PART 1 GENERAL

Refer to Specification 01730 for requirements for O&M manuals/ data.

#### 1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the County for review and approval: working drawings, shop drawings, test reports and data on materials and equipment (hereinafter in this section called data), and material samples (hereinafter in this section called samples) as are required for the proper control of work, including, but not limited to those working drawings, shop drawings, data and samples for materials and equipment specified elsewhere in the Specifications and in the Contract Drawings.
- B. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the County. This log should include the following items:
  - 1. Submittal description and number assigned.
  - 2. Date to County.
  - 3. Date returned to Contractor (from County).
  - 4. Status of Submittal (No exceptions taken, returned for confirmation or resubmittal, rejected).
  - 5. Date of Resubmittal and Return (as applicable).
  - 6. Date material released (for fabrication).
  - 7. Projected date of fabrication.
  - 8. Projected date of delivery to site.
  - 9. Projected date and required lead time so that product installation does not delay contact.
  - 10. Status of O&M manuals submitted.

#### 1.02 CONTRACTOR'S RESPONSIBILITY

- A. It is the duty of the Contractor to check all drawings, data and samples prepared by or for him before submitting them to the County for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the County without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the contract Documents.
- B. Determine and verify:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance with Specifications and indicate all variances from the Specifications.

- C. The Contractor shall furnish the County a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment. This schedule shall indicate those that are critical to the progress schedule.
- D. The Contractor shall not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the County, with No Exceptions Taken or Approved As Noted.
- E. The Contractor shall submit to the County all drawings and schedules sufficiently in advance of construction requirements to provide no less than twenty-one (21) calendar days for checking and appropriate action from the time the County receives them.
- F. All material & product submittals, other than samples, may be transmitted electronically as a pdf file. All returns to the contractor will be as a pdf file only unless specifically requested otherwise. **Submittal documents shall be in color. Submittals shall be at a readable resolution. Document should be such that text can be searched, selected and copied from the submitted PDF file.**
- G. The Contractor shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by County of the necessary Shop Drawings.

### 1.03 COUNTY'S REVIEW OF SHOP DRAWINGS AND WORKING DRAWINGS

- A. ~~The County's review of drawings, data and samples submitted by the Contractor shall cover only general conformity to the Specifications, external connections and dimensions which affect the installation.~~ **County's review of submittals covers only general conformity to the Drawings and Specifications, external connections, and dimensions that affect the layout; it does not indicate thorough review of all dimensions, quantities, and details of the material, equipment, device, or item covered. Engineer and County's review shall not relieve Contractor of sole responsibility for errors, omissions, or deviations in the drawings and data, nor or Contractor's sole responsibility for compliance with the Contract Documents**
- B. The review of drawings and schedules shall be general and shall not be construed:
  - 1. As permitting any departure from the Contract requirements.
  - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions and materials.
  - 3. As approving departures from details furnished by the County, except as otherwise provided herein.
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which the County finds to be in the interest of the County and to be so minor as not to involve a change in Contract

Price or time for performance, the County may return the reviewed drawings without noting any exception.

- D. When reviewed by the County, each of the Shop and Working Drawings shall be identified as having received such review being so stamped and dated. Shop Drawings stamped "REJECTED" and with required corrections shown shall be returned to the Contractor for correction and resubmittal. **Review of Shop Drawings will result in one of the following dispositions:**
1. **No Exceptions Taken**
  2. **Returned for Resubmittal**
  3. **Record Copy**
  4. **Rejected**
- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals, the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the County on previous submissions. The Contractor shall make any corrections required by the County.
- F. If the Contractor considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the County.
- G. The County shall review a submittal/resubmittal a maximum of three (3) times after which cost of review shall be borne by the Contractor. The cost of engineering shall be equal to the County's actual payroll cost.
- H. When the Shop and Working Drawings have been completed to the satisfaction of the County, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the County.
- I. No partial submittals shall be reviewed. Incomplete submittals shall be returned to the Contractor and shall be considered not approved until resubmitted.

#### 1.04 SHOP DRAWINGS

- A. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean Contractor's plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop Drawings shall consist of fabrication, drawings, setting drawings, schedule drawings, manufacturer's scale drawings and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature and performance and test data, shall be considered only as supportive to required Shop Drawings as defined above.
- B. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the County and shall bear the Contractor's stamp of approval and original signature as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval and original signature shall be returned to the Contractor for resubmission.

- C. Each Shop Drawing shall have a blank area 3-1/2 inches by 3-1/2 inches, located adjacent to the title block. The title block shall display the following:
1. Number and title of the drawing.
  2. Date of Drawing or revision.
  3. Name of project building or facility.
  4. Name of contractor and subcontractor submitting drawing.
  5. Clear identification of contents and location of the work.
  6. Specification title and number.
- D. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility of executing the work in accordance with the Contract, even though such drawings have been reviewed.
- E. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.
- F. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.
- G. All manufacturers or equipment suppliers who proposed to furnish equipment or products shall submit an installation list to the County along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and have been in operation for a period of at least one (1) year.
- H. Only the County will utilize the color "red" in marking shop drawing submittals.

## **1.05 WORKING DRAWINGS**

- A. When used in the Contract Documents, the term "working drawings" shall be considered to mean the Contractor's fabrication and erection drawings for structures such as roof trusses, steelwork, precast concrete elements, bulkheads, support of open cut excavation, support of utilities, groundwater control systems, forming and false work; underpinning; and for such other work as may be required for construction of the project.
- B. Copies of working drawings as noted above, shall be submitted to the County where required by the Contract Documents or requested by the County and shall be submitted at least thirty (30) days (unless otherwise specified by the County) in advance of their being required for work.

- C. Working drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the County, which review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error are assumed by the Contractor; the County and Engineer shall not have responsibility therefor.

## 1.06 SAMPLES

- A. The Contractor shall furnish, for the review of the County, samples required by the Contract Documents or requested by the County. Samples shall be delivered to the County as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until reviewed by the County.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of the product, with integrally related parts and attachment devices.
  - 2. Full range of color, texture and pattern.
  - 3. A minimum of two samples of each item shall be submitted.
- C. Each sample shall have a label indicating:
  - 1. Name of product.
  - 2. Name of Contractor and Subcontractor.
  - 3. Material or equipment represented.
  - 4. Place of origin.
  - 5. Name of Producer and Brand (if any).
  - 6. Location in project.  
(Samples of finished materials shall have additional markings that will identify them under the finished schedules.)
  - 7. Reference specification paragraph.
- D. The Contractor shall prepare a transmittal letter in triplicate for each shipment of samples containing the information required above. He shall enclose a copy of this letter with the shipment and send a copy of this letter to the County. Review of a sample shall be only for the characteristics or use named in such and shall not be construed to change or modify any Contract requirements.
- E. Reviewed samples not destroyed in testing shall be sent to the County or stored at the site of the work. Reviewed samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the reviewed samples. If requested at the time of submission, samples which failed testing or were rejected shall be returned to the Contractor at his expense.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01370 SCHEDULE OF VALUES

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the County a Schedule of Values allocated to the various portions of the work, within 10 days after date of Notice to Proceed.
- B. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.
- C. The Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment.
- D. The Schedule of Values shall have sufficient detail such that partial completion of separable items of work can easily be calculated. The Schedule of Values shall have separate lines for manufacturer's field services, O&M manuals, and performance testing for each item of equipment requiring such services.

An unbalanced Schedule of Values providing for overpayment of Contractor on items of Work which would be performed first will not be accepted. The Schedule of Values shall be revised and resubmitted until acceptable to Engineer. Final acceptance by Engineer shall indicate only consent to the Schedule of Values as a basis for preparation of applications for progress payments and shall not constitute agreement as to the value of each indicated item.

#### 1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Schedule of Values will be considered for approval by County upon Contractor's request. Identify schedule with:
  - 1. Title of Project and location.
  - 2. Project number.
  - 3. Name and address of Contractor.
  - 4. Contract designation.
  - 5. Date of submission.
- B. Schedule of Values shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the table of contents for the Contract Document as the format for listing component items for structures:
  - 1. Identify each line item with the number and title of the respective major section of the specification.
  - 2. For each line item, list sub values of major products or operations under item.

- D. Contractor shall use the bid sheet for the basis for the schedule of values.
- E. The sum of all values listed in the schedule shall equal the total Contract sum.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01380 CONSTRUCTION PHOTOGRAPHS

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall employ a competent photographer to take construction record photographs or perform video, recording including furnishing all labor, materials, equipment and incidentals necessary to obtain photographs and/or video recordings of all construction areas.
- B. Preconstruction record information shall consist of video recordings on digital video disks (DVD).
- C. Construction progress information shall consist of photographs and digital photographs on a recordable compact disc (CD-R).

#### 1.02 QUALIFICATIONS

- A. All photography shall be done by a competent camera operator who is fully experienced and qualified with the specified equipment.
- B. For the video recording, the audio portion should be done by a person qualified and knowledgeable in the specifics of the Contract, who shall speak with clarity and diction so as to be easily understood.

#### 1.03 PROJECT PHOTOGRAPHS

- A. Provide one print of each photograph with each pay application.
- B. Provide one recordable compact disc with digital photographs with each pay application.
- C. Negatives:
  - 1. All negatives shall remain the property of photographer.
  - 2. The Contractor shall require that photographer maintain negatives or protected digital files for a period of two years from date of substantial completion of the project.
  - 3. Photographer shall agree to furnish additional prints to County at commercial rates applicable at time of purchase. Photographer shall also agree to participate as required in any litigation requiring the photographer as an expert witness.
- D. The Contractor shall pay all costs associated with the required photography and prints. Any parties requiring additional photography or prints shall pay the photographer directly.
- E. All project photographs shall be a single weight, color image. All finishes shall be smooth surface and glossy and all prints shall be 8 inches x 10 inches.
- F. Each print shall have clearly marked on the back, the name of the project, the orientation of view, the date and time of exposure, name and address of the photographer and the photographers numbered identification of exposure.
- G. All project photographs shall be taken from locations to adequately illustrate conditions prior

to construction, or conditions of construction and state of progress. The Contractor shall consult with the County at each period of photography for instructions concerning views required.

**1.04 VIDEO RECORDINGS**

- A. Video, recording shall be done along all routes that are scheduled for construction. Video, recording shall include full, recording of both sides of all streets and the entire width of easements plus 10 feet on each side on which construction is to be performed. All video recording shall be in full color.
- B. A complete view, in sufficient detail with audio description of the exact location shall be provided.
- C. The engineering plans shall be used as a reference for stationing in the audio portion of the recordings for easy location identification.
- D. Two complete sets of video recordings shall be delivered to the County on digital video disks (DVD) for the permanent and exclusive use of the County prior to the start of any construction on the project.
- E. All video recordings shall contain the name of the project, the date and time of the video, recording, the name and address of the photographer and any other identifying information required.
- F. Construction shall not start until preconstruction video recordings are completed, submitted and accepted by the County. In addition, no progress payments shall be made until the preconstruction video recordings are accepted by the County.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01410 TESTING AND TESTING LABORATORY SERVICES

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. County shall employ and pay for the services of an independent testing laboratory to perform testing specifically indicated on the Contract Documents or called out in the Specifications. County may elect to have materials and equipment tested for conformity with the Contract Documents at any time.
1. Contractor shall cooperate fully with the laboratory to facilitate the execution of its required services.
  2. Employment of the laboratory shall in no way relieve the Contractor's obligations to perform the work of the Contract.

#### 1.02 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
1. Release, revoke, alter or enlarge on requirements of Contract Documents.
  2. Approve or accept any portion of the Work.
  3. Perform any duties of the Contractor.

#### 1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to Work and/or to Manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The County may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor and no extra charge to the County shall be allowed on account of such testing and certification.
- E. Furnish incidental labor and facilities:
1. To provide access to work to be tested.
  2. To obtain and handle samples at the project site or at the source of the product to be tested.
  3. To facilitate inspections and tests.
  4. For storage and curing of test samples.

- F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
  - 1. When tests or inspections cannot be performed due to insufficient notice, Contractor shall reimburse County for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- G. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience and as approved by the County.
- H. If the test results indicate the material or equipment complies with the Contract Documents, the County shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the contractor shall pay for the laboratory costs directly to the testing firm or the total of such costs shall be deducted from any payments due the Contractor.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01510 TEMPORARY AND PERMANENT UTILITIES**

### **PART 1 GENERAL**

#### **1.01 REQUIREMENTS INCLUDED**

The Contractor shall be responsible for furnishing all requisite temporary utilities, i.e., power, water, sanitation, etc. The Contractor shall obtain and pay for all permits required as well as pay for all temporary usages. The Contractor shall remove all temporary facilities upon completion of work.

#### **1.02 REQUIREMENTS OF REGULATORY AGENCIES**

- A. Comply with National Electric Code.
- B. Comply with Federal, State and Local codes and regulations and with utility company requirements.
- C. Comply with County Health Department regulations.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS, GENERAL**

Materials for temporary utilities may be "used". Materials for electrical utilities shall be adequate in capacity for the required usage, shall not create unsafe conditions and shall not violate requirements of applicable codes and standards.

#### **2.02 TEMPORARY ELECTRICITY AND LIGHTING**

Arrange with the applicable utility company for temporary power supply. Provide service required for temporary power and lighting and pay all costs for permits, service and for power used.

#### **2.03 TEMPORARY WATER**

- A. The Contractor shall arrange with Manatee County Utilities Customer Service office to provide water for construction purposes, i.e., meter, pay all costs for installation, maintenance and removal, and service charges for water used.
- B. The Contractor shall protect piping and fitting against freezing.

#### **2.04 TEMPORARY SANITARY FACILITIES**

- A. The Contractor shall provide sanitary facilities in compliance with all laws and regulations.
- B. The Contractor shall service, clean and maintain facilities and enclosures.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. The Contractor shall maintain and operate systems to assure continuous service.

- B. The Contractor shall modify and extend systems as work progress requires.

**3.02 REMOVAL**

- A. The Contractor shall completely remove temporary materials and equipment when their use is no longer required.
- B. The Contractor shall clean and repair damage caused by temporary installations or use of temporary facilities.

**END OF SECTION**

## SECTION 01570 TRAFFIC REGULATION

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the Contractor and which interfere with the driving or walking public.
- B. The Contractor shall remove temporary equipment and facilities when no longer required, restore grounds to original or to specified conditions.

#### 1.02 TRAFFIC CONTROL

- A. The necessary traffic control shall include, but not be limited to, such items as proper construction warning signs, signals, lighting devices, markings, barricades, channelization and hand signaling devices. The Contractor shall be responsible for installation and maintenance of all devices and detour routes and signage for the duration of the construction period. The Contractor shall utilize the appropriate traffic plan from the FDOT Maintenance of Traffic Standards, Series 600 of the FDOT Roadway & Traffic Design Standards, Latest Edition.
- B. Should there be the necessity to close any portion of a roadway carrying vehicles or pedestrians the Contractor shall submit a Traffic Control Plan (TCP) at least 5 days before a partial or full day closure, and at least 8 days before a multi-day closure. TCP shall be submitted, along with a copy of their accreditation, by a certified IMSA or ATSA Traffic Control Specialist.
  - 1. At no time will more than one (1) lane of a roadway be closed to vehicles and pedestrians without an approved road closure from the County Transportation Department. With any such closings, adequate provision shall be made for the safe expeditious movement of each.
  - 2. All traffic control signs must be in place and inspected at least 1 day in advance of the closure. Multi-day closures notification signs shall be in place at least 3 days in advance of the closure. All signs must be covered when not in effect, and checked twice a day by the Worksite Traffic Supervisor when they are in effect.
- C. The Contractor shall be responsible for removal, relocation, or replacement of any traffic control device in the construction area which exists as part of the normal preconstruction traffic control scheme. Any such actions shall be performed by the Contractor under the supervision and in accordance with the instructions of the applicable highway department unless otherwise specified.
- D. The Contractor will consult with the County immediately on any vehicular or pedestrian safety or efficiency problem incurred as a result of construction of the project.

- E. The Contractor shall provide ready access to businesses and homes in the project area during construction. The Contractor shall be responsible for coordinating this work with affected homeowners.
- F. When conditions require the temporary installation of signs, pavement markings and traffic barriers for the protection of workers and traffic, the entire array of such devices shall be depicted on working drawings for each separate stage of work. These drawings shall be submitted to the County for review and approval prior to commencement of work on the site.
- G. Precast concrete traffic barriers shall be placed adjacent to trenches and other excavations deeper than six inches below the adjacent pavement surface.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01580 PROJECT IDENTIFICATION AND SIGNS**

### **PART 1 GENERAL**

#### **1.01 REQUIREMENTS INCLUDED**

- A. Furnish, install and maintain County project identification signs.
- B. Remove signs on completion of construction.
- C. Allow no other signs to be displayed except for traffic control and safety.

#### **1.02 PROJECT IDENTIFICATION SIGN (COUNTY)**

- A. Two painted sign, of not less than 32 square feet (3 square meters) area, with painted graphic content to include:
  - 1. Title of Project.
  - 2. Name of County.
  - 3. Names and titles of authorities as directed by County.
  - 4. Prime Contractor.
- B. Graphic design, style of lettering and colors: As approved by the County.
- C. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the County

#### **1.03 INFORMATIONAL SIGNS**

- A. Painted signs with painted lettering, or standard products.
  - 1. Size of signs and lettering: as required by regulatory agencies, or as appropriate to usage.
  - 2. Colors: as required by regulatory agencies, otherwise of uniform colors throughout project.
- B. Erect at appropriate locations to provide required information.

#### **1.04 QUALITY ASSURANCE**

- A. Sign Painter: Professional experience in type of work required.
- B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

#### **1.05 PUBLIC NOTIFICATION**

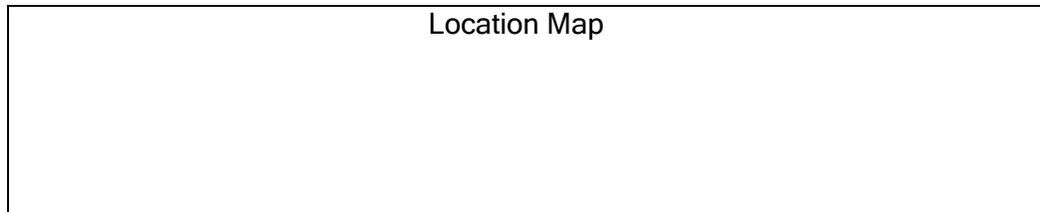
- A. Door Hangers: The Contractor shall generate and distribute door hangers to all residents who will be impacted by project construction.

1. Residents impacted include anyone who resides inside, or within 500 feet of project limits of construction.
- B. Door Hangers shall be distributed prior to start of construction of the project. Hangers shall be affixed to doors of residents via elastic bands or tape.

EXAMPLE:

PLEASE PARDON THE INCONVENIENCE WHILE THE ROADWAY IS BEING  
RECONSTRUCTED IN YOUR NEIGHBORHOOD

This project consists of utility improvements and the reconstruction of ???  
Boulevard from U.S. ??? to ??? Street West. The project is expected to begin in  
August, 200X and be completed in July 200X.



WE HOPE TO KEEP ANY INCONVENIENCE TO A MINIMUM. HOWEVER, IF  
YOU HAVE ANY PROBLEMS, PLEASE CONTACT THE FOLLOWING:

- |    |   |  |
|----|---|--|
| A. | Contractor<br>Contractor Address<br>Contractor Phone (Site Phone) | Project Manager<br>PM Address<br>PM Phone No. & Ext. |
| B. | Project Inspector<br>Inspector Phone Number                       |  |

AFTER HOURS EMERGENCY NUMBER - (941) 747-HELP  
THANK YOU FOR YOUR UNDERSTANDING AND PATIENCE  
MANATEE COUNTY GOVERNMENT - PROJECT MANAGEMENT DEPT.

**PART 2 PRODUCTS**

**2.01 SIGN MATERIALS**

- A. Structure and Framing: May be new or used, wood or metal, in sound condition structurally adequate to work and suitable for specified finish.
- B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.
  1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.

- C. Rough Hardware: Galvanized.
- D. Paint: Exterior quality, as specified in the Contract Documents.

**PART 3 EXECUTION**

**3.01 PROJECT IDENTIFICATION SIGN**

- A. Paint exposed surface or supports, framing and surface material; one coat of primer and one coat of exterior paint.
- B. Paint graphics in styles, size and colors selected.

**3.02 MAINTENANCE**

The Contractor shall maintain signs and supports in a neat, clean condition; repair damages to structures, framing or sign.

**3.03 REMOVAL**

The Contractor shall remove signs, framing, supports and foundations at completion of project.

**END OF SECTION**

## SECTION 01590 COUNTY'S FIELD OFFICE

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

Contractor shall furnish, install and maintain one temporary field office during the entire construction period for the sole use of the County.

#### 1.02 OTHER REQUIREMENTS

- A. Prior to installation of the County's field office, the Contractor shall consult with the County on location, access and related facilities.
- B. All site use approvals shall be obtained by the Contractor.
- C. Upon completion of construction, the Contractor shall remove the field office and restore the site to its original condition.

#### 1.03 REQUIREMENTS FOR FACILITIES

- A. Construction:
  - 1. The field office shall be structurally sound, weather tight, with floors raised aboveground.
  - 2. At Contractor's option, portable or mobile buildings may be used.
- B. Office for Field Engineer:
  - 1. A separate office for sole use of the County with secure entrance doors, key and lock shall be provided.
  - 2. Area: 250 sq. ft. minimum, with minimum dimension of 8 feet.
  - 3. Windows:
    - a. Minimum of three (3).
    - b. Operable sash and insect screens.
    - c. Locate field office to provide maximum view of construction areas.
  - 4. Furnishings:
    - a. Two standard size chairs and desks with three drawers each.
    - b. One drafting table: 39"x72"x36" high, with one equipment drawer.
    - c. One metal, double-door storage cabinet with lock and key.
    - d. One plan rack to hold a minimum of six sets of project drawings.
    - e. One standard four-drawer legal-size metal filing cabinet with lock and key.
    - f. Six linear feet of bookshelves.
    - g. One swivel arm chair.
    - h. Two straight chairs.
    - i. One drafting table stool.
    - j. One waste basket.
    - k. One tackboard, 36"x30".
    - l. One fire extinguisher.
    - m. One first aid kit.
  - 5. Services:
    - a. Adequate lighting.
    - b. Exterior lighting at entrance door.

- c. Automatic heating and mechanical cooling equipment to maintain comfort conditions.
- d. Minimum of four 110 volt duplex electric convenience outlets, at least one on each wall.
- e. Electric distribution panel: Two circuits minimum 110 volt, 60 hertz service.
- f. Convenient access to drinking water and toilet facilities.
- g. Telephone: One private direct line instrument.
- h. Fax: combination fax/duplicator.

**PART 2 PRODUCTS**

**2.01 MATERIALS, EQUIPMENT, FURNISHINGS**

May be new or used, but must be serviceable, adequate for required purpose and must adhere to all applicable codes or regulations including the Manatee County Building Codes.

**PART 3 EXECUTION**

**3.01 PREPARATION**

Fill and grade site as necessary for temporary structure to provide positive surface drainage.

**3.02 INSTALLATION**

- A. Construct temporary field office on proper foundation and provide connections for all utility services.
  - 1. Secure portable or mobile building when used.
  - 2. Provide steps and landings at entrance doors.

**END OF SECTION**

## **SECTION 01600 MATERIAL AND EQUIPMENT**

### **PART 1 GENERAL**

#### **1.01 REQUIREMENTS INCLUDED**

- A. Material and equipment incorporated into the work:
1. Conform to applicable specifications and standards.
  2. Comply with size, make, type and quality specified, or as specifically approved in writing by the County.
  3. Manufactured and Fabricated Products:
    - a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
    - b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
    - c. Two or more items of the same kind shall be identical and manufactured by the same manufacturer.
    - d. Products shall be suitable for service conditions.
    - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
  4. Do not use material or equipment for any purpose other than that for which it is specified.
  5. All material and equipment incorporated into the project shall be new.

#### **1.02 MANUFACTURER'S INSTRUCTIONS**

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to County. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with County prior to proceeding. Do not proceed with work without clear instructions.

#### **1.03 TRANSPORTATION AND HANDLING**

- A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
  2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and that products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

#### **1.04 SUBSTITUTIONS AND PRODUCT OPTIONS**

Contractor's Options:

1. For products specified only by reference standard, select any product meeting that standard.
2. For products specified by naming one or more products or manufacturers and "or equal", Contractor must submit a request for substitutions of any product or manufacturer not specifically named in a timely manner so as not to adversely affect the construction schedule.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01610 GENERAL EQUIPMENT STIPULATIONS

**1. SCOPE.** When an equipment specification section in this Contract references this section, the equipment shall conform to the general stipulations set forth in this section, except as otherwise specified in other sections.

**2. COORDINATION.** Contractor shall coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or Specifications.

**3. MANUFACTURER'S EXPERIENCE.** Unless specifically named in the Specifications, a manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.

**4. WORKMANSHIP AND MATERIALS.** Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch [6.3 mm] thick. When dissimilar metal components are used, consideration shall be given to prevention of galvanic corrosion.

**5. SEISMIC DESIGN REQUIREMENTS.** All equipment, including non-structural components and non-building structures as defined in ASCE 7, and their anchorage, shall be designed and detailed in accordance with the Meteorological and Seismic Design Criteria section.

**6. LUBRICATION.** Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Lubricants for equipment where the lubricants may come in contact with water before or during a potable water treatment process or with potable water, shall be food grade lubricants. This includes lubricants for equipment not normally in contact with water, but where accidental leakage of the lubricants may contaminate the water.

Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

**7. ELEVATION.** The elevation of the site shall be as indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished shall be designed to meet stipulated conditions and to operate satisfactorily at the specified elevation.

**8. ELECTRIC MOTORS.** Unless otherwise specified, motors furnished with equipment shall meet the requirements specified in the General Purpose Induction Motors section or specified in specific equipment sections.

**9. DRIVE UNITS.** The nominal input horsepower [kW] rating of each gear or speed reducer shall be at least equal to the nameplate horsepower [kW] of the drive motor. Drive units shall be designed for 24 hour continuous service.

**9.01. Gearmotors.** The use of gearmotors sharing an integral housing or cutgears into the motor output shaft, or that require removal of lubricant from the gear reducer to change out the motor will not be acceptable.

**9.02. Gear Reducers.** Each gear reducer shall be a totally enclosed unit with oil or grease lubricated, rolling element, antifriction bearings throughout.

Unless superseded by individual specification requirements each helical, spiral bevel, combination bevel-helical, and worm gear reducers shall have a service factor of at least 1.50 based on the nameplate horsepower [kilowatts] of the drive motor. Cycloidal gear reducers shall have a service factor of at least 2.0 based on the nameplate horsepower [kW] of the drive motor. Shaft-mounted and flange-mounted gear reducers shall be rated AGMA Class III. Helical gear reducers shall have a gear strength rating to catalog rating of 1.5. Each gear reducer shall be designed and manufactured in compliance with applicable most current AGMA standards, except the L<sub>10</sub> bearing life shall be 200,000 hours.

The thermal horsepower [kW] rating of each unit shall equal or exceed the nameplate horsepower [kW] of the drive motor. During continuous operation, the maximum sump oil temperature shall not rise more than 100°F [38°C] above the ambient air temperature in the vicinity of the unit and shall not exceed 200°F [93°C].

Each grease lubricated bearing shall be installed in a bearing housing designed to facilitate periodic regreasing of the bearing by means of a manually operated grease gun. Each bearing housing shall be designed to evenly distribute new grease, to properly dispose of old grease, and to prevent overgreasing of the bearing. The use of permanently sealed, grease lubricated bearings will not be acceptable in large sized reducers. In small reducers, similar to basin equipment, permanently sealed grease lubricated bearings rated L<sub>10</sub> 200,000 hour life may be provided at the manufacturer's option. An internal or external oil pump and appurtenances shall be provided if required to properly lubricate oil lubricated bearings. A dipstick or a sight glass arranged to permit visual inspection of lubricant level shall be provided on each unit.

Gear reducers which require the removal of parts or the periodic disassembly of the unit for cleaning and manual regreasing of bearings will not be acceptable.

Certification shall be furnished by the gear reducer manufacturer indicating that the intended application of each unit has been reviewed in detail by the manufacturer and that the unit provided is fully compatible with the conditions of installation and service.

**9.03. Adjustable Speed Drives.** Each mechanical adjustable speed drive shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower [kilowatts] of the drive motor. A spare belt shall be provided with each adjustable speed drive unit employing a belt for speed change. Unless specifically permitted by the detailed equipment specifications, bracket type mounting will not be acceptable for variable speed drives.

**9.04. V-Belt Drives.** Each V-belt drive shall include a sliding base or other suitable tension adjustment. V-belt drives shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower [kilowatts] of the drive motor.

**10. SAFETY GUARDS.** All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage [1.52 mm] thick or thicker galvanized, aluminum-clad sheet steel, or stainless sheet steel or from 1/2 inch [12.7 mm] mesh galvanized expanded metal, or pultrusion molded UV resistant materials. Each safety guard shall be reinforced or shaped to provide suitable strength to prevent vibration and deflection and shall comply with OSHA. Each guard shall be designed for easy installation and removal. All necessary

supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

**11. ANCHOR BOLTS.** Equipment suppliers shall design and detail suitable anchor bolts for each item of equipment. Anchor bolts shall be designed for all operating conditions of the equipment, including wind and seismic loadings when applicable. Wind and seismic loads shall be as indicated in the Meteorological and Seismic Design Criteria section.

Requirements for anchor bolt type, material, and minimum diameter shall be as indicated in the Anchorage in Concrete and Masonry section.

Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete or masonry grout is placed.

Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches [38 mm] of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

**12. EQUIPMENT BASES.** Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches [150 mm] high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in the Grouting section.

**13. SPECIAL TOOLS AND ACCESSORIES.** Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

**14. SHOP PAINTING.** All iron and steel surfaces of the equipment shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an epoxy or polyurethane

enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of a universal primer.

Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound as recommended by the equipment manufacturer.

**15. OBSERVATION OF PERFORMANCE TESTS.** Where the Specifications require the presence of Engineer, initial tests shall be observed or witnessed by Engineer. Owner shall be reimbursed by Contractor for all costs of subsequent visits by Engineer to witness or observe incomplete tests, retesting, or subsequent tests.

**16. PROGRAMMING SOFTWARE.** Programming software shall be provided for any equipment which includes a programmable logic controller (PLC) or other digital controller that is user-programmable. The software shall be suitable for loading and running on a laptop personal computer operating with a Windows-based operating system. A copy of the manufacturer's original operating logic program shall be provided for use in maintaining and troubleshooting the equipment. Where multiple pieces of equipment, from the same or different vendors, use the same programming software, only one copy of the software need be provided.

**END OF SECTION**

## SECTION 01611 METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

1. SCOPE. Buildings, non-structural components and non-building structures shall be designed in accordance with this section. In the event of conflict with requirements in other sections, the more stringent criteria shall be followed.
2. DESIGN CRITERIA. Buildings , non-structural components, non-building structures including anchorage of such items, shall be designed in accordance with the following criteria.

### General Design Data:

Building code and references	Florida Building Code 2020, ASCE 7-16 "Minimum Design Loads and Associated Criteria for Buildings and Other Structures", AISC 360 "Specification for Structural Steel Buildings", AISC 341 "Seismic Provisions for Structural Steel Buildings"
Site elevation, above mean sea level (ft)	18
Design flood elevation, DFE (ft)	Area of minimum flood hazard
Design groundwater elevation (ft)	

### Wind Design Data:

Basic (Ultimate) Design wind speed, V (mph)	156
Allowable Stress (Nominal) Design wind speed, $V_{asd}$ (mph)	121
Exposure category	C
Ground elevation factor, $K_e$	1.00
Risk Category	III

### Snow Design Data:

Ground snow load,  $P_g$  (psf) 0

#### Seismic Design Data

Mapped MCE short period spectral response acceleration, $S_s$	0.049g
Mapped MCE one second period spectral response acceleration, $S_1$	0.027g
Design short period spectral response acceleration, $S_{DS}$	0.052g
Design one second period spectral response acceleration, $S_{D1}$	0.043g
Risk Category	III
MLS 39A Building Importance factor, $I$	1.25
MLS 39A Building Seismic Design Category	A
Electrical Building Importance factor, $I$	1.25
Electrical Building Seismic Design Category	A
Non-Structural Components Importance factors, $I_p$	As indicated in the Non-Structural Component Schedule
Non-Structural Components Seismic Design Category	Architectural, Electrical, and Mechanical non-structural components are exempt from seismic design
Non-Building Structures Importance factors, $I$	1.0 or as indicated in the applicable reference documents, whichever is greater.

3. WIND ANCHORAGE. Equipment that is to be located outdoors shall have anchor bolts designed for the effects of wind forces, as determined in accordance with ASCE 7, Chapters 26-31. Design of anchorage into concrete shall be in accordance with ACI 318 Chapter 17, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer. Design of anchorage into masonry shall be in accordance with TMS 402. Post-installed anchors into concrete or masonry may be used only when approved by Engineer, and shall be

designed in accordance with the anchor manufacturer's research report. Shop drawings shall include full anchor bolt details, and shall be sealed by a professional engineer licensed in the state of the project. Calculations shall be furnished when requested by Engineer.

#### 4. SEISMIC DESIGN.

4-1. General. Structural systems shall provide continuous load paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the point of final resistance.

4-2. Pre-Engineered Buildings. Pre-engineered buildings shall have sufficient strength and ductility to resist the specified seismic effects defined for buildings and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code.

"W" for buildings shall include the total dead load, the total operating weight of permanent equipment and the effective contents of vessels, and applicable portions of other loads, as required by the specified building code.

4-3. Non-Structural Components. Not used.

4-4. Non-Building Structures. Not used.

End of Section

## SECTION 01620 STORAGE AND PROTECTION

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

Provide secure storage and protection for products to be incorporated into the work and maintenance and protection for products after installation and until completion of Work.

#### 1.02 STORAGE

- A. Store products immediately on delivery and protect until installed in the Work, in accord with manufacturer's instructions, with seals and labels intact and legible.
- B. Exterior Storage
  - 1. Provide substantial platform, blocking or skids to support fabricated products above ground to prevent soiling or staining.
    - a. Cover products, subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation.
    - b. Prevent mixing of refuse or chemically injurious materials or liquids.
- C. Arrange storage in manner to provide easy access for inspection.

#### 1.03 MAINTENANCE OF STORAGE

- A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:
  - 1. State of storage facilities is adequate to provide required conditions.
  - 2. Required environmental conditions are maintained on continuing basis.
  - 3. Surfaces of products exposed to elements are not adversely affected. Any weathering of products, coatings and finishes is not acceptable under requirements of these Contract Documents.
- B. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.
  - 1. Equipment shall not be shipped until approved by the County. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the County.
  - 2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by the County until such time as the equipment is to be installed.
  - 3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
  - 4. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.
  - 5. Lubricants shall be changed upon completion of installation and as frequently as

- required, thereafter during the period between installation and acceptance.
6. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

**1.04 PROTECTION AFTER INSTALLATION**

- A. Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion of work.
- B. Control traffic to prevent damage to equipment and surfaces.
- C. Provide coverings to protect finished surfaces from damage.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01650 STARTUP REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. The Contractor will conduct preliminary testing of pump station facilities, products and equipment. If the preliminary field tests disclose any items furnished under this Contract which do not comply with the requirements of the Contract Documents, the Contractor shall make all changes, adjustments and replacements required prior to Startup Testing.
- B. The Contractor shall arrange qualified instruction by the manufacturer's representative for the County's (Owner) designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- C. The Contractor shall furnish all labor, fuel, energy, lubrication, water, and all other materials, equipment, tools and instruments necessary for Startup Testing unless otherwise specified.
- D. The Master Lift Station shall be in continuous operation for the duration of startup and testing activities. Contractor shall install, startup, and commission one pump at a time, while other 2 pumps are in operation. Contractor is required to coordinate operation of existing equipment / facilities with the County.
- E. The startup and final check out shall demonstrate and ensure to the County the complete operating pump station system. The Contractor shall provide documentation certifying proper installation, testing and operation of all prescribed equipment and systems.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### **3.01 PUMP STATION START-UP TESTING AND INSPECTION**

- A. The Contractor shall provide the County with a startup plan, for review, at least forty-five (45) normal working days prior to start-up.
- B. The following shall have been successfully met prior to pump station start-up (shall be completed for each individual pump):
  - 1. A walk through letter of acceptance received;
  - 2. All wire checks conducted;
  - 3. Video of gravity main inspections completed;
  - 4. Completed Appendix "Pump Station Start-Up Report" form;

5. The Contractor shall conduct preliminary testing of equipment prior to start-up testing and make all changes, adjustments and replacements required; and
  6. The liner(s) shall meet the testing requirements of the Contract Documents and a letter or form signed by the County that testing was witnessed and approved.
- C. The intent of the start-up testing is for the Contractor to demonstrate to the County that each individual pump will function as a complete and operable system under normal as well as emergency operating conditions. Once each pump has been installed and tested, Contractor shall demonstrate to the County that the pump station will function as a complete and operable system under normal and emergency conditions and is ready for acceptance.
- D. The Contractor shall furnish all labor, fuel, energy, lubrication, water and all other materials, equipment, tools, and instruments necessary for pump station start-up testing and inspection. All required certification letters, spare parts and supplies shall be provided to the County. Listed below is a partial checklist of requirements to be met. These pertain to the testing of each individual pump, followed by the pump station as a complete system.
1. The Contractor shall coordinate startup activities with the County, the manufacturer's representatives and Subcontractors. A factory representative knowledgeable in the mechanical and electrical equipment furnished shall inspect and supervise a start-up of their respective equipment. A minimum of four full business days shall be provided for the testing (one day for each pump and one day for the pump station as a whole). Additional time may be necessary due to faulty or incomplete Work. Upon satisfactory completion of the equipment testing and inspection, the factory representative(s) shall issue the required manufacturer's warranty certificates.
  2. Initiate startup of each system in accordance with the operation and maintenance manual. Demonstrate that all of the components of a system are operating under their own controls as designated without overheating or overloading any parts and without objectionable vibration as determined by the County.
  3. Observe the system operation and make adjustments as necessary to optimize the system performance. Coordinate with County for any adjustments desired or operational problems requiring debugging.
  4. All functions of the pump station mechanical and electrical equipment shall be tested and inspected for operation and workmanship. All equipment shall be properly installed and meet the design performance requirements.
  5. The pumps shall be flow tested at the pump station startup to verify their performance meets the design requirements and the manufacturer's pump curve.
  6. Furnish two printed copies and three electronic copies in Acrobat "pdf" format of the Operation and Maintenance Manual for the pump station to the County.
  7. A pump station start-up report shall be completed. See Appendix B "Pump Station Start-Up Report Form".
  8. The Contractor shall bear the entire expense of rectifying Work installed.

9. The Contractor shall furnish the County with a written certification signed by the Manufacturer's representative that the equipment has been properly installed and lubricated, is in accurate alignment, is free from undue stress imposed by piping or mounting bolts and has been operated under full load conditions and that satisfactory operation has been obtained.

E. Re-testing:

If the start-up testing does not meet the requirements, the deficiencies shall be corrected, and the testing procedure will be rescheduled again.

F. Acceptance:

1. The pump station shall be accepted based on the pump station functioning as a complete and operable system under normal as well as emergency operating conditions, the approved construction documents have been met and any deficiencies that were observed and noted have been corrected.
2. The Contractor shall ensure all fuel, lubrication, and all other materials for operation are replenished.

**END OF SECTION**

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**APPENDIX  
01650**

**FORMS**

**Pump Station Start-up**

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## Pump Station Start-Up

Prior to the pump start-up, the CONTRACTOR shall submit this completed form to the COUNTY and the following shall have been successfully met. This shall be completed for each individual pump.

- A walk through letter of acceptance; and
- All wire checks, video inspections and valve locates
- Video inspections completed;
- Completed "Pump Station Start-Up" form (As Attached).

### GENERAL INFORMATION

Inspection Date: \_\_\_\_\_ Final Acceptance Date: \_\_\_\_\_  
Station Name: \_\_\_\_\_ PS # \_\_\_\_\_ FILE # \_\_\_\_\_  
Address: \_\_\_\_\_ Subdivision: \_\_\_\_\_  
Power Company: \_\_\_\_\_ Meter Number: \_\_\_\_\_  
Water Company: \_\_\_\_\_ Meter Number: \_\_\_\_\_

### PRESENT AT START-UP

Contractor Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Consulting Engineer: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Pump Manufacturer Rep: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Orange County  
Utilities Inspector: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Orange County Utilities  
Transmission Reps: \_\_\_\_\_

### ELECTRICAL EQUIPMENT

Control Panel Enclosure Mfg. \_\_\_\_\_ Control Panel Built By \_\_\_\_\_  
Control Panel SN: \_\_\_\_\_ Date of Manufacture: \_\_\_\_\_  
Main Service Voltage: \_\_\_\_\_ Amperage: \_\_\_\_\_  
Main Disconnect Breaker Model #: \_\_\_\_\_ Amperage: \_\_\_\_\_  
Control Panel Main Breaker Model #: \_\_\_\_\_ Amperage: \_\_\_\_\_  
Emergency Circuit Breaker Model: \_\_\_\_\_ Amperage: \_\_\_\_\_  
Pump Breaker Model #: \_\_\_\_\_ Amperage: \_\_\_\_\_

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**Pump Station Start-Up****ELECTRICAL EQUIPMENT (Continued)**

Control Breaker Model # \_\_\_\_\_ Amperage: \_\_\_\_\_  
SPD Type: \_\_\_\_\_ Model: \_\_\_\_\_ Receipt Received Yes No  
Transformer Model: \_\_\_\_\_ Primary: \_\_\_\_\_ Secondary: \_\_\_\_\_ KVA: \_\_\_\_\_  
Transformer Model: \_\_\_\_\_ Primary: \_\_\_\_\_ Secondary: \_\_\_\_\_ KVA: \_\_\_\_\_  
Alternator Name: \_\_\_\_\_ Model: \_\_\_\_\_  
Phase Monitor Name: \_\_\_\_\_ Model: \_\_\_\_\_  
Alarm Horn Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_  
Hour Meter Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_  
Starter Name: \_\_\_\_\_ Starter Size: \_\_\_\_\_ Heater Size: \_\_\_\_\_  
Starter Coil Part Number: \_\_\_\_\_  
Pump Voltage: \_\_\_\_\_ Phase: \_\_\_\_\_ Pump F.L.A.: \_\_\_\_\_ Pump HP.: \_\_\_\_\_  
Pressure Transducer Manufacturer: Model: \_\_\_\_\_

**PUMP EQUIPMENT**

Pump Manufacturer: \_\_\_\_\_ Model #: \_\_\_\_\_  
Impeller Size: \_\_\_\_\_ Number: \_\_\_\_\_  
Pump #1 Serial #: \_\_\_\_\_ Pump #2 Serial #: \_\_\_\_\_  
Pump #3 Serial #: \_\_\_\_\_

**FLOAT BALLS**

Float Ball Manufacturer: \_\_\_\_\_ Float Ball Type: \_\_\_\_\_  
Off Level Depth: \_\_\_\_\_ Lead Start Depth: \_\_\_\_\_  
Lag 1 Start Depth: \_\_\_\_\_ Lag 2 Start Depth: \_\_\_\_\_  
Lag 3 Start Depth: \_\_\_\_\_ High Level Depth: \_\_\_\_\_

**MECHANICAL**

Valve Vault Cover Mfg: \_\_\_\_\_ Valve Vault Cover Size: \_\_\_\_\_  
Wet Well Cover Manufacturer: \_\_\_\_\_ Wet Well Cover Size: \_\_\_\_\_  
Wet Well Diameter: \_\_\_\_\_ Wet Well Depth: \_\_\_\_\_ Guide Rail Size: \_\_\_\_\_  
Base Elbow Size: \_\_\_\_\_ Riser Pipe Material: \_\_\_\_\_ Riser Pipe Size: \_\_\_\_\_  
Plug Valve Manufacturer: \_\_\_\_\_

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**Pump Station Start-Up**

**MECHANICAL** *(Continued)*

Plug Valve Size: \_\_\_\_\_ Plug Valve Lay Length \_\_\_\_\_

Check Valve Manufacturer: \_\_\_\_\_

Check Valve Size: \_\_\_\_\_ Check Valve Type: \_\_\_\_\_

Check Valve Lay Length: \_\_\_\_\_ Pipe Size Entering Wet-Well: \_\_\_\_\_

Oil Filled Gauges: Yes No Gauge Manufacturer: \_\_\_\_\_

Emergency Pump Out Size: Female Cam-Lock Yes No

**BACKFLOW**

Backflow Manufacturer: \_\_\_\_\_ Size: \_\_\_\_\_ Model #: \_\_\_\_\_

**FLOW METER**

Flow Meter Manufacturer: \_\_\_\_\_ Flow Meter Model #: \_\_\_\_\_

**Pump Station Start-Up**

**For COUNTY Use Only**

**DESIGN CRITERIA**

Point 1 GPM: \_\_\_\_\_ At TDH: \_\_\_\_\_

Point 2 GPM: \_\_\_\_\_ At TDH: \_\_\_\_\_

Point 3 GPM: \_\_\_\_\_ At TDH: \_\_\_\_\_

<b>PUMPING CAPACITY AT STARTUP</b>						
	Pump # 1	Pump # 2	Pump # 3	Pump # 4	Pump # 5	Pump # 6
GPM at Startup:						
TDH at Startup:						
PSI at Startup:						

<b>ELECTRICAL DATA AT STARTUP</b>						
	<b>PHASE A:</b>		<b>PHASE B:</b>		<b>PHASE C:</b>	
Pump # 1 Amps at Startup						
Pump # 2 Amps at Startup						
Pump # 3 Amps at Startup						
Pump # 4 Amps at Startup						
Pump # 5 Amps at Startup						
Pump # 6 Amps at Startup						
Pump Megs Phase to Ground	Pump # 1:		Pump # 2:		Pump # 3:	
	Pump # 4:		Pump # 5:		Pump # 6:	
Incoming Service Voltage	A to GND:		B to GND:		C to GND:	
	A to B:		A to C:		B to C:	

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**Pump Station Start-Up****CONTROL PANEL SPARE PARTS TRANSMITTAL**

Project Name: \_\_\_\_\_

Project Number: \_\_\_\_\_

Quantity	Spec. Section	Manufacturer	Part Number	Part Description
1 set				Indicator pilot lamps of each type and voltage
1 ea				One-hundred percent replacement on lens caps, all colors
1 ea				Phase Monitor
1 ea				Alternator
1 ea				Time delay per starter
1 set				24-volt 8-pin relay
1 set				Fuses (as applicable)
1 set				Overload heaters per starter
1 ea				Elapsed Time Meter per pump
2 ea				Float Balls

Comments:

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Delivered by: \_\_\_\_\_ Date: \_\_\_\_\_  
Contractor

Witnessed by: \_\_\_\_\_ Date: \_\_\_\_\_

Received by: \_\_\_\_\_ Date: \_\_\_\_\_







## SECTION 01700 CONTRACT CLOSEOUT

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the work.

#### 1.02 SUBSTANTIAL COMPLETION

- A. The Contractor shall submit the following items when the Contractor considers the work to be substantially complete:
1. A written notice that the work, or designated portion thereof, is substantially complete.
  2. A list of items to be completed or corrected.
  3. **Red line markups that the Engineer will use to create Record Drawings. Markups shall clearly depict as-built conditions, and shall not contain miscellaneous notes /markups that are not intended to be on the Record Drawings. Existing facilities / utilities not shown on the drawings, but encountered in the field, shall be noted.**
- B. Within a reasonable time after receipt of such notice, the County shall make an inspection to determine the status of completion.
- C. Project record documents and operations and maintenance manuals must be submitted before the project shall be considered substantially complete.
- D. If the County determines that the work is not substantially complete:
1. The County shall notify the Contractor in writing, stating the reasons.
  2. The Contractor shall remedy the deficiencies in the work and send a second written notice of substantial completion to the County.
  3. The County shall reinspect the work.
- E. When the County finds that the work is substantially complete:
1. The Engineer shall prepare and deliver to the County a tentative Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a tentative list of the items to be completed or corrected before final payment.
  2. The Engineer shall consider any objections made by the County as provided in Conditions of the Contract. When the Engineer considers the work substantially complete, he will execute and deliver to the County a definite Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a revised tentative list of items to be completed or corrected.

### **1.03 FINAL INSPECTION**

- A. When the Contractor considered the work to be complete, he shall submit written certification stating that:
  - 1. The Contract Documents have been reviewed.
  - 2. The work has been inspected for compliance with Contract Documents.
  - 3. The work has been completed in accordance with Contract Documents.
  - 4. The equipment and systems have been tested in the presence of the County's representative and are operational.
  - 5. The work is completed and ready for final inspection.
- B. The County shall make an inspection to verify the status of completion after receipt of such certification.
- C. If the County determines that the work is incomplete or defective:
  - 1. The County shall promptly notify the Contractor in writing, listing the incomplete or defective work.
  - 2. The Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to County that the work is complete.
  - 3. The County shall reinspect the work.
- D. Upon finding the work to be acceptable under the Contract Documents, the County shall request the Contractor to make closeout submittals.
- E. For each additional inspection beyond a total of three (3) inspections for substantial and final completion due to the incompleteness of the work, the Contractor shall reimburse the County's fees.

### **1.04 CONTRACTOR'S CLOSEOUT SUBMITTALS TO COUNTY**

- A. Project Record Documents (prior to substantial completion).
- B. Operation and maintenance manuals (prior to substantial completion).
- C. Warranties and Bonds.
- D. Evidence of Payment and Release of Liens: In accordance with requirements of General and Supplementary Conditions.
- E. Certification letter from Florida Department of Transportation and Manatee County Department of Transportation, as applicable.
- F. Certificate of Insurance for Products and Completed Operations.
- G. Final Reconciliation, Warranty Period Declaration, and Contractor's Affidavit (Manatee County Project Management Form PMD-9).

H. Construction photographs / videos

I. Copies of all permits and permit clearances / closures.

**1.05 FINAL ADJUSTMENT OF ACCOUNTS**

- A. Submit a final statement of accounting to the County.
- B. Statement shall reflect all adjustments to the Contract Sum:
  - 1. The original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a. Previous Change Orders
    - b. Unit Prices
    - c. Penalties and Bonuses
    - d. Deductions for Liquidated Damages
    - e. Other Adjustments
  - 3. Total Contract Sum, as adjusted.
  - 4. Previous payments.
  - 5. Sum remaining due.
- C. Project Management shall prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

**1.06 FINAL APPLICATION FOR PAYMENT**

Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01710 CLEANING

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

Execute cleaning during progress of the work and at completion of the work, as required by the General Conditions.

#### 1.02 DISPOSAL REQUIREMENTS

Conduct cleaning and disposal operations to comply with all Federal, State and Local codes, ordinances, regulations and anti-pollution laws.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

### PART 3 EXECUTION

#### 3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulation of waste materials, rubbish and wind-blown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

#### 3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

#### 3.03 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

- C. Prior to final completion or County occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire work is clean.

**END OF SECTION**

## SECTION 01720 PROJECT RECORD DOCUMENTS

### PART 1 STANDARDS

#### 1.01 MINIMUM RECORD DRAWING STANDARDS FOR ALL RECORD DRAWINGS SUBMITTED TO MANATEE COUNTY

- A. Record drawings shall be submitted to at least the level of detail in the contract documents. It is anticipated that the original contract documents shall serve as at least a background for all record information. Original drawings in CAD format may be requested of the County.
- B. Drawings shall meet the criteria of paragraph 2.04 D above and as mentioned in Section 1.14 Record Drawings in the Manatee County Public Works Standards, Part I Utilities Standards Manual approved June 2015.

### PART 2 STANDARDS

#### 2.01 REQUIREMENTS INCLUDED

- A. Contractor shall maintain at the site for the County one record copy of:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. County's field orders or written instructions.
  - 6. Approved shop drawings, working drawings and samples.
  - 7. Field test records.
  - 8. Construction photographs.

#### 2.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
  - 1. Provide files and racks for storage of documents.
  - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI format.
- C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by the County.

#### 2.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by the County.

#### 2.04 RECORDING DRAWINGS PREPARATION

- A. Record information concurrently with construction progress.

- B. Do not conceal any work until required information is recorded.
- C. Drawings; Legibly mark to record actual construction:
1. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc. Locations of drainage ditches, swales, water lines and force mains shall be shown every 200 feet (measured along the centerline) or alternate lot lines, whichever is closer. Dimensions at these locations shall indicate distance from centerline of right-of-way to the facility.
  2. Field changes of dimension and detail.
  3. Changes made by Field Order or by Change Order.
  4. Details not on original contract drawings.
  5. Equipment and piping relocations.
  6. Locations of all valves, fire hydrants, manholes, water and sewer services, water and force main fittings, underdrain cleanouts, catch basins, junction boxes and any other structures located in the right-of-way or easement, shall be located by elevation and by station and offset based on intersection P.I.'s and centerline of right-of-way. For facilities located on private roads, the dimensioning shall be from centerline of paving or another readily visible baseline.
  7. Elevations shall be provided for all manhole rim and inverts; junction box rim and inverts; catch basin rim and inverts; and baffle, weir and invert elevations in control structures. Elevations shall also be provided at the PVI's and at every other lot line or 200 feet, whichever is less, of drainage swales and ditches. Bench marks and elevation datum shall be indicated.
  8. Slopes for pipes and ditches shall be recalculated, based on actual field measured distances, elevations, pipe sizes, and type shown. Cross section of drainage ditches and swales shall be verified.
  9. Centerline of roads shall be tied to right-of-way lines. Elevation of roadway centerline shall be given at PVI's and at all intersections.
  10. Record drawings shall show bearings and distances for all right-of-way and easement lines, and property corners.
  11. Sidewalks, fences and walls, if installed at the time of initial record drawing submittal, shall be located every 200 feet or alternate lot lines, whichever is closer. Dimensions shall include distance from the right-of-way line and the back of curb and lot line or easement line.
  12. Sanitary sewer mainline wyes shall be located from the downstream manhole. These dimensions shall be provided by on-site inspections or televising of the sewer following installation.
  13. Elevations shall be provided on the top of operating nuts for all water and force main valves.
  14. Allowable tolerance shall be  $\pm 6.0$  inches for horizontal dimensions. Vertical dimensions such as the difference in elevations between manhole inverts shall have an allowable tolerance of  $\pm 1/8$  inch per 50 feet (or part thereof) of horizontal distance up to a maximum tolerance of  $\pm 2$  inch.
  15. Properly prepared record drawings on mylar, together with two copies, shall be certified by a design professional (Engineer and/or Surveyor registered in the State of Florida), employed by the Contractor, and submitted to the County.
- D. Specifications and Addenda; Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
  2. Changes made by field order or by change order.
- E. Shop Drawings (after final review and approval):
1. Five sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

## **2.05 SUBMITTAL**

- A. Prior to substantial completion and prior to starting the bacteria testing of water lines, deliver signed and sealed Record Documents and Record Drawings to the County. These will be reviewed and verified by the inspector. If there are any required changes or additions, these shall be completed and the entire signed and sealed set resubmitted prior to final pay application.
- B. The Contractor shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings. Record drawings shall be certified by the professional(s) (Engineer or Surveyor licensed in Florida), as stipulated by the Land Development Ordinance and submitted on signed and sealed paper drawings, signed and dated mylar drawings together with an AutoCAD version on a recordable compact disk (CD).
- C. The CD shall contain media in AutoCad Version 2004 or later, or in any other CAD program compatible with AutoCad in DWG or DXF form. All fonts, line types, shape files, external references, or other pertinent information used in the drawing and not normally included in AutoCad shall be included on the media with a text file or attached noted as to its relevance and use.
- D. Accompany submittal with transmittal letter, containing:
1. Date.
  2. Project title and number.
  3. Contractor's name and address.
  4. Title and number of each Record Document.
  5. Signature of Contractor or his authorized representative.

Note: The data required to properly prepare these record drawings shall be obtained at the site, at no cost to the County by the responsible design professional or his/her duly appointed representative. The appointed representative shall be a qualified employee of the responsible design professional or a qualified inspector retained by the responsible design professional on a project-by-project basis.

## **PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01730 OPERATING AND MAINTENANCE DATA

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. Compile product data and related information appropriate for County's maintenance and operation of products furnished under Contract.

Prepare operating and maintenance data as specified in this and as referenced in other pertinent sections of Specifications.

- B. Instruct County's personnel in maintenance of products and equipment and systems.
- C. Provide three (3) sets of operating and maintenance manuals for each piece of equipment provided within this Contract.

#### 1.02 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional manual for use by County's personnel.

- B. Format:

1. Size: 8-1/2 inch x 11 inch
2. Paper: 20 pound minimum, white, for typed pages
3. Text: Manufacturer's printed data or neatly typewritten
4. Drawings:
  - a. Provide reinforced punched binder tab, bind in with text.
  - b. Fold larger drawings to size of text pages.
5. Provide fly-leaf for each separate product or each piece of operating equipment.
  - a. Provide typed description of product and major component parts of equipment.
  - b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
  - a. Title of Project.
  - b. Identity of separate structures as applicable.
  - c. Identity of general subject matter covered in the manual.

- C. Binders:

1. Commercial quality three-ring binders with durable and cleanable plastic covers.
2. Maximum ring size: 1 inch.
3. When multiple binders are used, correlate the data into related consistent groupings.

#### 1.03 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit three copies of complete manual in final form.

- B. Content for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.
  - a. Function, normal operating characteristics and limiting conditions.

- b. Performance curves, engineering data and tests.
- c. Complete nomenclature and commercial number of replaceable parts.
- 2. Operating Procedures:
  - a. Start-up, break-in, routine and normal operating instructions.
  - b. Regulation, control, stopping, shut-down and emergency instructions.
  - c. Summer and winter operating instructions.
  - d. Special operating instructions.
- 3. Maintenance Procedures:
  - a. Routine operations.
  - b. Guide to "trouble-shooting".
  - c. Disassembly, repair and reassembly.
  - d. Alignment, adjusting and checking.
- 4. Servicing and lubricating schedule.
  - a. List of lubricants required.
- 5. Manufacturer's printed operating and maintenance instructions.
- 6. Description of sequence of operation by control manufacturer.
- 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
  - a. List of predicted parts subject to wear.
  - b. Items recommended to be stocked as spare parts.
- 8. As installed control diagrams by controls manufacturer.
- 9. Each contractor's coordination drawings.
  - a. As installed color coded piping diagrams.
- 10. Charts of valve tag numbers, with location and function of each valve.
- 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
- 12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

- 1. Description of system and component parts.
  - a. Function, normal operating characteristics and limiting conditions.
  - b. Performance curves, engineering data and tests.
  - c. Complete nomenclature and commercial number of replaceable parts.
- 2. Circuit directories of panelboards.
  - a. Electrical service.
  - b. Controls.
  - c. Communications.
- 3. As-installed color coded wiring diagrams.
- 4. Operating procedures:
  - a. Routine and normal operating instructions.
  - b. Sequences required.
  - c. Special operating instructions.
- 5. Maintenance procedures:
  - a. Routine operations.
  - b. Guide to "trouble-shooting".
  - c. Disassembly, repair and reassembly.
  - d. Adjustment and checking.
- 6. Manufacturer's printed operating and maintenance instructions.
- 7. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
- 8. Prepare and include additional data when the need for such data becomes apparent during instruction of County's personnel.

- D. Prepare and include additional data when the need for such data becomes apparent during instruction on County's personnel.
- E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

**1.04 SUBMITTAL SCHEDULE**

- A. Submit one copy of completed data in final form fifteen days prior to substantial completion.
  - 1. Copy will be returned after substantial completion, with comments (if any).
- B. Submit two copies of approved data in final form. Final acceptance will not be provided until the completed manual is received and approved.

**1.05 INSTRUCTION OF COUNTY'S PERSONNEL**

- A. Prior to final inspection or acceptance, fully instruct County's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
  - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01739 EQUIPMENT INSTALLATION

### PART 1 - GENERAL

1-1. SCOPE. This section covers general installation requirements of new equipment units that have been purchased by Contractor as part of this Work. Equipment specific installation requirements are covered in the equipment sections.

1-2. GENERAL. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

Any existing equipment which is removed and salvaged for reinstallation shall be handled as indicated in the Demolition and Salvage section.

1-2.01. Coordination. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

### 1-3. DELIVERY, STORAGE, AND HANDLING.

1-3.01. Storage. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with the Product Storage and Handling Requirements section until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on or come into contact with the ground, grass, or any other type of vegetation. Contractor shall keep the equipment dry at all times.

### PART 2 - PRODUCTS

2-1. MATERIALS. Materials shall be as follows:

Grout	As specified in the Grouting section.
Anti-Seize thread lubricant for SS bolts	As specified in the Anchorage in Concrete and Masonry section.

### PART 3 - EXECUTION

3-1. INSTALLATION. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results as specified in the Startup Requirements section.

Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly. For equipment installed in drinking water facilities, the anti-seize lubricant shall meet requirements of NSF-61.

When specified in the equipment sections, the equipment manufacturer will provide installation supervision and installation checks. For installation supervision, the manufacturer's field representative will observe, instruct, guide, and direct Contractor's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer's field representative will inspect the equipment installation immediately following installation by Contractor, and observe the tests indicated in the Startup Requirements section. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner.

All equipment shall be protected after installation, prior to final acceptance by Owner. Protection provisions shall be as recommended by the manufacturer, and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.

3-2. STARTUP AND TESTING. Startup requirements, and tests associated with startup shall be as indicated in the Startup Requirements section. Other field tests shall be as indicated in the specific equipment sections. Startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

End of Section

## SECTION 01740 WARRANTIES AND BONDS

### PART 1 GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to County for review and transmittal.

#### 1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
  - 1. Product or work item.
  - 2. Firm, with name of principal, address and telephone number.
  - 3. Scope.
  - 4. Date of beginning of warranty, bond or service and maintenance contract.
  - 5. Duration of warranty, bond or service maintenance contract.
  - 6. Provide information for County's personnel:
    - a. Proper procedure in case of failure.
    - b. Instances which might affect the validity of warranty or bond.
  - 7. Contractor, name of responsible principal, address and telephone number.

#### 1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
  - 1. Size 8-1/2 inch x 11 inch punched sheets for standard 3-ring binder. Fold larger sheets to fit into binders.
  - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
    - a. Title of Project.
    - b. Name of Contractor.
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

#### 1.04 TIME OF SUBMITTALS

- A. Make submittals within ten days after date of substantial completion and prior to final request for payment.
- B. For items of work, where acceptance is delayed materially beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

**1.05 SUBMITTALS REQUIRED**

- A. Submit warranties, bonds, service and maintenance contracts as specified in respective sections of Specifications.
- B. Approval by the County of all documents required under this section is a pre-requisite to requesting a final inspection and final payment

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 02050 DEMOLITION

### PART 1 - GENERAL

1-1. SCOPE. This section covers the demolition of existing structures, piping, equipment, sitework and the salvage of existing equipment as indicated on the Drawings.

1-2. GENERAL. Contractor shall be responsible for all work under this section. Contractor shall provide 90 days written notice prior to beginning demolition activities.

All structures and facilities of the existing Master Lift Station which are not to be removed must remain in continuous operation during the work. Demolition and salvage work shall create minimum interference with Owner's operations and minimum inconvenience to Owner. Contractor shall provide protection and safety of all roadways, sidewalks, and all accessible areas during demolition activities.

Blasting will not be permitted.

PART 2 - PRODUCTS Not used.

### PART 3 - EXECUTION

3-1. DEMOLITION. Removal of equipment or facilities shall include removal of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed. Existing materials and equipment removed, and not indicated to be reused as a part of the Work, shall become Contractor's property unless otherwise specified, and shall be removed from the Site and properly disposed of or recycled in accordance with state laws.

Contractor shall conduct demolition activities in a manner that prevents damage to existing facilities which are indicated to remain and shall provide all necessary protection for existing facilities. Any remaining facilities damaged during demolition shall be repaired by Contractor to a condition equal to or better than the original condition.

When demolition is complete, all debris shall be removed from the Site and the Site graded back to original condition or otherwise indicated on the Drawings.

3-1.01. Structure Demolition.

Louvered wall opening on South side of Pump Building  
Exhaust fans (x 6) on roof of Pump Building  
Skylights (x 3) on roof of Pump Building  
Double Door on West side of Pump Building

3-1.02. Piping and Equipment Demolition. The following piping and equipment shall be removed and shall become the property of Contractor. All such items shall be promptly removed from the jobsite. Electrical equipment demolition work shall include the removal of associated conduit / wiring. Conduits shall be properly capped.

Submersible Dry Pit Pump (x 3)  
Pump Discharge Annular Seal  
Pump Discharge Pressure Switch  
Pump Discharge Pressure Gauge  
Pump 14" Gate Valves (x 5)  
Pump Discharge 12" Check Valve (x 3)  
Pump Discharge 12" Gate Valve (x 3)  
Miscellaneous Pump Discharge Piping / Appurtenances (8" and 12")  
Miscellaneous Pump Suction Piping / Appurtenances (14")  
Pump AFDs (x 3) and concrete equipment pad  
Automatic Transfer Switch by ASCO and concrete equipment pad  
Motor Control Center and concrete equipment pad.  
Motor Control Center RTU section, RTU backplane to be retained and moved to new cabinet.  
Electrical equipment as indicated on the drawings

3-1.03. Sitework Demolition. Sitework demolition shall include the following:

Removal of fence within the limits indicated on the Drawings.

Removal of existing stoops and concrete pads indicated on the Drawings.

Diesel piping (to / from fuel tank)

3-2. SALVAGE.

3-2.01. Items To Be Salvaged by Owner. Not used.

3-2.02. Items To Be Salvaged by Contractor. Removed and salvaged equipment or facilities shall include removal and salvage of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed.

Existing materials and equipment removed, and not reused as a part of the work, shall become Contractor's property unless otherwise specified, and shall be removed from the jobsite.

The following items shall remain Owner's property and shall be handed over to the Owner by Contractor in good condition:

<u>Item</u>	<u>Location</u>
Diesel Generator	First Floor of Pump Building
Diesel Fuel Tank	South of Pump Building
Rain Gauge (Antenna)	North of Pump Building

The following existing materials and equipment shall be removed by Contractor, shall be reused as a part of the work, and shall remain the property of Owner:

<u>Item</u>	<u>Location</u>	<u>Location of Reuse</u>
Various Electrical	See Drawings	See Electrical Design

The existing rain gauge shall be handed over to the Owner for relocation. This rain gauge is referred to as an Antenna on the construction drawings and must be relocated as its location interferes with the new improvements at this master lift station.

Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified herein or indicated to be salvaged and to remain the property of Owner. Contractor shall store and protect salvaged items specified or indicated to be reused in the work. Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

Owner reserves to refuse salvaged equipment / material, and if done, this material becomes the property of the Contractor and shall be disposed in accordance with this Specification.

Contractor may, at his option, furnish and install new items instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property.

End of Section

## SECTION 02064 MODIFICATIONS TO EXISTING STRUCTURES, PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required to modify, alter and/or convert existing structures as shown or specified and as required for the installation of piping, mechanical equipment and appurtenances. Existing piping and equipment shall be removed and dismantled as necessary for the performance of facility alterations in accordance with the requirements herein specified.

### PART 2 PRODUCTS

- A. Epoxy mortar shall be fiberglass fiber mixed with an epoxy filler.
- B. Non-shrink grout shall be a sand-cement, non-metallic formulation, having a 28-day strength of 4,000 psi and 0.0 percent shrinkage per ASTM C1090.
- ~~C. Liners to be installed in existing manholes and wetwells shall be spray applied, monolithic, reinforced urethane resin. Urethane resin-based manhole liner material shall be resistant to hydrogen sulfide gas, and other common contents found in a sanitary sewer environment.~~
- ~~D. Approved manhole and wet well liner products are Raven 405, SprayWall, Green Monster, or SpectraShield.~~

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Cut, repair, reuse, excavate, demolish or otherwise remove parts of the existing structures or appurtenances, as indicated on the construction drawings, or as necessary to complete the work as required. Dispose of surplus materials resulting from the above work in an approved manner. The work shall include all necessary cutting and bending of reinforcing steel, structural steel, or miscellaneous metal work found embedded in the existing structures.
- B. Dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the work. Where called for or required, cut existing pipelines for the purpose of making connections thereto.
- C. Anchor bolts for equipment and structural steel to be removed shall be cut off one inch below the concrete surface. Surfaces shall then be refinished using non-shrink grout or epoxy mortar or as indicated on the construction drawings. Repairs to the interior surfaces of existing concrete structures in sanitary sewers shall be made with epoxy mortar. Repairs to be made on other existing concrete surfaces using non-shrink grout shall be made using a bonding agent such as Acrylbond by Concrete Producers Solutions or an equal approved by the County. Remove all

dirt, curing compounds, sealers, paint, rust or other foreign material, and etch with muriatic acid solution. Flush with clean water and while still damp, apply a coating of the bonding agent. Place the new grout patch onto the treated area immediately.

- D. At the time that a new connection is made to an existing pipeline, additional new piping, extending to and including a new valve, shall be installed. Pipe restraint devices, if required, shall also be installed as required. At the time when a new potable or reclaimed water service is installed, a pipe locator tracer wire shall be installed and connected to the tracer wire at the main.
- E. No existing structure, equipment, or appurtenance shall be shifted, cut, removed, or otherwise altered except with the express approval of and only to the extent approved by the County. All existing valve boxes, fire hydrants, air release valve cabinets, and manholes shall be relocated to meet the new finished grade elevations after construction.
- F. When removing materials or portions of existing utility pipelines or structures or when making openings in walls and partitions, take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work, and not to damage the structures or contents by falling or flying debris. Unless otherwise approved by the County, saw-cutting, rotary core-boring, or line drilling will be required in removing material from existing concrete structures or pipes.
- G. Materials and equipment removed in the course of making alterations and additions shall remain the property of the County, except that items not salvageable, as determined by the County, shall be disposed of off the work site.
- H. All alterations to existing utility pipes and structures shall be done at such time and in such a manner as to comply with the approved time schedule. Before any part of the work is started, all tools, equipment, and materials shall be assembled and made ready so that the work can be completed without delays.
- I. All cutting of existing concrete or other material to provide suitable bonding to new work shall be done in a manner to meet the requirements of the respective section of these Standards covering the new work. When not covered, the work shall be carried on in the manner and to the extent directed by the County or per the construction drawings.
- J. Surfaces of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.
- K. Non-shrink cementitious grout shall be used for setting wall castings, sleeves, leveling pump bases, doweling anchors into existing concrete and elsewhere as shown on the construction drawings. The surface to which grout is to be applied shall be wetted to facilitate good bonding.
- L. Where necessary or required for the purpose of making connections; cut existing pipelines in a manner to provide an approved joint. Where required, use flanges, couplings, or adapters, all as required.

- M. Provide flumes, hoses, piping, pumps and well points, and other related items to divert or provide suitable plugs, bulkheads, or other means to hold back the flow of water or other liquids, all as required in the performance of the work.
- N. Care shall be taken not to damage any part of existing buildings or foundations or outside structures.
- O. Prior to entering confined spaces in sanitary sewer structures, conduct an evaluation of the atmosphere within, in accordance with local, state, and federal regulations. Provide ventilation equipment and other equipment as required to assure safe working conditions.

**3.02 CONNECTING TO EXISTING PIPING AND EQUIPMENT**

The Contractor shall verify exact location, material, alignment, joint, etc. of existing piping and equipment prior to making the connections called out in the Drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection. A County Inspector must be present for all tie-ins for a visual inspection.

**3.03 REMOVAL AND ABANDONMENT OF ASBESTOS CEMENT PIPE AND APPURTENANCES (NOT USED)**

- ~~A. All work associated with the removal or abandonment of existing asbestos cement pipe and appurtenances shall be performed by a licensed asbestos removal Contractor registered in the State of Florida.~~
- ~~B. The asbestos Contractor shall contact the appropriate regulatory agencies prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices. The cost for all fees associated with permits, licenses and notices to the governing regulatory agencies shall be borne by the asbestos Contractor.~~
- ~~C. All work associated with removal or abandonment of asbestos cement pipe and appurtenances shall be performed in accordance with the standards listed below and all other applicable local, State, or Federal standards.~~
  - ~~(1) Florida Administrative Code, Chapter 62-257, ASBESTOS PROGRAM~~
  - ~~(2) Title 40 CFR, Part 61, Subpart M, NATIONAL EMISSION STANDARD FOR ASBESTOS~~
  - ~~(3) Occupational Safety and Health Act, Title 29 CFR~~
  - ~~(4) Title 40 CFR, Part 763, ASBESTOS~~
  - ~~(5) Florida Statute Title XXXII, Chapter 469, ASBESTOS ABATEMENT~~
- ~~D. All asbestos cement pipe sections indicated on the construction drawings to be removed, and all related tees, valves, fittings and appurtenances shall be removed in their entirety and disposed of by the asbestos Contractor in accordance with this Section. Asbestos cement nipples between tees and valves shall be replaced. After removal of the pipelines, all excavations shall be backfilled in accordance with the applicable provisions of the Trenching and Excavation Section of these~~

~~Standards. The cost of disposing of the removed materials shall be borne by the asbestos Contractor.~~

- ~~E. The cutting of existing asbestos cement (A/C, a.k.a. "Transite") pipe shall be by hand tools only. No powered machine cutting is allowed. Removal of all fragments of pipe shall be double bagged prior to shipment. Longer sections of pipe removed may be shipped without double bagging. An asbestos manifest form must accompany each shipment of such pipe or pipe material waste to the Manatee County Lena Road Landfill. Prior to each shipment, a minimum of 24 hours notice to the Landfill field office (telephone (941) 748-5543) is required.~~

### **3.04 IN-PLACE GROUTING OF EXISTING PIPE (NOT USED)**

- ~~A. Where water and wastewater utility pipes are to be abandoned in place, they shall be filled with a nonshrinking sand cement grout. When such pipes are made of asbestos cement materials, the abandonment activities shall be performed by a licensed asbestos Contractor. It is completely the Contractor's responsibility to obtain all regulatory clearances and provide documentation in cases where they have determined that an asbestos cement pipe abandonment activity by in-place grouting does not require a licensed asbestos Contractor.~~
- ~~B. The ends of the pipe sections to be grout-filled shall be capped or plugged with suitable pipe fittings. The grout material shall be of suitable properties and the pumping pressure shall be such that the pipe sections are filled completely with grout. All above ground features shall be removed: hydrants, meters, valve & meter boxes, pads, vaults, etc. Existing tees, crosses, and valves left in service shall be plugged and restrained.~~
- ~~C. The County shall be given timely notice so that the County's representative may be present to monitor all pipe grouting operations. Provide standpipes and/or additional means of visual inspection as required to determine if adequate grout material has filled the entire pipe sections.~~
- ~~D. All tees, crosses, and valves left in service shall be plugged and restrained.~~

### **3.05 SPRAY-APPLIED LINERS (NOT USED)**

- ~~A. Use a high-pressure water spray to remove all foreign material from the walls and bench of the structure. Loose or protruding masonry materials shall be removed using a hammer and chisel. Fill any voids, holes or cracks using a hand trowel with epoxy mortar to form a uniform surface. Place covers over all pipe openings to prevent extraneous material from entering the pipes. Block or divert sewer flow from entering the structure. Any infiltration leaks shall be stopped by using such methods as approved by the County.~~
- ~~B. The liner material shall be sprayed onto the invert, bench and wall areas. The sprayed-on material shall be applied such that the entire structure is lined with a structurally enhanced monolithic liner. The thickness of the wall liner material shall be such that it will withstand the hydraulic load generated by the surrounding groundwater table, using a factor of safety of two, and using the assumption that~~

~~the groundwater table is at the level of the top of the structure. The invert and bench liner material shall be the same thickness as that required for the base of the wall.~~

- ~~C. Special care shall be used to provide a smooth transition between the intersecting pipelines and the manhole inverts such that flow is not impaired. Remove concrete material from the existing manhole base channel in depth to the required thickness of the new liner material.~~
- ~~D. No active sewer flow shall be allowed in the newly lined structure, nor shall any vacuum tests be performed, until the liner material has had adequate time to cure, as recommended by the liner material manufacturer.~~
- ~~E. Install the coating systems per manufacturer's recommendation and completely protect the structure from corrosion. The liner or coating systems must extend and seal onto manhole ring, onto and around pipe openings and any other protrusions, and completely cover the bench and flow invert. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the coating or liner system, and shall protect the structure for at least five (5) years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.~~

### 3.06 CONNECTION TO EXISTING MANHOLE (NOT USED)

- ~~A. Where required or as indicated on the construction drawings, make connection of new pipelines to existing manhole structures. If pipe stub-outs of the correct size and position are not available, make connections by removing a portion of the manhole wall by mechanical rotary core boring. The connection between pipe and concrete manhole shall be complete with resilient seals meeting the requirements of ASTM C923.~~
- ~~B. A new channel shall be formed in the manhole base by removing and reforming or by providing new concrete to convey the new flow into the existing channel in accordance with the standard requirements for new sewer manhole structures. Flow direction shall not change by more than 90 degrees within the manhole base.~~
- ~~C. Repair internal coating of existing manholes cored during connection of new sewers by applying approved coating material as listed above in accordance with the manufacturer's recommendations. If existing manhole has an internal coating other than that listed above, sandblast the interior of the existing manhole and apply an approved coating in accordance with the manufacturer's recommendations.~~
- ~~D. When connecting a force main to an existing manhole, the force main termination manhole and the next two manholes downstream shall be rehabilitated and lined with a currently approved liner. If the existing manholes are lined with a non-conforming liner according to Part 2.D above, the existing liner shall be removed and replaced, unless otherwise noted on the plans or with written approval by the County.~~

**END OF SECTION**

## SECTION 02100 SITE PREPARATION

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. This Section covers clearing, grubbing and stripping of the project site and/or along the pipeline route.
- B. The Contractor shall clear and grub all of the area within the limits of construction or as required, which includes, but is not limited to utility easements. The width of the area to be cleared shall be reviewed by the County prior to the beginning of any clearing.
- C. The Contractor's attention is directed to any Soil Erosion and Sediment Control Ordinances in force in Manatee County. The Contractor shall comply with all applicable sections of these ordinances.

### PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION

#### 3.01 CLEARING

The surface of the ground, for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground. However, trees shall be preserved as hereinafter specified unless otherwise designated by the County. Clearing operations shall be conducted so as to prevent damage to existing structures and installations and to those under construction, so as to provide for the safety of employees and others. Soil erosion control devices such as hay bales and silt fences shall be installed to satisfy all Federal, State and County requirements.

#### 3.02 GRUBBING

Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

#### 3.03 STRIPPING

In areas so designated, topsoil shall be stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. The County shall have the option to receive all excess topsoil materials. The Contractor shall pay all equipment and labor cost to deliver excess top soil material to a remote site chosen by the County within a

five mile radius of the construction site. Should County not choose to receive any or all excess topsoil materials, the Contractor shall dispose of said material at no additional cost to County.

### **3.04 DISPOSAL OF CLEARED AND GRUBBED MATERIAL**

The Contractor shall dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris off site. The cost of disposal (including hauling) of cleared and grubbed material and debris shall be considered a subsidiary obligation of the Contractor; the cost of which shall be included in the prices bid for the various classes of work.

### **3.05 PRESERVATION OF TREES**

Those trees which are not designated for removal by the County shall be carefully protected from damage. The Contractor shall erect such barricades, guards and enclosures as may be considered necessary by him for the protection of the trees during all construction operation.

### **3.06 PRESERVATION OF DEVELOPED PRIVATE PROPERTY**

- A. The Contractor shall exercise extreme care to avoid unnecessary disturbance of developed private property adjacent to proposed project site. Trees, shrubbery, gardens, lawns and other landscaping, which are not designated by the County to be removed, shall be replaced and replanted to restore the construction easement to the condition existing prior to construction.
- B. All soil preservation procedures and replanting operations shall be under the supervision of a nursery representative experienced in such operations.
- C. Improvements to the land such as fences, walls, outbuildings and other structures which of necessity must be removed, shall be replaced with equal quality materials and workmanship.
- D. The Contractor shall clean up the construction site across developed private property directly after construction is completed upon approval of the County.

### **3.07 PRESERVATION OF PUBLIC PROPERTY**

The appropriate paragraphs of these Specifications shall apply to the preservation and restoration of public lands, parks, rights-of-way, easements and all other damaged areas. This includes, but is not limited to the trimming of trees damaged by contractor's equipment.

**END OF SECTION**

**SECTION 02220 EXCAVATION, BACKFILL, FILL AND GRADING FOR  
STRUCTURES**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Structural excavation shall consist of the removal of material for the construction of foundations for structures and other excavation **required to complete the work shown on the drawings and specifications.** ~~designated on the drawings or in these specifications.~~
- B. Structural excavation and backfill shall consist of furnishing material, if necessary and placing and compacting backfill material around structures to the lines and grades designated on the drawings, **to match existing conditions,** ~~as specified~~ or directed by the County.
- C. Structural excavation and backfill shall include the furnishing of all materials, equipment and other facilities which may be necessary to perform the excavations, place and compact the backfill, install sheeting and bracing, and carry out any necessary dewatering. It shall also include the wasting or disposal of surplus excavated material in a manner and in locations approved by the County.
- D. The Contractor is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the County. This includes, but is not limited to, protecting the root systems and adjusting grades as necessary for tree/root protection.
- E. Refer to Specification 02221 for additional requirements for the excavation, backfill, fill, and grading for structures.**

**1.02 QUALITY ASSURANCE**

- A. Testing Agency:
  - 1. In place soil compaction tests shall be performed by a qualified testing laboratory.
  - 2. Compaction tests shall be taken every 500 feet, except in the road crossings or road shoulders. Tests are to be taken according to current FDOT Standards.
- B. Reference Standards:
  - 1. American Society for Testing and Materials (ASTM):
    - a. ASTM D1557, Moisture-Density Relations of Soils Using 10-lb. (4.5-kg) Rammer and 18-in. (457-mm) Drop.

### 1.03 JOB CONDITIONS

- A. The Contractor shall provide, operate and maintain all necessary pumps, discharge lines, well points, etc., in sufficient number and capacity to keep all excavation, bases, pits, etc., free from seepage, standing or running water at all times throughout the period of construction.
- B. The Contractor shall assume all responsibility for the security of the excavation required, employing bracing, lining or other accepted means necessary to accomplish same.
- C. Excavated areas shall be cleared of all debris, water, slush, muck, clay and soft or loose earth and shall be conditioned to the entire satisfaction of the County.
- D. All excavated material unsuitable for use or which will not be used shall be disposed of in a manner consistent with State and County regulation.
- E. All unsuitable organic materials, roots, logs, etc., found during excavation shall be removed by the Contractor and the trench shall be refilled with suitable material.

## PART 2 PRODUCTS

### 2.01 MATERIAL FOR CONTROLLED FILL

- A. Composition: Only approved material free from organic matter and lumps of clay, shall be used for backfill. Excavated earth free from debris or organic material may be used for backfilling foundations or fill.
- B. Crushed stone and shell shall meet or exceed current FDOT Standards.

### 2.02 UNSUITABLE MATERIAL

Unsuitable material shall be defined as highly organic soil per ASTM D2487 Group PT. This includes, but is not limited to, such items as topsoil, roots, vegetable matter, trash, debris, and clays that cannot be dried sufficiently to obtain specified compaction.

### 2.03 MISCELLANEOUS FILLS / BACKFILLS

- A. Refer to Specification 02221 for additional materials.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. The Contractor shall verify that work preceding the affected work of this Section has been satisfactorily completed.
- B. Conditions adversely affecting the work of this Section shall be corrected to the satisfaction of the County.

### **3.02 REMOVAL OF UNSUITABLE MATERIALS**

- A. The Contractor shall remove unsuitable material from within the limits of the Work.
- B. Materials meeting requirements for controlled fill shall be stockpiled as necessary and in such a manner satisfactory to the County.
- C. All material excavated shall be placed so as to minimize interference with public travel and to permit proper access for inspection of the work.

### **3.03 EXCAVATION**

- A. When concrete or shell subbase footing is to rest on an excavated surface, care shall be taken not to disturb the natural soil. Final removal and replacement of the foundation material and subbase compaction to grade shall not be made until just before the concrete or masonry is placed.
- B. When any structural excavation is completed, the Contractor shall notify the County who will make an inspection of the excavation. No concrete or masonry shall be placed until the excavation has been approved by the County.
- C. The elevations of the footing bottom and the base slab as shown on the Drawings, shall be considered as approximate and the County may order in writing, such changes in dimensions or elevations of the footings and slab base as necessary to secure satisfactory foundations.
- D. All excavation shall be made within an area bounded by lines five feet outside and parallel to the exterior walls of the structure to allow for correct forming, shoring and inspection of foundation work. Pouring of concrete against earth side walls shall not be permitted.
- E. If the ground is excavated below the grade called for by the Drawings or becomes unstable due to the Contractor's carelessness or operations, the ground shall be excavated to undisturbed native soil before continuing concreting operations.
- F. If in the opinion of the County, the material at or below the normal grade of the bottom of the trench is unsuitable for pipe or structure foundation, it shall be removed to the depth directed by the County and if so directed, replaced by crushed stone or washed shell.

### **3.04 STRUCTURAL BACKFILL**

- A. Structural backfill shall not be placed until the footings or other portions of the structure or facility have been inspected by the County and approved for backfilling.
- B. A minimum of 1-1/2" layer of lean concrete shall be placed as a working mat for the concrete base slabs and footings if required by the County.
- C. Fill shall be placed in uniform layers not more than 12" thick and compacted to a minimum of 98 percent of the maximum density determined by ASTM D1557,

Method A or C, or as directed by the County. The Contractor shall securely tamp the backfill with pneumatic rammer around all wall foundations. The method of compaction shall be satisfactory to the County.

- D. Compaction of structural backfill by ponding and jetting may be permitted when, as determined by the County: the backfill material is of such character that it will be self-draining when compacted; foundation materials will not soften or be otherwise damaged by the applied water; no damage from hydrostatic pressure will result to the structure. Ponding and jetting within two feet below finished subgrade shall not be permitted in roadway areas. At the discretion of the County, ponding and jetting may be permitted with compaction layers not to exceed four feet.
- E. Surplus material not used on-site shall be removed and disposed of off-site by the Contractor. In no case shall surplus material be deposited on adjacent lands. Fill used for grading shall be placed in layers not to exceed 12 inches in thickness and shall be compacted to a density equal or greater to that of the surrounding natural ground.

### **3.05 BACKFILLING AROUND STRUCTURES**

- A. Common fill and structural fill are specified for use as backfill against the exterior walls of the structures. Fill shall be placed in layers having a maximum thickness of eight (8) inches in loose state and shall be compacted sufficiently to prevent settlement. If compaction is by rolling or ramming, material shall be wetted down as required. Where material can be suitably compacted by jetting or puddling, the Contractor may use one of these methods. No boulders shall be allowed to roll down the slopes and hit the walls.
- B. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. A variation of two (2) feet in elevation will be the maximum allowable. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength. Backfilling shall be subjected to approval by the County.
- C. In locations where pipes pass through building walls, the Contractor shall take the following precautions to consolidate the refill up to an elevation of at least one foot above the bottom of the pipes:
  - 1. Place structural fill in such areas for a distance of not less than three feet either side of the center line of the pipe in level layers not exceeding 6-inches in depth.
  - 2. Wet each layer to the extent directed and thoroughly compact each layer with a power tamper to the satisfaction of the County.
  - 3. Structural fill shall be of the quality specified under Part 2 of this Section.
- D. The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan. No soft spots or uncompacted areas shall be allowed in the work.
- E. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads,

hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

**3.06 FIELD QUALITY CONTROL**

- A. The density of soil in place shall be a minimum of 95 percent in accordance with ASTM test 1557-70T, Method A or C.

**END OF SECTION**

## SECTION 02221 TRENCHING, BEDDING AND BACKFILL FOR PIPE

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all dewatering, excavation, backfill, fill, grading, trench protection or other related work required to complete the piping work shown on the Drawings and specified herein. The work shall include, but not be limited to: vaults; duct conduit; pipe; roadways and paving; backfilling; required fill or borrow operations; grading; disposal of surplus and unsuitable materials; and all related work such as sheeting, bracing and dewatering.
- B. Prior to commencing work, the Contractor shall examine the site and review test borings if available, or undertake his own subsurface investigations and take into consideration all conditions that may affect his work.
- C. The Contractor is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the County. This includes, but is not limited to protecting the root systems and adjusting grades as necessary for tree/root protection.

#### 1.02 PROTECTION (NOT USED)

##### ~~A. Sheeting and Bracing in Excavations:~~

- ~~1. In connection with construction of underground structures, the Contractor shall properly construct and maintain cofferdams. These shall consist of: sheeting and bracing as required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing yard pipe and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.~~
- ~~2. Trench sheeting for pipes: no sheeting is to be withdrawn if driven below, mid-diameter of any pipe and no wood sheeting shall be cut off at a level lower than one foot above the top of any pipe unless otherwise directed by the County. During the progress of the work, the County may direct the Contractor in writing to leave additional wood sheeting in place. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given for an alternate method of removal.~~
- ~~3. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. Unless otherwise approved or indicated on the Drawings or in the Specification, all sheeting and bracing shall be removed~~

~~after completion of the piping or structure, care being taken not to disturb or otherwise injure the pipeline or finished masonry. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specifically made for that purpose, by watering, or as may otherwise be directed.~~

- ~~4. The Contractor shall construct, to the extent he deems it desirable for his method of operation, the cofferdams and sheeting outside the neat lines of the pipeline trench or foundation unless otherwise indicated on the Drawings or directed by the County. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing and cofferdams shall be adequate to withstand all pressures to which the pipeline or structure will be subjected. Pumping, bracing and other work within the cofferdam shall be done in a manner to avoid disturbing any construction of the pipeline or the enclosed masonry. Any movement or bulging which may occur shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.~~
- ~~5. Drawings of the cofferdams and design computations shall be submitted to the County and approved prior to any construction. However, approval of these drawings shall not relieve the Contractor of the responsibility for the cofferdams. The drawings and computations shall be prepared and stamped by a Registered Professional Engineer in the State of Florida and shall be in sufficient detail to disclose the method of operation for each of the various stages of construction, if required, for the completion of the pipeline and substructures.~~

B. Dewatering, Drainage and Flotation

1. The Contractor shall construct and place all pipelines, concrete work, structural fill, bedding rock and limerock base course, in-the-dry. In addition, the Contractor shall make the final 24" of excavation for this work in-the-dry and not until the water level is a minimum of 18 below proposed bottom of excavation.
2. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavation and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations. At all times during the construction operations, the groundwater levels shall be maintained at an elevation 18 inches below the lowest level where structures are being installed.
3. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
4. Wellpoints may be required for dewatering the soil prior to final excavation for deeper in-ground structures or piping and for maintaining the lowered

groundwater level until construction has been completed to avoid the structure, pipeline, or fill from becoming floated or otherwise damaged. Wellpoints shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from wellpoints shall be continuous and standby pumps shall be provided.

5. The Contractor shall furnish all materials and equipment to perform all work required to install and maintain the proposed drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.
6. Where required, the Contractor shall provide a minimum of two operating groundwater observation wells at each structure to determine the water level during construction of the pipeline or structure. Locations of the observation wells shall be at structures and along pipelines as approved by the County prior to their installation. The observation wells shall be extended to 6 inches above finished grade, capped with screw-on caps protected by 24" x 24" wide concrete base and left in place at the completion of this Project.
7. Prior to excavation, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions to the County for approval. Such approval shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The Contractor shall be responsible for correcting any disturbance of natural bearing soils for damage to pipeline or structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
8. As part of his request for approval of a dewatering system, the Contractor shall demonstrate the adequacy of the proposed system and wellpoint filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one quart sample. Discharge water shall not flow directly into wetlands or Waters of the State as defined by FDEP and SWFWMD.
9. During backfilling and construction, water levels shall be measured in observation wells located as directed by the County.
10. Continuous pumping will be required as long as water levels are required to be below natural levels.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

#### **A. General**

1. Materials for use as fill and backfill shall be described below and shall be from an FDOT certified pit. For each material, the Contractor shall notify the County of the source of the material and shall furnish the County, for

approval, a representative sample weighing approximately 50 pounds, at least ten calendar days prior to the date of anticipated use of such material.

2. Additional materials shall be furnished as required from off-site sources and hauled to the site.
- B. Bedding - shall conform to FDOT Standard Specifications for Road and Bridge Construction, Section 901 Coarse Aggregate, and shall be either coarse aggregate of Size No. 57 or coarse sand of Size No. 9. Washed shell size No.57 may be used as an alternate bedding material.
- C. Structural Fill
1. Structural fill in trenches shall be used below spread footing foundations, slab-on-grade floors and other structures as backfill within three feet of the below grade portions of structures.
  2. Shall be either soil classification A-1, A-2 or A-3, per AASHTO M-145, and shall be free of organic matter, lumps of clay or marl, muck, compressible materials, and rock exceeding 2.5 inches in diameter. Broken concrete, masonry, rubble or other similar materials shall not be used as backfill. Minimum acceptable density shall be 98 percent of the maximum density as determined by AASHTO T-180.
- D. Selected Common Fill - shall have the same material classification and requirements as Structural Fill, as described above.
- E. Common Fill
1. Shall be either soil classification A-1, A-2, A-3, A-4, A-5 or A-6, per AASHTO M-145, and shall be free of organic matter, lumps of clay or marl, muck, compressible materials and rock exceeding 2.5 inches in diameter. Broken concrete, masonry, rubble or other similar materials shall not be used as backfill.
  2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the County, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials by the Contractor.
- E. Unsuitable Material - soil classification A-7 and A-8, per AASHTO M-145, shall not be used as backfill material.

## **PART 3 EXECUTION**

### **3.01 EXCAVATION**

- A. Excavate trenches and pits for structures to the elevations indicated on the construction drawings. Take special care to avoid over-excavating or disturbing the bottom of the trench or pit, so that the soil at the bottom of the hole remains in a

naturally compacted condition. Excavate to widths sufficient to provide adequate working room to install the required structures. Do not excavate the final layer of soil to the designed grade until just before placing the bedding, foundation, pipe, structure, or masonry work required. Remove boulders, rocks, logs or any unforeseen obstacles encountered.

- B. In case the foundation soil found at the bottom of the trench or pit is soft, plastic or mucky, or does not conform to the soils classification specified as suitable foundation material, over-excavation to a greater depth will be required. Soils not meeting the classification required for foundation material shall be removed to a depth at least four inches below the bottom of the pipe, bedding or structure bottom elevation. Rock, boulders or other hard or lumpy material shall be removed to a depth 12 inches below the bottom of the pipe, bedding or structure bottom elevation. Remove muck, clay or other soft material to a depth as needed to establish a firm foundation.
- C. Where possible, the sides of trenches should be vertical up to at least the spring line of the installed pipe.
- D. Trench excavation shall be performed in accordance with Florida Statute Title XXXIII, Chapter 553, Part III, Trench Safety Act.

### **3.02 BACKFILLING**

- A. Backfill materials shall be placed on solid, firm, naturally compacted or compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, dry or dewatered in place soil foundations.
- B. Where over-excavation is required due to nonconforming soil classification or rocky, unstable, or otherwise undesirable soil conditions, place Structural Fill or Selected Common Fill in the over-excavated zone up to the base of the bedding material layer. Compact the over-excavated zone to 98 percent of the maximum dry density of the material as determined by AASHTO T-180.
- C. When backfilling in an over-excavated zone where moist or watery conditions exist, backfill shall be coarse No. 9 sand or a mixture of No. 57 coarse aggregate with either No. 9 coarse sand, A-1, or A-3 material.
- D. After compaction, backfill material in the over-excavation zone shall form a solid and firm foundation on which to build up successive layers of backfill and structures.
- E. Bedding materials shall be placed on solid, firm soil foundations and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180.
- F. Concrete and masonry structures shall be backfilled using Structural Fill. Backfilling and compaction shall be underneath the structure and carried up evenly on all walls of an individual structure simultaneously. The maximum allowable difference in backfill elevations shall be two feet. No backfilling shall be allowed against concrete or masonry walls until the walls and their supporting slabs have

been in place at least seven days or until the specified 28-day strength has been attained. Compaction of Structural Fill underneath the base and along the walls shall be 98 percent of the maximum dry density of the material as determined by AASHTO T-180. The Structural Fill shall be either dried or shall have water added so that the moisture content of the material is within a range that will allow the required density to be achieved.

- G. Trenching backfill for pipe installation shall be Selected Common Fill for the pipe bedding zone. The pipe bedding envelope shall begin at the level four inches, six inches, or nine inches, depending on pipe diameter, below the bottom of the pipe, and shall extend vertically up to a level 12 inches above the top of the pipe. Where the in-place soil material within the four inch, six inch, or nine inch pipe bedding zone beneath the bottom of the pipe meets the soil classification for Selected Common Fill, undercutting of the trench below the bottom of the pipe will not be required. In this case, loosen the soil in the bottom of the trench immediately below the middle third of the pipe diameter, and place the pipe upon it. Where the in-place soil material within the pipe bedding zone does not meet the soil classification for Selected Common Fill, undercutting shall be required, and the bedding zone shall be backfilled with Selected Common Fill. In this case, place the pipe bedding material and leave it in a moderately firm uncompacted condition under the middle third of the pipe diameter, and compact the outer portions of the trench bottom to 98 percent of the maximum dry density. Soils that were over-excavated due to rocky, soft or otherwise unsuitable soil foundation conditions shall also be replaced with Selected Common Fill. Compaction of Selected Common Fill shall be 98 percent of the maximum dry density as determined by AASHTO T-180. Such backfill material shall have an optimized moisture content that will allow the required density to be achieved.
- H. Pipe sections for gravity flow systems shall be laid with spigots downstream and bells upstream. Excavate for pipe bells before laying pipe. Lay pipe true to the lines and grades indicated on the construction plans. Place backfill material on both sides of the pipe and compact to 98 percent of the maximum dry density of the material as determined by AASHTO T-180. Take special care to effectively fill and compact the material in the haunch areas under the sides of the pipe.
- I. For pipes that are not installed under roadways or driveways, trenching backfill for pipe installation shall be Common Fill above the pipe envelope zone, and shall be compacted to 95 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density. For pipes that are installed under roadways or driveways, trenching backfill for pipe installation shall be Selected Common Fill above the pipe envelope zone, and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density. Selected Common Backfill shall be placed in layers not to exceed 6 inches. Common Backfill shall be placed in layers not to exceed 12 inches.
- J. Backfill compaction tests shall be performed every 500 feet in pipe line trenches and for every utility structure. Test reports shall be presented to the County Inspector.

### **3.03 GRADING AND CLEAN UP**

- A. Surplus and unsuitable soil materials not used on-site shall be removed and disposed of off-site in a manner that is consistent with state and local regulations. In no case shall surplus or unsuitable material be deposited on-site or on adjacent lands.
- B. The surface of backfilled areas shall be graded smooth and true to the lines and grades indicated on the construction plans. No soft spots or uncompacted areas shall be allowed in the work.
- C. Upon completion of the work, leave the work areas and all adjacent areas in a neat and presentable condition, clear of all temporary structures, rubbish and surplus materials. Pile any salvageable materials that have been removed in neat piles for pickup by County crews, unless otherwise directed.

**END OF SECTION**

**SECTION 02223 EXCAVATION BELOW GRADE AND CRUSHED STONE OR SHELL REFILL**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. If in the opinion of the County, the material at or below the normal grade of the bottom of the trench is unsuitable for pipe or structure foundation, it shall be removed to the depth directed by the County and replaced by crushed stone or washed shell.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 MATERIALS**

**3.01 EXCAVATION AND DRAINAGE**

- A. Whatever the nature of unstable material encountered or the groundwater conditions, trench stabilization shall be complete and effective.
- B. Should the Contractor excavate below the grade shown on the Contract drawings because of negligence or for his own convenience; due to failure in properly dewatering the trench; disturbs the subgrade before dewatering is sufficiently complete; he shall be directed by the County to excavate below grade. The work of excavating below grade and furnishing and placing the approved refill material shall be performed at the Contractor's expense.

**3.02 REFILL**

- A. Soils not meeting the classification required for foundation material shall be removed to a depth at least four inches below the bottom of the pipe, bedding or structure bottom elevation. Rock, boulders or other hard or lumpy material shall be removed to a depth 12 inches below the bottom of the pipe, bedding or structure bottom elevation. Remove muck, clay or other soft material to a depth as needed to establish a firm foundation.

**END OF SECTION**

## SECTION 02260 FINISH GRADING

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. The Contractor shall finish grade sub-soil.
- B. The Contractor shall cut out areas to receive stabilizing base course materials for paving and sidewalks.
- C. The Contractor shall place, finish grade and compact top soil.
- D. Finish grading shall be completed to match existing grade; the grade before construction activities commenced.

#### 1.02 PROTECTION

The Contractor shall prevent damage to existing fencing, trees, landscaping, natural features, bench marks, pavement, **and** utility lines, **and existing structures / facilities**. Damage shall be corrected at no cost to the County.

### PART 2 PRODUCTS

- A. Topsoil: Shall be friable loam free from subsoil, roots, grass, excessive amount of weeds or other organics, stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter. The Contractor may use topsoil stockpiles on site if they conform to these requirements.

### PART 3 EXECUTION

#### 3.01 SUB-SOIL PREPARATION

- A. The Contractor shall rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Uneven areas and low spots shall be eliminated. Debris, roots, branches or other organics, stones, and sub-soil shall be removed by the Contractor and disposed of in a manner consistent with the latest Manatee County Standards as well as any affected regulatory agency. Should contaminated soil be found, the Contractor shall notify the County.
- B. The Contractor shall cut out areas to sub-grade elevation to stabilize base material for paving and sidewalks and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density.
- C. The Contractor shall bring sub-soil to required profiles and contour grades gradually; and blend slopes into level areas.

- D. The Contractor shall slope the structure grade a minimum of two (2) inches in ten (10) feet unless indicated or as to match existing grade. otherwise on the Drawings.
- E. The Contractor shall cultivate sub-grade to a depth of 3 inches where the topsoil is to be placed. He shall repeat cultivation in areas where equipment use has compacted sub-soil.
- F. The Contractor shall not make grade changes which causes water to flow onto adjacent lands.

### **3.02 PLACING TOPSOIL**

- A. The Contractor shall place topsoil in areas where seeding, sodding and planting is to be performed. He shall place from the following minimum depths, up to finished grade elevations:
  - 1. 6 inches for seeded areas
  - 2. 4-1/2 inches for sodded areas
  - 3. 24 inches for shrub beds
  - 4. 18 inches for flower beds
- B. The Contractor shall use topsoil in a dry state as determined by the County. He shall place the material during dry weather.
- C. The Contractor shall use fine grade topsoil eliminating rough and low areas to ensure positive drainage. He shall maintain levels, profiles and contours of the sub-grades.
- D. The Contractor shall remove stone, roots, grass, weeds, debris, and other organics or foreign material while spreading the material.
- E. The Contractor shall manually spread topsoil around trees, plants and structures to prevent damage which may be caused by grading equipment.
- F. The Contractor shall lightly compact and place the topsoil.

### **3.03 SURPLUS MATERIAL**

- A. The Contractor shall remove surplus sub-soil and topsoil from site at his expense.
- B. The Contractor shall leave stockpile areas and entire job site clean and raked, ready for landscaping operations.

**END OF SECTION**

## SECTION 02276 TEMPORARY EROSION AND SEDIMENTATION CONTROL

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. The work specified in this Section consists of the design, provision, maintenance and removal of temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls include, but are not limited to: grassing, mulching, netting, watering, and the reseeding of on-site surfaces and spoil and borrow area surfaces, interceptor ditches at ends of berms and other such work at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the County.
- C. Temporary sedimentation controls include, but are not limited to: silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which shall ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the County.
- D. The Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.
- E. Contractor shall follow the erosion control measures on the drawings, at a minimum. Additional erosion control shall be provided as required and shall meet this Specification.**

#### 1.02 REFERENCE DOCUMENTS

- A. Florida Building Code.
- B. FDEP/COE Dredge and Fill Regulations and/or Permit as applicable.
- C. SWFWMD Permit Regulations and/or Permit as applicable.
- D. Florida Stormwater, Erosion and Sedimentation Control Inspector's Manual.

### PART 2 PRODUCTS

#### 2.01 EROSION CONTROL

- A. Netting - fabricated of material acceptable to the County.
- B. Seed and sod.

#### 2.02 SEDIMENTATION CONTROL

- A. Bales - clean, seed free cereal hay type.

- B. Netting - fabricated of material acceptable to the County.
- C. Filter stone - crushed stone conforming to Florida Dept of Transportation specifications.
- D. Concrete block - hollow, non-load-bearing type.
- E. Concrete - exterior grade not less than one inch thick.

### **PART 3 EXECUTION**

#### **3.01 EROSION CONTROL**

- A. Minimum procedures for grassing shall be:
  - 1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
  - 2. Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
  - 3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2 inches.
  - 4. Apply netting over mulched areas on sloped surfaces.
  - 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

#### **3.02 SEDIMENTATION CONTROL**

- A. The Contractor shall install and maintain silt dams, traps, barriers, and appurtenances as required. ~~shown on the approved descriptions and working drawings~~. Deteriorated hay bales and dislodged filter stone shall be replaced by the Contractor at his expense.

#### **3.03 PERFORMANCE**

- A. The Contractor, at his own expense, shall immediately take whatever steps are necessary to correct any deficiencies of the temporary erosion and sediment control measures employed if they fail to produce results or do not comply with the requirements of the State of Florida or any other federal, governmental or regulatory agency.

**END OF SECTION**

## SECTION 02480 LANDSCAPING

### PART 1 GENERAL

#### 1.10 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment, and incidentals required to install trees, ground cover, and shrubs, to place accessory planting materials, to maintain and guarantee all planted areas. All work shall be in strict accordance with sound nursery practice and shall include maintenance and watering of all of the work of this Contract until final completion and acceptance by the County.
- B. The landscaping shall be performed by a contractor or subcontractor who specializes in landscaping and who is fully familiar and experienced in projects of this type and scope. The landscaping contractor or subcontractor shall be subject to the approval of the County.
- C. The Contractor shall provide all landscaping complete and ready for use as **as required to return grade back to existing conditions or better, and as** specified in the Contract Documents and as shown on the Drawings.

#### 1.02 SUBMITTALS

- A. The Contractor shall submit to the County for review and approval, shop drawings and complete written maintenance instructions for each type of plant furnished under this Contract.
- B. The Contractor shall submit representative samples of any or all of required accessory planting materials as requested by the County.

#### 1.03 OBSTRUCTIONS BELOW GROUND

- A. The County may change the location of plant material if underground construction, utilities or obstructions are encountered in excavation of planting areas or pits.
- B. The Contractor shall make such changes without additional compensation from the County.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Plant species and size shall **match existing plants that are damaged due to construction activities, conform to those indicated in the Plant List and in plan locations shown on the Drawings. Nomenclature shall conform to the Florida Department of Agriculture: "Grades and Standards for Nursery Plants"**. The designated authority for identification of plants shall be in conformance with FDOT Standard Specification Section 580-2.1.1 Plants.

- B. Plants shall be sound, healthy, vigorous, free from plant diseases, insects, pests, or their eggs and shall have healthy normal root systems. Plants shall be nursery grown stock, freshly dug. No heeled in, cold storage, or collected stock shall be accepted.
- C. Shape and Form
1. Plant material shall be symmetrical, typical for the variety and species, and shall conform to the measurements specified in the Plant List.
  2. Plants used where symmetry is required shall be matched as nearly as possible.
  3. Plants shall not be pruned prior to delivery except as authorized by the County.
  4. All plants shall have been transplanted or root pruned at least once in the past three years.
  5. Unless otherwise noted, street trees shall be free of branches up to six feet, with the single leader well branched, and with straight trunks.
  6. Shrubs shall have been transplanted twice, have fully developed root systems, be heavily canned with foliage to base, fulfill dimensions required, and be typical of species.
  7. Ground covers shall have sturdy fibrous root systems and shall be heavily leafed.
- D. Measurement: The height and/or width of trees shall be measured from the ground or across the normal spread of branches with the plants in their normal position. This measurement shall not include the immediate terminal growth.
- E. Substitutions in plant species or size shall be made only with the written approval of the County.
- F. Ground cover plants shall be planted in beds of four inches of approved topsoil. The beds shall be thoroughly disked into the soil. The compacted and settled finished surface shall be set to the required grade. Plants shall be spaced **to match existing conditions as described in the Contract Documents or shown on the Contract Drawings**, or otherwise directed by the County in accordance with the best practices of the trade.
- G. Planting Soil
1. Soil for backfilling around plants and planting beds shall be a good grade of garden loam as approved by the County. Soil shall be free of heavy clay, coarse sand, stones, lumps, sticks, or other foreign material. The soil shall not be delivered or used in a muddy condition.
  2. The soil shall be taken from ground that has never been stripped. There shall be a slight acid reaction to the soil with no excess of calcium or carbonate. The soil shall be free from excess weeds or other objectionable material.
  3. Soil for trees and shrubs shall be delivered in a loose, friable condition. All trees shall average approximately one cubic yard per tree, except Sabal Palmetto, which shall be planted with clean sand. There shall be a minimum of 4-inches of planting soil in ground cover areas and 1/8 cubic yard per shrub or vine.

4. No marl shall be allowed in ground cover planting beds.
- H. Before plants are backfilled with planting soil, fertilizer tablets, Agriform 20-10-5 or equal, shall be placed in each pit. The Contractor shall provide three tablets for each tree and one for each shrub or vine.
- I. Tree Staking: All tree staking and bracing shall be included herein in accordance with sound nursery practice. ~~and shall be in accordance with the Contract Documents.~~—The Contractor shall furnish all materials required for staking and bracing as approved.
- J. Landscaping stones shall be inert and nonleaching. The Contractor shall provide physical samples for approval prior to installation. Crushed limerock shall not be acceptable.

## **PART 3 EXECUTION**

### **3.01 PLANTING PROCEDURES**

- A. Plant Locations: All plants shall be located to match existing conditions, as shown on the Drawings, to dimensions if shown, to scale if not dimensioned. Large areas or beds shall be scaled and the plants spaced evenly. Approval by the County is required before any plants may be installed.
- B. Tree Pits: Pits for trees shall be at least two feet greater in diameter than the specified diameter of the ball. Pits shall be of sufficient depth to allow a 12-inch layer of planting soil under the ball when it is set to grade. Bottom of pit shall be loosened prior to backfilling.
- C. Digging and Handling
  1. Plants shall be handled at all times so that roots or balls are adequately protected from sun or drying winds. Tops or roots of plant allowed to dry out will be rejected.
  2. Balled and burlapped plants shall be moved with firm, natural balls of soil, not less than one foot diameter of ball to every one inch caliper of trunk, and a depth of not less than 2/3 of ball diameter. No plant shall be accepted when the ball of earth surrounding its roots has been cracked or broken. All trees, except palms, shall be dug with ball and burlapped. Root pruning shall have been done at minimum of four weeks before planting at the job.
  3. Bare root plants shall be dug with spread of root and of sufficient depth to insure full recovery of plant.
- D. Cabbage Palms (Sable Palmetto):
  1. Cabbage Palms shall be taken from moist black sand areas. Only a minimum of fronds shall be removed from the crown to facilitate moving and handling. Clear trunk or overall height shall be as specified after the minimum of fronds have been removed.
  2. Cabbage Palms buds shall be tied to a suitable support with a burlap strip, to be left in place until the tree is well established in its new location.

3. Cabbage Palms shall be planted in sand, thoroughly washed in during planting operations, and with a dished or saucer depression left at the soil line for future waterings. Palms with marred or burned trunks will be accepted at the discretion of the County only.
  4. Trees moved by winch or crane shall be thoroughly protected from chain marks, girdling or bark slippage by means of burlap, wood battens, or other approved method.
- E. When balled or burlapped plants are set, planting soil shall be carefully tamped under and around the base of the balls to prevent voids. All burlap, rope, wires, etc., shall be removed from the sides and tops of balls, but no burlap shall be pulled from underneath. Roots of bare rooted plants shall be properly spread out and planting soil carefully worked in among them.
  - F. All plants shall be set straight or plumb. ~~, in locations shown on the Drawings.~~ Except as otherwise specified, plants shall be planted in pits which shall be set at such level that, after settlement, they bear the same relation to the finished grade or the surrounding ground as they bore to the grade of the soil from which they are taken.
  - G. Pruning shall be carefully done by experienced plantsmen. Prune immediately upon acceptance by the County, including any broken branches, thinning small branches and tipping back main branches (except main leaders).
  - H. Excess soil and debris shall be disposed of off the project site unless ordered stockpiled by the County.

### **3.02 NORMAL MAINTENANCE OF PLANT MATERIALS**

- A. Plant material maintenance shall begin when planting operations start and shall extend until final acceptance of work.
- B. Maintain all plant materials under this Contract to the satisfaction of the County. Maintenance shall include necessary watering, cultivation, weeding, pruning, spraying, tightening and repair to guy wires, removal of dead material, resetting, and other work required to conform with referenced standards and accepted nursery standards as approved.
- C. Plant materials which are in a tilted or in a leaning position shall be properly righted.
- D. After final acceptance by the County and until one calendar year after acceptance of all plantings, the landscaping contractor or subcontractor shall make monthly inspections of materials and report in writing to the County the conditions of the plants and the necessary requirements to keep the plants in a healthy growing condition.

### **3.03 TREE AND PLANT PROTECTION**

- A. The Contractor shall remove all trees (if any) within the limit of landscaping shown on the detail sheet except those designated to be salvaged (if any). Prior to removal of said trees, the Contractor shall obtain a tree removal permit, if required.

All other trees in the vicinity of the work shall be protected against damage by the Contractor until all work under the Contract has been completed.

- B. Consult with the County, and remove agreed-on roots and branches which interfere with construction. Employ qualified tree surgeon to remove, and to treat cuts.
- C. Provide temporary barriers to a height of six feet around each group of trees and plants.
- D. Protect root zones of trees and plants
  - 1. Do not allow vehicular traffic or parking.
  - 2. Do not store materials or products.
  - 3. Prevent dumping or refuse or chemically injurious materials or liquids.
  - 4. Prevent puddling or continuous running water.
- E. Carefully supervise excavating, grading, and filling, and subsequent construction operations, to prevent damage.
- F. In case of inadvertent damage to any tree or plant by the Contractor or any of his subcontractors or employees, the Contractor shall provide replacement of each such damaged tree or plant with a new one of acceptable type, size and quality.
- G. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by the County.
- H. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes, and clean the area.

### **3.04 GUARANTEE**

The life and satisfactory condition of all plant material planted shall be guaranteed by the Contractor for a minimum of one calendar year. Guarantee shall include complete replacement with material of the same kind and size as in the original work if not in a healthy condition, as determined by the County, at the end of the guarantee period.

### **3.05 REPLACEMENT**

- A. At the end of the guarantee period, any plant required under this Contract that is dead or not in satisfactory growth as determined by the County, shall be removed. Plants replaced shall be guaranteed for 90 days after date of replacement.
- B. Replacement of plants necessary during guarantee period shall be the responsibility of the Contractor, except for possible replacements of plants resulting from removal, vandalism, acts of neglect on the part of others, or acts of God.

- C. All replacements shall be plants of the same kind and size. ~~as specified in the Drawings.~~ They shall be furnished and planted as herein specified. The cost shall be the responsibility of the Contractor.

**END OF SECTION**

## SECTION 02485 SEEDING AND SODDING

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials and equipment necessary to satisfactorily return all construction areas to their original conditions or better.
- B. Work shall include furnishing and placing seed or sod, fertilizing, planting, watering and maintenance until acceptance by County.

#### 1.02 RELATED WORK NOT INCLUDED

Excavation, filling and grading required to match existing grade ~~establish elevation shown on the Drawings~~ are included under other sections of these Specifications.

#### 1.03 QUALITY ASSURANCE

- A. It is the intent of this Specification that the Contractor is obliged to deliver a satisfactory stand of grass as specified. If necessary, the Contractor shall repeat any or all of the work, including grading, fertilizing, watering and seeding or sodding at no additional cost to the County until a satisfactory stand is obtained. For purposes of grassing, a satisfactory stand of grass is herein defined as a full lawn cover over areas to be sodded or seeded, with grass free of weeds, alive and growing, leaving no bare spots larger than 3/4 square yard within a radius of 8 feet.
- B. All previously grassed areas damaged due to construction activities where pipelines are laid shall be sodded. All sodding and grassing shall be installed in accordance with these Specifications or as directed by the County.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Fertilizer: The fertilizer shall be of the slow-release type meeting the following minimum requirements: 12 percent nitrogen, 8 percent phosphorus, 8 percent potassium; 40 percent other available materials derived from organic sources. At least 50 percent of the phosphoric acid shall be from normal super phosphate or an equivalent source which will provide a minimum of two units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container. Fertilizer shall be uniform in composition, dry and free flowing delivered to sites in original unopened containers bearing manufacturer's statement or guarantee.
- B. Seeding/Grassing: The Contractor shall grass all unpaved areas disturbed during construction which do not require sod. All grassing shall be completed in conformance with FDOT Specifications, Sections 570 and 981. The grassed areas shall be mulched and fertilized in accordance with FDOT Specifications, except that no additional payment will be made for mulching, fertilizing and/or watering.

- C. Sodding: Sod shall be provided as required on the construction drawings or at locations as directed by the County in accordance with Florida Department of Transportation, Specifications Section 575 and 981. The Contractor shall furnish bahia grass sod or match existing sod. Placement and watering requirements shall be in accordance with FDOT Specifications Section 575, except that no additional payment will be made for placement and/or watering. This cost shall be included in the Contract price bid for sodding.
- D. Topsoil: Topsoil stockpiled during **clearing and grubbing, and** excavation may be used as necessary. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the County. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants and grassing specified herein.
- E. Water: It is the Contractor's responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. The Contractor shall make whatever arrangements that may be necessary to ensure an adequate supply of water to meet the needs for his work. He shall also furnish all necessary hose, equipment, attachments and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. When the trench backfill has stabilized sufficiently, the Contractor shall commence work on lawns and grassed areas, including fine grading as necessary and as directed by the County.
- B. Finish Grading: Areas to be seeded or sodded shall be finish graded, raked, and debris removed. Soft spots and uneven grades shall be eliminated. The County shall approve the finish grade of all areas to be seeded or sodded prior to seed or sod application.
- C. Areas to be sodded shall be excavated or cut-down to accept the approximate 2” thick sod, so finish grade matches existing. Sod shall not be thrown over top of existing sod or debris.
- D. Protection: Seeded and sodded areas shall be protected against traffic or other use by placing warning signs or erecting barricades as necessary. Any areas damaged prior to acceptance by the County shall be repaired by the Contractor as directed by the County.

**3.02 CLEANUP**

Soil or similar materials spilled onto paved areas shall be removed promptly, keeping those areas as clean as possible at all times. Upon completion of seeding

and sodding operations, all excess soil, stones and debris remaining shall be removed from the construction areas.

**3.03 LANDSCAPE MAINTENANCE**

- A. Any existing landscape items damaged or altered during construction by the Contractor shall be restored or replaced as directed by the County.
- B. Maintain landscape work for a period of 90 days immediately following complete installation of work or until County accepts project. Watering, weeding, cultivating, restoration of grade, mowing and trimming, protection from insects and diseases, fertilizing and similar operations as needed to ensure normal growth and good health for live plant material shall be included at no additional cost to the County.

**3.04 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATORS**

Lawn areas planted under this Contract and all lawn areas damaged by the Contractor's operation shall be repaired at once by proper soil preparation, fertilizing and sodding, in accordance with these Specifications.

**END OF SECTION**

## SECTION 02513 ASPHALT CONCRETE PAVING

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials and equipment necessary to complete all milling asphalt pavement and asphalt concrete paving as called out on the Contract Documents or as shown on the Drawings. **Contractor is also required to repair any asphalt concrete paving damaged as a result of construction activities.**

#### 1.02 QUALITY ASSURANCE

- A. Qualifications of Asphalt Concrete Producer: The only materials permitted shall be furnished by a bulk asphalt concrete producer exclusively engaged in the production of hot-mix, hot-laid asphalt concrete.
- B. Qualification of Testing Agency: The County may employ a commercial testing laboratory to conduct tests and evaluations of asphalt concrete materials and design. The Contractor shall:
  - 1. Provide asphalt concrete testing and inspection service acceptable to County.
  - 2. Include sampling and testing asphalt concrete materials proposed, and tests and calculations for asphalt concrete mixtures.
  - 3. Provide field testing facilities for quality control testing during paving operations.
- C. Requirements of Regulatory Agencies: The Contractor shall comply with the applicable requirements of:
  - 1. Manatee County Utility Operations Department
  - 2. Manatee County Transportation Department
  - 3. State of Florida Dept. of Transportation

#### 1.03 PAVING QUALITY REQUIREMENTS

- A. General: In addition to other specified conditions, the Contractor shall comply with the following minimum requirements:
  - 1. In-place asphalt concrete course shall be tested for compliance with requirements for density, thickness and surface smoothness.
  - 2. Final surface shall be provided of uniform texture, conforming to required grades and cross sections.
  - 3. A minimum of four inch diameter pavement specimens for each completed course shall be taken from locations as directed by the County.
  - 4. Holes from test specimens shall be repaved as specified for patching defective work.

- B. Density:
1. When subjected to 50 blows of standard Marshall hammer on each side of an in place material specimen, densities shall be comparable to a laboratory specimen of same asphalt concrete mixture.
  2. The minimum acceptable density of in-place course material shall be 98% of the recorded laboratory specimen density.
- C. Thickness: In-place compacted thicknesses shall not be acceptable if less than the minimum thicknesses shown on the Drawings. **For any asphalt concrete paving that is damaged by Contractor, must be replaced by the Contractor and the thickness shall match the existing thickness.**
- D. Surface Smoothness:
1. Finished surface of each asphalt concrete course shall be tested for smoothness, using a 10 ft. straightedge applied parallel to and at right angles to centerline of paved areas.
  2. Surface areas shall be checked at intervals directed by County.
  3. Surfaces shall not be acceptable if they exceed the following:
    - a. Base Course: 1/4 in. in 10 ft.
    - b. Surface Course: 3/16 in. in 10 ft.
    - c. Crowned Surfaces:
      - (1) Test crowned surfaces with a crown template, centered and at right angles to the crown.
      - (2) Surfaces will not be acceptable if varying more than 1/4 in. from the template.

#### 1.04 SUBMITTALS

- A. Samples: The Contractor may be required to provide samples of materials for laboratory testing and job-mix design.
- B. Test Reports: The Contractor shall submit laboratory reports for following materials tests:
1. Coarse and fine aggregates from each material source and each required grading:
    - a. Sieve Analysis: ASTM C 136 (AASHTO T 27).
    - b. Unit Weight of Slag: ASTM C29 (AASHTO T 19).
    - c. Soundness: ASTM C 88 (AASHTO T 104) for surface course aggregates only.
    - d. Sand Equivalent: ASTM D 2419 (AASHTO T 176).
    - e. Abrasion of Coarse Aggregate: ASTM C131 (AASHTO T 96),for surface course aggregates only.
  2. Asphalt cement for each penetration grade:
    - a. Penetration: ASTM D5 (AASHTO T49).
    - b. Viscosity (Kinematic): ASTM D2170 (AASHTO T 201).
    - c. Flash Point: ASTM D92 (AASHTO T 48).
    - d. Ductility: ASTM D 113 (AASHTO T 51).

- e. Solubility: ASTM D 4 (AASHTO T 44).
- f. Specific Gravity: ASTM D 70 (AASHTO T 43).
- 3. Job-mix design mixtures for each material or grade:
  - a. Bulk Specific Gravity for Coarse Aggregate: ASTM C 117(AASHTO T 85).
  - b. Bulk Specific Gravity for Fine Aggregate: ASTM C 128(AASHTO T 84).
- 4. Uncompacted asphalt concrete mix: Maximum Specific Gravity: ASTM D 2041 (AASHTO T 209).
- 5. Compacted asphalt concrete mix:
  - a. Bulk Density: ASTM D 1188 (AASHTO T 166).
  - b. Marshall Stability and Flow: ASTM D 1559.
- 6. Density and voids analysis:
  - a. Provide each series of asphalt concrete mixture test specimens, in accordance with A.I. MS-2 "Mix Design Methods for Asphalt Concrete".
  - b. Use Marshall method of mix design unless otherwise directed or acceptable to the County.
  - c. Report the quantity of absorbed asphalt cement in pounds of dry aggregate, percent air voids, and percent voids in mineral aggregate.
- 7. Sampling and testing of asphalt concrete mixtures for quality control during paving operations:
  - a. Uncompacted asphalt concrete mix.
    - (1) Asphalt Cement Content: ASTM D 2172 (AASHTO T 164).
    - (2) Penetration of Recovered Asphalt Cement: ASTM D 5(AASHTO T 49).
    - (3) Ductility of Recovered Asphalt Cement: ASTM D 113(AASHTO T 51).
  - b. Compacted asphalt concrete mix:
    - (1) Bulk Density: ASTM D 1188 (AASHTO T 166).
    - Marshall Stability and Flow: ASTM D1559).
  - c. Perform at least one test for each day's paving.
- 8. Asphalt plant inspection: ASTM D 290.
- 9. Additional testing:
  - a. Retesting shall be required if previous tests indicate insufficient values, or if directed by the County.
  - b. Testing shall continue until specified values have been attained.
- 10. Asphalt concrete materials which do not comply with specified requirements shall not be permitted in the work.

## 1.05 JOB CONDITIONS

### A. Weather Limitations:

- 1. Apply bituminous prime and tack coats only when the ambient temperature in the shade is 50 degrees F. and when the temperature has not been below 35 degrees F. for 12 hours immediately prior to application.
- 2. Do not apply when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

3. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees F., when the underlying base is dry, and when weather is not rainy.
  4. Base course may be placed when air temperature is not below 30 degrees F. and rising, when acceptable to the County.
- B. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.
- C. Traffic Control: Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Soil Cement or Shell Base Course: as specified in FDOT Section 270, "Material for Base and Stabilized Base", and as called for in the Contract Documents.
- B. Aggregate for Asphalt Concrete, General:
1. Sound, angular crushed stone, crushed gravel, or crushed slag: ASTM D 692.
  2. Sand, stone, or slag screening: ASTM D 1073.
  3. Provide aggregate in gradations for various courses to comply with local highway standards.
- C. Surface Course Aggregates:
1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
- D. Asphalt Cement: Comply with ASTM D 946 for 85-100 penetration grade.
- E. Prime Coat:
1. Cut-back liquid asphalt.
  2. Medium-Curing type: ASTM D 2027, Grade MC-70.

### **2.02 ASPHALT-AGGREGATE MIXTURES**

- A. Job-mix criteria:
1. Provide job-mix formulas for each required asphalt-aggregate mixture.
  2. Establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to aggregate, and a single temperature at which asphalt concrete is to be produced.
  3. Comply with the mix requirements of local governing highway standards.
  4. Maintain material quantities within allowable tolerances of the governing standards.

**2.03 TRAFFIC AND PARKING MARKING MATERIALS**

- A. Traffic lane marking paint with chlorinated rubber base.
- B. Factory mixed, quick drying and non bleeding, FS TT-P-115C, Type III.
- C. Color: Driving Lane Dividers - White  
No Parking Zone - Yellow  
Parking Dividers - White

**PART 3 EXECUTION**

**3.01 SURFACE PREPARATION**

- A. Subbase Preparation:
  - 1. The Contractor shall remove from the area all organic substance encountered to a depth of six or eight inches (6" or 8"), or to such depth and width as directed by the County. The entire area shall be plowed and dragged prior to placing a stabilizing additive, if required to meet minimum bearing value.
  - 2. Subbase shall be compacted to a minimum density of 98 percent of the maximum as determined by the Modified Proctor Density AASHTO T180, and shall have a minimum bearing value of 40 pounds per square inch as determined by the Florida Bearing Test.
- B. Base Course:
  - 1. Check subgrade for conformity with elevations and section immediately before placing base material.
  - 2. Place base material in compacted layers not more than 6 inches thick, unless continuing tests indicate the required results are being obtained with thicker layers.
  - 3. In no case will more than 8-inches of compacted base be placed in one lift.
  - 4. Spread, shape, and compact all base material deposited on the subgrade during the same day.
  - 5. Compact base course material to be not less than 98% of maximum density: ASTM D 1557, Method D (98 percent maximum density: AASHTO T-180).
  - 6. Test density of compacted base course: ASTM D 2167.
  - 7. Conduct one test for each 250 sq. yds. of in-place material, but in no case not less than one daily for each layer.
- C. Loose and Foreign Material:
  - 1. Remove loose and foreign material from compacted subbase surface immediately before application of paving.
  - 2. Use power brooms or blowers, and brooming as required.
  - 3. Do not displace subbase material.

D. Prime Coat:

1. Uniformly apply at rate of 0.20 to 0.5 gal. per sq. yd. over compacted and cleaned subbase surface.
2. Apply enough material to penetrate and seal, but not flood the surface.
3. Allow to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than 24 hours unless otherwise acceptable to the County.
4. Blot excess asphalt with just enough sand to prevent pick-up under traffic.
5. Remove loose sand before paving.

E. Tack Coat:

1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or portland cement concrete and similar surfaces.
2. Apply at rate of 0.05 to 0.15 gal. per sq. yd. of surface.
3. Apply tack coat by brush to contact surfaces of structures projecting into or abutting asphalt concrete pavement.
4. Allow surfaces to dry until material is at condition of tackiness to receive pavement.

**3.02 MANHOLE FRAME / VALVE BOX ADJUSTMENTS (IF APPLICABLE)**

A. Placing Manhole frames:

1. Surround manhole frames set to elevation with a ring of compacted asphalt concrete base prior to paving.
2. Place asphalt concrete mixture up to 1 in. below top of frame, slope to grade, and compact by hand tamping.

B. Adjust manhole frames to proper position to meet paving.

C. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.

D. Set cover manhole frames to grade, flush with surface of adjacent pavement.

**3.03 PREPARING THE MIXTURE**

A. Comply with ASTM D 995 for material storage, control, and mixing, and for plant equipment and operation.

B. Stockpiles:

1. Keep each component of the various-sized combined aggregates in separate stockpiles.
2. Maintain stockpiles so that separate aggregate sizes shall not be intermixed.

- C. Heating:
  1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture
  2. Use lowest possible temperature to suit temperature-viscosity characteristics of asphalt.
  3. Do not exceed 350 degrees F. (176.6 degrees C.).
- D. Aggregate:
  1. Heat-dry aggregates to reduce moisture content to not more than 2.0%.
  2. Deliver dry aggregate to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
  3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.
- E. Mix aggregate and asphalt cement to achieve 90-95% of coated particles for base mixtures and 85-90% of coated particles for surface mixture, when tested in accordance with ASTM D 2489.
- F. Transporting:
  1. Transport asphalt concrete mixtures from mixing site in trucks having tight, clean compartments.
  2. Coat hauling compartments with a lime-water mixture to prevent asphalt concrete mixture from sticking.
  3. Elevate and drain compartment of excess solution before loading mix.
  4. Provide covers over asphalt concrete mixture when transporting to protect from weather and to prevent loss of heat.
  5. During periods of cold weather or for long-distance deliveries, provide insulation around entire truck bed surfaces.

### **3.04 EQUIPMENT**

- A. Provide size and quantity of equipment to complete the work specified within project time schedule.
- B. Bituminous Pavers: Self-propelled that spread hot asphalt concrete mixtures without tearing, shoving or gouging surfaces, and control pavement edges to true lines without use of stationary forms.
- C. Rolling Equipment:
  1. Self-propelled, steel-wheeled and pneumatic-tired rollers that can reverse direction without backlash.
  2. Other type rollers may be used if acceptable to the County.
- D. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified.

### 3.05 PLACING THE MIX

- A. Place asphalt concrete mixture on prepared surface, spread and strike-off using paving machine.
- B. Spread mixture at a minimum temperature of 225 degrees F. (107.2 degrees C.).
- C. Inaccessible and small areas may be placed by hand.
- D. Place each course at thickness so that when compacted, it will conform to the indicated grade, cross-section, finish thickness, and density indicated.
- E. Paver Placing:
  - 1. Unless otherwise directed, begin placing along centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.
  - 2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
  - 3. Complete base courses for a section before placing surface courses.
  - 4. Place mixture in continuous operation as practicable.
- F. Hand Placing:
  - 1. Spread, tamp, and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to County.
  - 2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.
- G. Joints:
  - 1. Carefully make joints between old and new pavements, or between successive days' work, to ensure a continuous bond between adjoining work.
  - 2. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
  - 3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
  - 4. Offset transverse joints in succeeding courses not less than 24 inches.
  - 5. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
  - 6. Offset longitudinal joints in succeeding courses not less than 6 inches.
  - 7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

### 3.06 COMPACTING THE MIX

- A. Provide sufficient rollers to obtain the required pavement density.

- B. Begin rolling operations as soon after placing when the mixture will bear weight of roller without excessive displacement.
- C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
- D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- F. Do not roll centers of sections first under any circumstances.
- G. Breakdown Rolling:
  - 1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
  - 2. Operate rollers as close as possible to paver without causing pavement displacement.
  - 3. Check crown, grade, and smoothness after breakdown rolling.
  - 4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- H. Second Rolling:
  - 1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
  - 2. Continue second rolling until mixture has been thoroughly compacted.
- I. Finish Rolling:
  - 1. Perform finish rolling while mixture is still warm enough for removal of roller marks.
  - 2. Continue rolling until roller marks are eliminated and course has attained specified density.
- J. Patching:
  - 1. Remove and replace defective areas.
  - 2. Cut-out and fill with fresh, hot asphalt concrete.
  - 3. Compact by rolling to specified surface density and smoothness.
  - 4. Remove deficient areas for full depth of course.
  - 5. Cut sides perpendicular and parallel to direction of traffic with edges vertical.
  - 6. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

### **3.07 MARKING ASPHALT CONCRETE PAVEMENT**

- A. Cleaning:
  - 1. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
  - 2. Do not begin marking asphalt concrete pavement until acceptable to the County.
- B. Apply paint with mechanical equipment.
  - 1. Provide uniform straight edges.
  - 2. Not less than two separate coats in accordance with manufacturer's recommended rates.

### **3.08 CLEANING AND PROTECTION**

- A. Cleaning: After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the County.
- B. Protection:
  - 1. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case sooner than 6 hours.
  - 2. Provide barricades and warning devices as required to protect pavement.
  - 3. Cover openings of structures in the area of paving until permanent coverings are placed (if applicable).

**END OF SECTION**

## SECTION 02575 PAVEMENT REPAIR AND RESTORATION

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, as required to repair / restore pavement damaged by the Contractor. ~~obtain County or State right-of-way permits and incidentals required and remove and replace pavements over trenches excavated for installation of water or sewer lines and appurtenances as shown on the Contract Drawings.~~

#### 1.02 GENERAL

- A. The Contractor shall take before and after photographs.
- B. The Contractor shall repair in a manner satisfactory to the County or State, all damage done to existing structures, pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basin, flagstones, or stabilized areas or driveways and including all obstructions not specifically named herein, which results from this Project.
- C. The Contractor shall keep the surface of the backfilled area of excavation in a safe traffic bearing condition and firm and level with the remaining pavement until the pavement is restored in the manner specified herein. All surface irregularities that are dangerous or obstructive to traffic are to be removed. The repair shall conform to applicable requirements of Manatee County Transportation Department requirements for pavement repair and as described herein, including all base, subbase and asphalt replacement.
- D. All materials and workmanship shall meet or exceed the County requirements and as called for in the Contract Documents and nothing herein shall be construed as to relieve the Contractor from this responsibility.
- E. All street, road and highway repair shall be made in accordance with the FDOT and County requirements details indicated on the Drawings and in accordance with the applicable requirements and approval of affected County and State agencies.

### PART 2 PRODUCTS

#### 2.01 PAVEMENT SECTION

- A. Asphaltic concrete shall consist of asphalt cement, coarse aggregate, fine aggregate and mineral filler conforming to FDOT Type S-III Asphalt. Pavement replacement thickness shall match that removed but in no case shall be less than 1-1/2" compacted thickness. All asphalt concrete pavement shall be furnished, installed and tested in accordance with FDOT Specifications for Road and Bridge Construction.

- B. Asphalt or crushed concrete or approved equal base material shall be furnished and installed under all pavement sections restored under this Contract. Asphalt base shall have a minimum 6" compacted thickness, meet requirements for FDOT ABC III (Minimum Marshall Stability of 1000) and be furnished, installed and tested in accordance with the requirements of the FDOT Standards. Crushed concrete base shall be 10" minimum compacted thickness. Crushed concrete aggregate material shall have a minimum LBR of 140 compacted to 98% T-180 AASHTO density. Asphalt base and crushed concrete base are acceptable. Other bases shall be submitted for approval.
- C. Prime and tack will be required and applied in accordance with Section 300 - FDOT Specifications: Prime and Tack Coat for Base Courses.

## **PART 3 EXECUTION**

### **3.01 CUTTING PAVEMENT**

- A. The Contractor shall saw cut in straight lines and remove pavement as necessary to install the new pipelines and appurtenances and for making connections to existing pipelines.
- B. Prior to pavement removal, the Contractor shall mark the pavement for cuts nearly paralleling pipe lines and existing street lines. Asphalt pavement shall be cut along the markings with a rotary saw or other suitable tool. Concrete pavement shall be scored to a depth of approximately two (2) inches below the surface of the concrete along the marked cuts. Scoring shall be done by use of a rotary saw, after which the pavement may be broken below the scoring with a jackhammer or other suitable equipment.
- C. The Contractor shall not machine pull the pavement until it is completely broken and separated along the marked cuts.
- D. The pavement adjacent to pipe line trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the Contractor shall remove and replace the pavement. In addition, the base and sub-base shall be restored in accordance with these Specifications, Florida Dept. of Transportation Standard Specifications and as directed by the County.

### **3.02 PAVEMENT REPAIR AND REPLACEMENT**

- A. The Contractor shall repair, to meet or exceed original surface material, all existing concrete or asphaltic pavement, driveways, or sidewalks cut or damaged by construction under this Contract. He shall match the original grade unless otherwise specified or shown on the Drawings. Materials and construction procedures for base course and pavement repair shall conform to those of the Florida Dept. of Transportation.
- B. The Contractor's repair shall include the preparation of the subbase and base, place and maintain the roadway surface, any special requirements whether specifically called for or implied and all work necessary for a satisfactory

completion of this work. Stabilized roads and drives shall be finished to match the existing grade.

- C. The asphaltic concrete repairs shall be in accordance with the Manatee County Public Works Standards, Part I Utilities Standards Manual, Detail UG-12. The asphaltic concrete repairs shall extend the full width and length of the excavation or to the limits of any damaged section. The edge of the pavement to be left in place shall be cut to a true edge with a saw or other approved method so as to provide a clean edge to abut the repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities. The existing asphalt beyond the excavation or damaged section shall be milled 25' back from the saw cut. Final overlay shall match existing with no discernable "bump" at joint.

### **3.03 MISCELLANEOUS RESTORATION**

Sidewalks or driveways cut or damaged by construction shall be restored in full sections or blocks to a minimum thickness of four inches. Concrete curb or curb and gutter shall be restored to the existing height and cross section in full sections or lengths between joints. RCP pipe shall be repaired or installed in accordance with manufacturer's specifications. Grassed yards, shoulders and parkways shall be restored to match the existing sections with grass sod of a type matching the existing grass.

### **3.04 SPECIAL REQUIREMENTS**

The restoration of all surfaces, as described herein, disturbed by the installation of pipelines shall be completed as soon as is reasonable and practical. The complete and final restoration of both paved and shell stabilized roads within a reasonable time frame is of paramount importance. To this end, the Contractor shall, as part of his work schedule, complete the restoration of any area of road within five weeks after removing the original surface. Successful leak testing shall be performed prior to restoring any area of road. All restoration and replacement or repairs are the responsibility of the Contractor.

### **3.05 CLEANUP**

After all repair and restoration or paving has been completed, all excess asphalt, dirt and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

### **3.06 MAINTENANCE OR REPAIR**

All wearing surfaces shall be maintained by the Contractor in good order suitable for traffic prior to completion and acceptance of the work.

**END OF SECTION**

## SECTION 02615 DUCTILE IRON PIPE AND FITTINGS

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to install ductile iron pipe and restrained joint ductile iron pipe and cast iron or ductile iron restrained joint fittings, complete, as shown on the Drawings and specified in these Standards.
- B. Fittings are noted on the drawings for the Contractor's convenience and do not relieve him from laying and jointing different or additional items where required.
- C. The Contractor shall furnish all labor, materials, equipment and incidentals required to install ~~push-on joint or~~ restrained joint ductile iron pipe, complete as shown on the Drawings and Specifications.
- D. Newly installed pipe shall be kept clean and free of all foreign matter. All DI pipe installed underground shall be poly wrapped unless noted otherwise on the plans.

#### 1.02 SUBMITTALS

- A. The Contractor shall submit to the County, within ten days after receipt of Notice to Proceed, a list of materials to be furnished, the names of the suppliers and the appropriate shop drawings for all ductile iron pipe and fittings.
- B. The Contractor shall submit the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Ductile iron pipe shall conform to AWWA C150 and AWWA C151. Pipe shall be Pressure Class 350. All ductile iron pipe used in above ground applications shall be Special Thickness Class 53. All pipe materials used in potable water systems shall comply with NSF Standard 61.
- ~~B. Unrestrained joint pipe shall be supplied in lengths not to exceed 21 ft. and shall be either the rubber ring compression type push-on joint or standard mechanical joint pipe as manufactured by the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, or an approved equal.~~
- C. All mechanical joint fittings shall be pressure rated for 350 psi for sizes 4-24 inches and 250 psi for sizes 30 inches and larger. All flanged fittings shall be pressure rated for 250 psi for all sizes. All fittings shall meet the requirements of AWWA C110 or AWWA C153.

- D. Rubber gaskets shall conform to AWWA C111 for mechanical ~~and push-on type joints. and shall be Ethylene Propylene Diene Monomer (EPDM) rubber for potable water and reclaimed water pipelines.~~ Standard gaskets shall be such as Fastite as manufactured by American Cast Iron Pipe Company, or an approved equal.
- E. ~~Water Main and Reclaimed Water Main Coatings: All ductile iron pipe used in water and reclaimed water systems shall have a standard thickness cement lining on the inside in accordance with AWWA C104 and a standard 1-mil asphaltic exterior coating per AWWA C151. All ductile iron or gray iron fittings used in water and reclaimed water systems shall have standard thickness cement linings on the inside per AWWA C104 and an asphaltic exterior coating or they shall have factory-applied fusion-bonded epoxy coatings both inside and outside in accordance with AWWA C550.~~
- F. Wastewater Main Coatings: All ductile iron pipe and fittings used in wastewater sewer systems shall have a factory applied dry film thickness 40-mil Protecto 401 or 40-mil Novocoat SP2000W amine cured novalac ceramic epoxy lining on the inside. The interior lining application is to be based on the manufacturer's recommendation for long-term exposure to raw sewage. To ensure a holiday-free lining, documentation must be provided, prior to shipment, showing each section of lined pipe has passed holiday testing at the time of production per ASTM G62. The lining shall have a minimum one year warranty covering failure of the lining and bond failure between liner and pipe.

Exterior coatings ~~shall be in accordance with the Protective Coatings Specification. for ductile iron pipe and fittings used in wastewater systems shall be either an asphaltic coating per AWWA C151 or a factory-applied epoxy coating per AWWA C550.~~

- G. Thrust restraint devices shall be provided at all horizontal and vertical bends and fittings, in casings under roads and railroads and at other locations specifically indicated on the construction drawings. Thrust restraint devices shall be either concrete thrust blocks or restraining glands as manufactured by Star Pipe Products, Stargrip 3000 and 3100, Allgrip 3600, or as manufactured by EBAA Iron Sales, Megaflange, 2000 PV, or other approved equal restraining gland products. Restrained joints, where used, shall be installed at bend and fitting locations and at pipe joint locations both upstream and downstream from the bends or fittings at distances as required by these Standards. Restrained joint pipe fittings shall be designed and rated for the following pressures:

350 psi for pipe sizes up to and including 24" diameter  
250 psi for pipe sizes 30" diameter and above

## 2.02 DETECTION

- A. Pipe shall have a 3-inch wide warning tape of the proper color placed directly above the pipe 12 inches below finished grade or a 6-inch warning tape between 12 inches and 24 inches below finished grade.
- B. Pipe shall have a solid, 10 gauge, high strength, copper clad steel wire with a polyethylene jacket of appropriate color installed along the pipe alignment as

detailed in these standards. Tracer wire shall be manufactured by Copperhead Industries or Manatee County approved equal.

## **2.03 IDENTIFICATION**

- A. Each length of pipe and each fitting shall be marked with the name of the manufacturer, size and class, lining type, and shall be clearly identified as ductile iron pipe. All gaskets shall be marked with the name of the manufacturer, size and proper insertion direction.
- B. All ductile iron pipe 12 inches and smaller shall be entirely polyethylene-wrapped blue for water mains, purple (Pantone 522 C) for reclaimed water mains and green for sewer mains, per AWWA C105.
- C. All ductile iron pipe greater than 12 inches shall be spiral wrapped with color coded polyethylene at a six-inch minimum spacing. If soil testing, in accordance with AWWA C105, indicates that the soil at the site is corrosive, the ductile iron pipe shall be entirely polyethylene-wrapped with color coded polyethylene.
- D. Poly-wrap shall be by V-Bio™ Enhanced Polyethylene Encasement (or equivalent).
- E. ~~All above ground potable water mains and appurtenances shall be painted safety blue.~~ Pipeline coding and color shall be defined by the County.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

The Contractor shall install the pipe in strict accordance with the manufacturer's technical data and printed instructions.

### **3.02 INSPECTION AND TESTING**

New pumps shall be tested in accordance with the drawings and Specification 01650. All pipelines shall be subjected to hydrostatic pressure and leak testing. Refer to Manatee County Public Works Utility Standards Part 1-Utility Standards Manual Section 1.9.7. Prior to testing, the pipe lines shall be supported in a manner approved by the County to prevent movement during tests. Contractor is responsible for providing temporary equipment to support the pressure and leakage testing.

**END OF SECTION**

## SECTION 02617 INSTALLATION AND TESTING OF PRESSURE PIPE

### PART 1 GENERAL

Reference Section 1.9, Installation of Pipelines in the Manatee County Public Works Utility Standards Part 1-Utility Standards Manual.

#### 1.01 GENERAL

- A. Furnish and install pipe, fittings, valves, fire hydrants, services, and all other appurtenances and incidentals complete and in-place as required by the construction drawings.
- B. Where potable or reclaimed water mains are to be installed under pavement, in parking lots, etc., the main shall be DI or protected by a steel casing pipe.
- C. All pipe crossing state or federal roads or local arterials & thoroughfares shall be installed in a casing pipe.
- D. Services under any kind of pavement shall be Type "L" copper or Schedule 40 stainless steel.
- E. Water mains 16-inches and larger shall be ductile iron. High density polyethylene or PVC (for 16" only). The use of HDPE pipe must be authorized by the County prior to ordering and installation.
- F. ~~Soil testing in accordance with AWWA C105 shall be performed during the design phase to determine if the soil is corrosive to ductile iron pipe. One (1) soil test shall be performed for pipe lengths under 500 lineal feet, with an additional soil test every 500 of additional ductile iron pipe to be installed. The soil testing shall be performed by a Florida licensed geotechnical engineering and signed and sealed report shall be supplied to the County for review prior to installation of the ductile iron pipe for evaluation. The soil testing results shall be used to determine if additional requirements for the installation of ductile iron pipe and/or the restrained joints is warranted.~~
- G. Ductile iron pipe, with gasket materials as required in these Standards, shall be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents.
- H. Trees shall not be planted or located within 10 feet of any potable water main, reclaimed water main, sanitary force main or gravity sanitary sewer main that is owned and maintained by County. With prior approval, an approved root barrier may be used with 5 feet of clearance.
- I. All distribution waterlines that enter private property become private lines and shall have a back-flow preventer installed at the right-of-way. BFP can be part of a meter assembly or a BFP / detector check assembly.

## 1.02 HANDLING AND STORAGE

- A. Prior to installation, all pipe and fittings shall be inspected. Cracked, broken, or otherwise defective materials not in compliance with these standards shall not be used and shall be removed from the project site.
- B. The pipeline installer shall take care in the handling, storage and installation of the pipe and fittings to prevent injury to the materials or coatings. Use proper implements, tools and facilities for the safe and proper protection of the work. Lower the pipe and fittings from the truck to the ground and from the ground into the trench in a manner to avoid any physical damages. Under no circumstances shall the pipe or fittings be dropped onto the ground or into the trenches.
- C. The pipeline installer shall not distribute material on the job site faster than it can be used to good advantage. Unless otherwise approved by the County, installer shall not distribute more than one week's supply of material in advance of laying. Any materials not to be installed within two weeks of delivery shall be protected from the sunlight, atmosphere and weather by suitable enclosures or protective wrapping until ready for installation. Stored PVC pipe shall be placed on suitable racks with bottom tiers raised above the ground to avoid damage. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's written instructions.

## 1.03 SURVEY MARKINGS (Not Used)

- ~~A. As a marker for the Surveyor, a PVC pipe marker or 2" x 4" marker shall be inserted by the Contractor on the top of pipe for potable water mains, reclaimed water mains and sanitary force mains at intervals no greater than 200 feet apart and at locations where there is a substantial grade change. The pipe markers shall indicate the pipe diameter and shall be labeled PWM in "safety" blue, RWM in purple, and FM in green, for potable water mains, reclaimed water mains and sanitary force mains, respectively. The Contractor is responsible for making the aforementioned markers available to the Surveyor. The Contractor shall field locate the mains and fittings when markers are not made available to the Surveyor.~~
- ~~B. As a marker for the Surveyor, a PVC pipe marker or 2" x 4" marker shall be inserted by the Contractor on the top of all pipe fittings (other than sanitary sewer service wyes, potable water saddles and reclaimed water saddles). The markers for fittings shall indicate the type of fitting and shall be labeled PWF in "safety" blue, RWF in purple, and FMF in green, for potable water fittings, reclaimed water fittings, and sanitary force main fittings, respectively. The Contractor is responsible for making the aforementioned markers available to the Surveyor. The Contractor shall field locate the mains and fittings when markers are not made available to the Surveyor.~~
- ~~C. A PVC pipe marker or 2" x 4" marker shall be inserted by the Contractor at the beginning and end of each horizontal directional drill (HDD). The HDD Contractor shall provide a certified report and bore log indicating the horizontal and vertical location every 25 linear feet or less along the pipe.~~
- ~~D. A 2" PVC pipe marker with a painted end cap shall be inserted by the Contractor~~

~~at the ROW line indicating each individual new service location or stub out. The marker shall be a 6 foot length of PVC pipe inserted 2 feet into the ground and shall be painted "safety" blue for potable water, purple for reclaimed water, and green for sewer.~~

**1.04 PROCEDURE FOR TESTING WATER LINES, FORCE MAINS AND RECLAIMED WATER LINES**

- A. A 48-hour notice is needed prior to testing. A letter stating the reasons testing should be scheduled ahead of other jobs must accompany all emergency testing requests.
- B. County and Contractor must be present for all testing, except for testing tapping valves and sleeves.
- C. HYDROSTATIC TESTING
  1. Refer to Manatee County Public Works Utility Standards Part 1-Utility Standards Manual Section 1.8.7.

**1.05 INSPECTION/TESTING PROCEDURE COVERING BORED PIPE LINES OR CASING AND CONDUITS INSTALLED ACROSS PREVIOUSLY TESTED AND/OR COUNTY ACCEPTED WATER AND SEWER PIPE WITHIN DEVELOPMENT PROJECTS UNDER ACTIVE CONSTRUCTION (NOT USED)**

- ~~A. Prior to testing water and sewer lines, every effort will be made to install sleeves for underground utilities that will cross these water and sewer lines or services.~~
- ~~B. Where it has not been possible to pre-install sleeves prior to testing and bores or conduits are required, it is the responsibility of the utility company and/or their Contractor performing the work to provide Manatee County Utility Operations Department or the Engineer of Record with accurate horizontal and vertical as-built information of the sleeves, bores and conduits installed by said utility company. This applies to all bores and conduits crossing water and sewer lines.~~
- ~~C. Procedures to be followed for installation of conduits, pipe lines and bores that will cross, or be closer than 5'-0" horizontally and 18 inches vertically to, previously tested water and sewer lines that are still under the ownership of the developer/contractor.
  1. Notify the County and obtain the best as-built information available. Allow sufficient time for the County to field locate the existing pipe lines.
  2. Submit drawings of proposed location to the County and Manatee County Utility Operations Dept. Utility Locations Section for review.
  3. Obtain a County Right of Way Use Permit if the work area is within a dedicated area of right-of-way.
  4. Perform installation in the presence of a County representative. Call (941) 792-8811, ext. 5061 or ext. 5069 with at least two (2) working days notice.
  5. Submit two (2) copies of as-built information to the County to incorporate into the record drawings to be submitted to the County.
  6. Failure to follow steps 2) thru 5) will result in additional charges for retesting the previously tested water and sewer lines.~~

~~D. Procedures to be followed for installation of conduits, pipe lines and bores crossing or closer than 5'-0" horizontally and 18 inches vertically to previously tested water and sewer lines that have been previously accepted by Manatee County:~~

- ~~1. Obtain record drawing information from the County.~~
- ~~2. If roadway has been dedicated to Manatee County, obtain Right-of-Way Use Permit and copy the Project Management Department Locations Section with proposed location drawing.~~
- ~~3. Follow procedures in "Sunshine State One-Call", paying special attention to the requirements of Section VII.~~

~~E. Should water or sewer lines be damaged during the bore pipe line or casing installation, the cost of any repairs and retesting will be paid for by the utility company that installed the bore. The actual clearance between a bored casing crossing a water or sewer pipe should not be less than 18 inches.~~

1.06 DETECTION (NOT USED)

~~A. Direct buried pipe shall have 3" detectable metallic tape of the proper color placed directly above the pipe and 12" below finished grade or 6" detectable tape between 12" and 24" below finished grade.~~

~~B. Direct buried or horizontal directional drilled non-metallic pipe shall also have tracer wire installed along the pipe alignment. The tracer wire to be used shall be a solid, 10 gauge, high strength, copper clad steel wire with a polyethylene jacket of appropriate color manufactured by Copperhead Industries or Manatee County approved equal.~~

END OF SECTION

## **SECTION 02618 PIPELINE CLEANING**

### **PART 1 GENERAL**

#### **1.01 SCOPE OF WORK**

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to clean all new lines 4" and larger, and existing pipelines as specified in this specification and as indicated on the Drawings.
- B. This work shall include the furnishing and installation of all pig launching and retrieval devices and the appropriate pigs for the cleaning procedure, and all necessary excavations, shutdowns, fittings and valves required.

#### **1.02 RELATED WORK**

- A. The contractor is responsible for all necessary supply water.
- B. The contractor is responsible for all necessary bypass pumping.
- C. The contractor is responsible for the proper disposal of any materials removed from the pipe lines as a result of the cleaning procedure.

#### **1.03 SUBMITTALS**

- A. The Contractor shall submit prior to construction, a cleaning plan, Shop Drawings, and layout diagram for approval to the County.
- B. The Contractor shall submit to the County a list of materials to be furnished, and the names of suppliers.

#### **1.04 QUALIFICATIONS**

- A. The Contractor performing this work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner.
- B. The Contractor shall also be capable of providing crews as needed to complete this work without undue delay.
- C. The County reserves the right to approve or disapprove the Contractor, based on the submitted qualifications.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL**

- A. The contractor shall be responsible for furnishing pigs in sufficient numbers and sizes, of appropriate densities, coatings and configurations to properly clean the piping systems.

- B. All pigs used for the cleaning of sewer or reclaimed water lines shall not be used in the cleaning of potable water lines.

## **2.02 MATERIALS**

- A. The pig launching and retrieval equipment shall be of the latest design and construction and shall include the means to maintain constant monitoring of the in-line flows and pressures of the system being cleaned and the constant location of the cleaning pigs in the system. Launching and retrieval systems shall be fabricated, designed and manufactured according to ANSI standards and capable of withstanding working pressures of 150 psi. Launching and receiving devices shall be sized one diameter larger than the system to which it will be attached with a minimum length of 2.5 times the diameter.
- B. The contractor shall have available for immediate use an electronic pig detector for use in the system being cleaned to provide a means of tracking the passage of the pig in the system to locate areas of potential or suspected blockage and other disparities in the system.
- C. The pig shall be constructed of elastomer polyurethane with an open cell construction and a density equal to or suitable for use in the piping system being cleaned. Pig configuration shall consist of a parabolic nose with a concave base and coated with a resilient surface material that will maintain a peripheral seal and will effectively clean the piping system without over abrading the interior pipe wall. Pig characteristics shall include the ability to navigate through 90 degree bends, 180 degree turns, bi-directional fittings, full port valves, reduce its cross sectional area and return to its original design configuration and be propelled by hydraulic pressure.

## **PART 3 EXECUTION**

### **3.01 PIPELINE CLEANING**

- A. The cleaning of the pipe line shall be done by the controlled and pressurized passage of a polyurethane pig of varying dimensions, coatings and densities as determined by the County through the piping system.
- B. A series of pigs shall be entered into the system at a point as near to the beginning as is logistically and mechanically feasible.
- C. A launching assembly shall be used as the entrance point for the pig. This assembly shall allow for the following:
  - 1. The entering of pigs into the system by providing the means to induce flow from an external source, independent of the flows and pressures immediately available from the system, on the back of the pig to develop sufficient pressure to force the pig through the system.
  - 2. A means to control and regulate the flow.
  - 3. A means to monitor the flows and pressures.
  - 4. A means to connect and disconnect from the system without any disruption to the operation of the system.

- D. The pig shall be removed or discharged from the system at a point as near to the end as is logistically and mechanically feasible.
- E. The contractor shall be responsible for the retrieval of the pig at the discharge point. This may include setting a trap that will not disrupt normal flow and operations but will capture the pig and any debris. A retrieval assembly may also be used but said assembly shall be able to connect and disconnect from the system without any disruption to the operation of the system.
- F. Alternative launching and retrieval methods shall be done with the prior approval of the County.
- G. Any pig that cannot progress through the piping system shall be located by the contractor and removed by excavation of the pipe in order to remove the blockage. All pipe repairs shall be the responsibility of the contractor and shall be performed with as little disruption to the system as possible.
- H. Any increase in pressure that cannot be accounted for, i.e. fittings or valves or additional cleaning runs, shall be investigated, per the Engineers' approval, by locating the pig at the beginning of the increased pressure and excavating to determine the cause of the pressure increase. All pipe repairs shall be the responsibility of the contractor and shall be performed with as little disruption to the system as possible.
- I. Final flushing of the cleansed lines shall be performed after the last successful run of the pig as determined by the County. The contractor shall be responsible for all applicable flushing and disinfection requirements for potable water lines.

**3.02 ACCEPTANCE**

- A. The contractor shall maintain and provide a report at the end of the cleaning procedure containing the following:
  - 1. The pressures in the pipe during the pigging procedure.
  - 2. Any inline problems encountered during the procedure including all excavations with detailed locations, reason for the excavation and any corrective measures taken to the pipeline.
  - 3. A record of the pigs used, their sizes, styles and other pertinent information regarding what materials were used during the cleaning.
  - 4. An analysis of the condition of the pipeline before and after the cleaning procedure.

**END OF SECTION**

## SECTION 02640 VALVES AND APPURTENANCES

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these standards as applicable. Valves used in waterworks applications shall comply with Section 8 of NSF Standard 61 for mechanical devices.
- C. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of potable water, reclaimed water, wastewater, etc., depending on the applications.
- D. All valves and appurtenances shall be of the size shown on the drawings and, to the extent possible, all equipment of the same type on the project shall be from a single manufacturer.
- E. All valves and appurtenances shall have the name of the manufacturer, year of the valve and the working pressure for which they are designed cast in raised letters upon some visible part of the body.
- F. Special tools, if required for the normal operation or maintenance, shall be supplied with the equipment.
- G. All hand actuated buried valves shall have three-piece adjustable valve boxes and 2-inch square AWWA operating nuts. Provide stainless steel extension stems and alignment rings where needed to bring the operating nut to within 4 feet below the box lid.
- H. Water and reclaimed water system isolation valves shall be gate valves for sizes 2-inch through 12-inch and shall be butterfly valves for sizes 16-inch and larger.
- I. Isolation valves for sewer force main pipelines shall be gate valves, unless otherwise noted on the plans. Tapping valves shall be used for tapping force mains. Plug valves shall be full port, have a 100% circular cross section, and must have prior written authorization from the County for use.
- J. Valves shall open when turning the operating nut or wheel counterclockwise and shall close when turning clockwise.

- K. All bonnet bolts, gland bolts, flange connection bolts, nuts, washers, and other trim hardware exposed to the outside environment shall be stainless steel. Thrust collar tie-rod bolts shall be stainless steel. All MJ-type underground bolts, nuts, and washers shall be COR-TEN or stainless steel.
- L. All valves shall have a factory applied, holiday free, fusion bonded epoxy coating on the interior and exterior unless otherwise noted in the plans or the following specification. All other painted items exposed to sunlight, including field painted box lids, etc., shall be painted the appropriate color with an epoxy type paint.
- M. No valves with a break-way stem shall be allowed.
- N. The equipment shall include, but not be limited to, the following:
  - ~~1. Gate valves (Sec. 2.01)~~
  - ~~2. Combination Pressure Reducing and Pressure Sustaining with Check Valves Option (Sec. 2.02)~~
  - 3. Ball Valves (Sec. 2.03)
  - ~~4. Butterfly Valves (Sec. 2.04)~~
  - ~~5. Plug Valves (Sec. 2.05)~~
  - 6. Valve Actuators (Sec. 2.06)
  - ~~7. Air Release Valves (Sec. 2.07)~~
  - ~~8. Valves Boxes (Sec. 2.08)~~
  - ~~9. Corporation Stops and Saddles (Sec. 2.09)~~
  - 10. Flange Adapters and Plain End Couplings (Sec. 2.10)
  - ~~11. Hose Bibs (Sec. 2.11)~~
  - 12. Swing Check Valves (Sec. 2.12)
  - ~~13. Hydrants (Sec. 2.13)~~
  - 14. Restrained Joints (Sec. 2.14)
  - 15. Tapping Sleeves and Tapping Valves (Sec. 2.15)
  - ~~16. Tracer Wire Boxes (Sec. 2.16)~~

**1.02 SUBMITTALS**

- A. Submit to the County within 30 days after execution of the contract a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
- B. Complete shop drawings of all valves and appurtenances shall be submitted to the County for approval in accordance with the Specifications.

**1.03 TOOLS**

Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

## **PART 2 PRODUCTS**

### **2.01 GATE VALVES**

- A. Where indicated on the drawings or necessary due to locations, size, or inaccessibility, chain wheel operators shall be furnished with the valves. Such operators shall be designed with adequate strength for the valves with which they are supplied and provide for easy operation of the valve. Chains for valve operators shall be galvanized.
- B. Gate valves installed underground shall be provided with a box cast in a concrete pad and a box cover. Stainless steel or equivalent valve extension stems shall be provided to place the valve operating nut no more than 4 feet deep. One valve wrench, 6 feet in length, shall be provided for every 15 valves installed.
- C. Gate valves 2 inches to 14 inches in diameter shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509 or AWWA C515 and shall be UL listed and FM approved where applicable. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- D. The valves shall have a non-rising stainless steel stem to eliminate lead content. All bolts, nuts and washers shall be stainless steel to eliminate exterior corrosion and maintain fastener strength. Manufacturer shall use Never-Seez or equivalent during assembly of bolt and nut sets to prevent galling of similar metals. Stem seals shall be provided and shall be of the O-ring type, two above and one below the thrust collar. Valves that are located above grade and located in valve vaults shall be OS&Y with flanged joints.
- E. The wedge shall be ductile iron fully encapsulated with an EPDM rubber. The Elastomer type shall be permanently indicated on the disc or body of the valve. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
- F. The valve body, bonnet, and bonnet cover shall meet or exceed all the requirements of AWWA C515.
- G. Valves meeting AWWA C515 requirements shall be rated for an operating pressure of 250 psi and shall be tested in accordance with AWWA C515.
- H. The valves are to have 2-inch cast or ductile iron AWWA operating nuts and shall open left or counterclockwise.
- I. The valves shall be covered by a Manufacturer's 10 year warranty on manufacturer's defects and reasonable labor costs for replacement. Warranty shall become effective from the date of purchase by the end user and delivered within 30 days from the receipt of the purchase order. For publicly owned and maintained utilities, the end user is Manatee County Government.

- J. Gate valves shall be assembled and tested in a certified ISO 9001:2000 manufacturing facility within the United States and provide their certification of meeting internationally recognized quality control procedures.

**2.02 COMBINATION PRESSURE REDUCING & PRESSURE SUSTAINING WITH CHECK VALVE OPTION (Not Used)**

- ~~A. Pressure sustaining and check valve shall be pilot operated diaphragm actuated valve with cast iron body, bronze trim, and 125-pound flanged ends. The valve shall be hydraulically operated, diaphragm type globe valve. The main valve shall have a single removable seat and a resilient disc, of rectangular cross section, surrounded on three and a half sides. No external packing glands are permitted and there shall be no pistons operating the main valve or any controls. The valve shall be equipped with isolation valves to service the pilot system while permitting flow if necessary. Main valve and all pilot controls shall be manufactured in the United States of America. Valve shall be single chamber type, with stainless steel stem.~~
- ~~B. Valve shall automatically reduce pressure for the downstream distribution network and sustain a minimum pressure in the high pressure main regardless of distribution demand, and as an option, shall also close when a pressure reversal occurs for check valve operations. The pilot system shall consist of two direct acting, adjustable, spring loaded diaphragm valves.~~
- ~~C. Valve shall be cast iron or ductile iron with main valve trim of brass and bronze. The pilot control valves shall be cast brass with 303 stainless steel trim. Valve shall be similar in all respects to Cla-Val Company, Model 92-01 or a similar control valve such as Bernad Model 723, GA Industries Model 4700 or an approved equal.~~

**2.03 BALL VALVES**

- A. Ball valves for water and reclaimed water, in sizes 3/4-inch through 2-inch, shall be brass body, stem and ball per ASTM B 62, alloy 85-5-5-5, full port, full flow, 1/4-turn check, ball curb valves, rated for 300 psi, Mueller 300 (as specified in the table below), Ford B-Series, or approved equal, with compression, pack joint, flare, threaded or flanged ends as required. Ball valves for wastewater, 2-inch through 3-inch, shall be 316 stainless steel body, cap, stem and ball per ASTM A351, full port, full flow, 1/4-turn check, ball valves, steam rated for 150 psi, pressure rating 1,000 psi CWT, Apollo 76F or approved equal, with threaded or flanged ends as required.

**Curb Stops for Water and Reclaimed Water**

Pipe Material	Type of Connection	Model
HDPE	Compression x FIP	B-25170 *
HDPE	Pack Joint x FIP	P-25170 *
Copper	Compression x FIP	B-25170
Copper	Flare x FIP	B-25166
Stainless Steel	FIP x FIP Thread	B-20200
* Insert required, part number per manufacturer product information		

- B. All valves shall be mounted in such a position that valve position indicators are plainly visible. Above grade ball valves shall have a vinyl coated lever handle. Lever handle, handle nut, and lever packing gland shall be 304 or 316 stainless steel.
- C. Potable plastic service pipe material and compression and pack joint connectors shall not be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Appropriate service tubing shall apply.

## 2.04 BUTTERFLY VALVES (Not Used)

- ~~A. Butterfly valves shall conform to AWWA C504, Class 250 B, Mueller Lineseal XPII, DeZurik AWWA, Pratt HP-250II, or an approved equal.~~
- ~~B. Valve seats shall be an EPDM elastomer. Valve seats 24 inches and larger shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. Valves 20 inches and smaller shall have bonded or mechanically restrained seats as outlined in AWWA C504.~~
- ~~C. All valves shall be subject to hydrostatic and leakage tests at the point of manufacture. The hydrostatic test for Class 250 valves shall be performed with an internal hydrostatic pressure equal to 500 psi applied to the inside of the valve body of each valve. During the hydrostatic test, there shall be no leakage through the metal, the end joints or the valve shaft seal. The leakage test for the Class 250 valves shall be performed at a differential pressure of 250 psi and against both sides of the valve. No adjustment of the valve disc shall be necessary after pressure test for normal operation of valve. All valves shall be leaktight in both directions.~~
- ~~D. Butterfly valve actuators shall conform to AWWA C504. Gearing for the actuators shall be totally enclosed in a gear case. Actuators shall be capable of seating and unseating the disc against the full design pressure and shall transmit a minimum torque to the valve. Actuators shall be rigidly attached to the valve body.~~
- ~~E. The valve shaft shall be constructed of 18-8, ASTM A-276, Type 304 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one piece unit extending full size through the valve disc and valve bearing or it may be of a stub shaft design. Shaft bearings shall be teflon or nylon, self-lubricated type.~~
- ~~F. Gearing for the operators shall be totally enclosed in a gear case in accordance with paragraph 3.8.3 of the above mentioned AWWA Standard Specification.~~
- ~~G. Operators shall be capable of seating and unseating the disc against the full design pressure of velocity, as specified for each class, into a dry system downstream and shall transmit a minimum torque to the valve. Operators shall be rigidly attached to the valve body.~~

- H. ~~The manufacturer shall certify that the required tests on the various materials and on the completed valves have been satisfactory and that the valves conform with all requirements of this Specification and the AWWA standard.~~
- I. ~~Where indicated on the Drawings, extension stems, floor stands, couplings, stem guides, and floor boxes as required shall be furnished and installed.~~

## 2.05 PLUG VALVES (Not Used)

- A. ~~Plug valves shall be eccentric, non-lubricating type with integral plug and shafts and shall be furnished with end connections and with actuating mechanisms as called for on the construction plans or as otherwise required. Valves shall seal bubble tight or water drop tight in both directions when tested according to the Leakage Test method of AWWA C504 with a hydrostatic pressure of 150 psi.~~
- B. ~~Plug valves shall also be subjected to the internal, full body Hydrostatic Test of AWWA C504 at a pressure two times the rated pressure or a minimum pressure of 300 psi, whichever is greater. During the test, there shall be no leakage through the metal, or through the end joints or shaft seal, nor shall any part of the valve be deformed. Plug valves shall be Kennedy or Dezurik.~~
- C. ~~Flanged valve ends shall be faced and drilled according to ANSI B 16.1, Class 125. Mechanical joint valve ends shall conform to AWWA C111. Threaded ends shall conform to the NPT requirements of ANSI B1.20.1.~~
- D. ~~The plug valve body, bonnet and gland shall be ductile iron per ASTM A 126, Class B. The integral plug and shafts shall be cast iron ASTM A 126, Class B, or 316 stainless steel. The entire plug, except for the shafts, shall be covered with nitrile (Buna N) rubber. The rubber compound shall have been vulcanized to the metal plug and shall have a peel strength of not less than 75 pounds per inch when tested according to ASTM D 429, method B. The valve seat shall be at least 90 percent pure nickel, welded in overlay into the cast iron body. The top and bottom bearings shall be 316 stainless steel.~~
- E. ~~Plug valves shall have a full port area of 100 percent of the nominal pipe size area.~~
- F. ~~Valves shall have worm gear type actuators with 2-inch square operating nuts.~~
- G. ~~Plug valves shall be installed side ways with plug shaft horizontal so that the plug rotates upward when it opens, with the flow entering the seat end of the valve.~~
- H. ~~Plug valves shall be coated inside with Protecto 401 or amine-cured novolac ceramic epoxy or another two-part epoxy suitable for sanitary sewer service which has been approved by Manatee County.~~

## 2.06 VALVE ACTUATORS

- A. Butterfly valve and plug valve actuators (Note Used).

~~Butterfly valve and plug valve actuators shall conform to the requirements for actuators presented in AWWA C 504 and shall be either manual or motor operated. Actuators shall be capable of seating and unseating the disc against the full design pressure and velocity, as specified for each class, into a dry system downstream, and shall transmit a minimum torque to the valve. Actuators shall be rigidly attached to the valve body.~~

B. Manual Actuators.

Manual actuators shall have permanently lubricated, totally enclosed gearing with handwheel and gear ratio sized on the basis of actual line pressure and velocities. Actuators shall be equipped with handwheel, position indicator, and mechanical stop-limiting locking devices to prevent over travel of the disc in the open and closed positions. They shall turn counter-clockwise to open valves. Manual actuators shall be of the traveling nut, self-locking type or of the worm gear type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Valves located above grade shall have handwheel and position indicator, and valves located below grade shall be equipped with a 2-inch square AWWA operating nut located at ground level and cast iron extension type valve box.

~~C. Motor Actuators (Modulating)~~

- ~~(1) The motor actuated valve controller shall include the motor, actuator unit gearing, limit switch gearing, limit switches, position transmitter which shall transmit a 4-20 mA DC signal, control power transformer, electronic controller which will position the valve based on a remote 4-20 milliamp signal, torque switches, bored and key wayed drive sleeve for non-rising stem valves, declutch lever and auxiliary handwheel as a self-contained unit.~~
- ~~(2) The motor shall be specifically designed for valve actuator service using 480 volt, 60 Hertz, three phase power as shown, on the electrical drawings. The motor shall be sized to provide an output torque and shall be the totally enclosed, non-ventilated type. The power gearing shall consist of helical gears fabricated from heat treated alloy steel forming the first stage of reduction. The second reduction stage shall be a single stage worm gear. The worm shall be of alloy steel with carburized threads hardened and ground for high efficiency. The worm gear shall be of high tensile strength bronze with hobbed teeth. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout. Preference will be given to units having a minimum number of gears and moving parts. Spur gear reduction shall be provided as required.~~
- ~~(3) Limit switches and gearing shall be an integral part of the valve control. The limit switch gearing shall be made of bronze and shall be grease lubricated, intermittent type and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between fully opened valve and fully closed valve.~~

- ~~(4) The speed of the actuator shall be the responsibility of the system supplier with regard to hydraulic requirements and response compatibility with other components within the control loop. Each valve controller shall be provided with a minimum of two rotor type gear limit switches, one for opening and one for closing. The rotor type gear limit switch shall have two normally open and two normally closed contacts per rotor. Gear limit switches must be geared to the driving mechanism and in step at all times whether in motor or manual operation. Provision shall be made for two additional rotors as described above, each to have two normally open and two normally closed contacts. Each valve controller shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. It shall operate during the complete cycle without auxiliary relays or devices to protect the valve, should excessive load be met by obstructions in either direction of travel. The torque switch shall be provided with double pole contacts.~~
- ~~(5) A permanently mounted handwheel shall be provided for manual operation. The handwheel shall not rotate during electric operations, but must be responsive to manual operation at all times except when being electrically operated. The motor shall not rotate during hand operation nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve operator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. This movement from motor operation to handwheel operation shall be accomplished by a positive declutching lever which will disengage the motor and motor gearing mechanically, but not electrically. Hand operation must be reasonably fast. It shall be impossible to place the unit in manual operation when the motor is running. The gear limit switches and torque switches shall be housed in a single easily accessible compartment integral with the power compartment of the valve control. All wiring shall be accessible through this compartment. Stepping motor drives will not be acceptable.~~
- ~~(6) The motor with its control module must be capable of continuously modulating over its entire range without interruption by heat protection devices. The system, including the operator and control module must be able to function, without override protection of any kind, down to zero dead zone.~~
- ~~(7) All units shall have strip heaters in both the motor and limit switch compartments.~~
- ~~(8) The actuator shall be equipped with open stop close push buttons, an auto-manual selector switch, and indicating lights, all mounted on the actuator or on a separate locally mounted power control station.~~
- ~~(9) The electronics for the electric operator shall be protected against temporary submergence.~~
- ~~(10) Actuators shall be Limitorque L120 with Modutronic Control System containing a position transmitter with a 4-20MA output signal or equal.~~

~~D. Motor Actuators (Open-Close)~~

- ~~(1) The electronic motor-driven valve actuator shall include the motor, actuator gearing, limit switch gearing, limit switches, torque switches, fully machined drive sleeve, declutch lever, and auxiliary handwheel as a self-contained unit.~~
- ~~(2) The motor shall be specifically designed for valve actuator service and shall be of high torque totally enclosed, nonventilated construction, with motor leads brought into the limit switch compartment without having external piping or conduit box.~~
- ~~(3) The motor shall be of sufficient size to open or close the valve against maximum differential pressure when voltage to motor terminals is 10% above or below nominal voltage.~~
- ~~(4) The motor shall be prelubricated and all bearings shall be of the anti-friction type.~~
- ~~(5) The power gearing shall consist of helical gears fabricated from heat treated steel and worm gearing. The worm shall be carburized and hardened alloy steel with the threads ground after heat treating. The worm gear shall be of alloy bronze accurately cut with a hobbing machine. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout.~~
- ~~(6) Limit switches and gearing shall be an integral part of the valve actuator. The switches shall be of the adjustable rotor type capable of being adjusted to trip at any point between fully opened valve and fully closed valve. Each valve controller shall be provided with a minimum of two rotor type gear limit switches, one for opening and one for closing (influent valves require additional contacts to allow stopping at an intermediate position). The rotor type gear limit switch shall have two normally open and two normally closed contacts per rotor. Additional switches shall be provided if shown on the control and/or instrumentation diagrams. Limit switches shall be geared to the driving mechanism and in step at all times whether in motor or manual operation. Each valve actuator shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. It shall operate during the complete cycle without auxiliary relays or devices to protect the valve should excessive load be met by obstructions in either direction of travel. Travel and thrusts shall be independent of wear in valve disc or seat rings.~~
- ~~(7) A permanently mounted handwheel shall be provided for manual operation. The handwheel shall not rotate during electric operation except when being electrically operated. The motor shall not rotate during hand operation, nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve actuator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. Movement from motor operation to handwheel operation shall be accomplished by a positive declutching lever which will disengage the motor and motor gearing mechanically, but not electrically. Hand operation must be reasonably fast. It~~

~~shall be impossible to place the unit in manual operation when the motor is running.~~

- ~~(8) Valve actuators shall be equipped with an integral reversing controller and three phase overload relays, Open-Stop-Close push buttons, local-remote-manual selector switch, control circuit transformer, three phase thermal overload relays and two pilot lights in a NEMA 4X enclosure. In addition to the above, a close coupled air circuit breaker or disconnect switch shall be mounted and wired to the valve input power terminals for the purpose of disconnecting all underground phase conductors.~~
- ~~(9) The valve actuator shall be capable of being controlled locally or remotely via a selector switch integral with the actuator. In addition, an auxiliary dry contact shall be provided for remote position feedback.~~
- ~~(10) Valve A.C. motors shall be designed for operation on a 480 volt, 3-phase service. Valve control circuit shall operate from a fuse protected 120 volt power supply.~~
- ~~(11) Motor operators shall be as manufactured by Limitorque Corporation, Type L120 or approved equal.~~

## 2.07 AIR RELEASE VALVES (Not Used)

- ~~A. Air release valves shall be automatic float operated, GA Industries fig-929 for sewer applications, Fig-920 for water and reclaimed water application, or an approved equal, with inlet size and working pressure ratings as required and NPT connections.~~
- ~~B. Valve bodies shall be ductile iron per ASTM A 126, Class B. The orifice, float and linkage shall be stainless steel. The seat shall be (Buna N) nitrile elastomer.~~

## 2.08 VALVE BOXES (Note Used)

- ~~A. Buried valves shall have adjustable cast iron or HDPE valve boxes. Lids shall be cast iron drop type, and shall have "WATER", "SEWER", or "RECLAIM", as applicable, cast into the top. Lids will be painted "safety" blue for potable, purple for reclaimed, and green for sanitary sewer.~~
- ~~B. Cast iron boxes shall be two piece, or three piece, as required, screw type, Tyler Pipe, 6850 Series, Box 461-S through 668-S, with extensions, as required to make the desired box length, or an approved equal. Bottom barrel shall be 5-1/4 inches inside diameter, with a flanged bottom with sufficient bearing area to prevent settling.~~
- ~~C. HDPE boxes shall be two piece, adjustable, 1/4 inch thick minimum heavy wall, high density polyethylene, with cast iron top and stainless steel adjustable stem, Trench Adapter, as manufactured by American Flow Control, or an approved equal. Bottom barrel shall have flanged bottom to prevent settling. All bolts, screws and pins shall be stainless steel.~~

- D. ~~Reclaimed Valve Boxes shall be square 9-inch x 9-inch load bearing marked "Reclaimed Water" and painted Pantone 522C purple.~~
- E. ~~All valves shall either have operating nuts within 4 feet below the top of the lid or shall have extension stems with centering guides to provide an extended operating nut within 4 feet below the lid. Extension stems shall be fixed to the valve operating nut with a stainless steel fastener.~~
- F. ~~All potable water, sewer, and reclaimed water grade adjustment risers shall be cast iron material just like the valve box. No plastic or steel risers shall be allowed.~~
- G. ~~A centering device BoxLok or equal shall be installed in the valve box.~~
- H. ~~Stand pipe shall match color code of the system being installed, (blue for potable, Pantone purple 522 C for reclaimed, and green for sanitary sewer).~~

**2.09 CORPORATION STOPS AND SADDLES (Not Used)**

- A. ~~Corporation stops for connections to ductile iron and PVC water and reclaimed water mains shall be all red brass, alloy 85-5-5-5, per ASTM B 62, and shall conform to AWWA C800. 1-inch through 2-inch corporation stops shall be ball type, 300 psi working pressure rated, with AWWA MIP threaded inlets and compression, pack joint, flare, or FIP threaded joint outlets, Mueller as shown in the table below, or an approved equal. All joints made to CTS size HDPE tubing shall use stainless steel insert stiffeners.~~

**Corporation Stops**

Pipe Material	Type of Connection	Mueller 300 Model
HDPE	Compression x AWWA IP Thread	B-25028 (Saddle) *
HDPE	Compression x AWWA Taper Thread	B-25008 (Direct Tap) *
HDPE	Pack Joint x AWWA IP Thread	P-25028 (Saddle) *
HDPE	Pack Joint x AWWA Taper Thread	P-25008 (Direct Tap) *
Copper	Compression x AWWA IP Thread	B-25028 (Saddle)
Copper	Pack Joint x AWWA Taper Thread	B-25008 (Direct Tap)
Copper	Pack Joint x AWWA IP Thread	P-25028 (Saddle)
Copper	Pack Joint x AWWA Taper Thread	P-25008 (Direct Tap)
Copper	Flare x AWWA IP Thread	B-25025 (Saddle)
Copper	Flare x AWWA Taper Thread	B-25000 (Direct Tap)
Stainless Steel	FIP Thread x AWWA IP Thread	B-20046 (Saddle)
Stainless Steel	FIP Thread x AWWA Taper Thread	B-20045 (Direct Tap)
* Insert required, part number per manufacturer product information		

- B. ~~Potable plastic service pipe material and compression and pack joint connectors shall not be used in soil that is contaminated with low molecular weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Appropriate service tubing shall apply.~~
- C. ~~Water and reclaimed water service connections to PVC and DIP mains shall be made using red brass saddles, alloy 85-5-5-5, per ASTM B 62. Straps, washers and nuts shall be brass or stainless steel. No ductile iron, cast iron or steel saddles~~

~~will be allowed. Saddles shall be Smith Blair 325 Bronze saddles with Stainless Steel or brass extra wide strap or equivalent.~~

- ~~D. Connections to PVC sanitary force mains for services up to 2 inches shall be made using Romac Style 306 double bolt stainless steel service saddles or equivalent.~~
- ~~E. Service and air release valve (ARV) connections to HDPE water, reclaimed water and sewer mains may be made using Romac Style 306H saddle or approved equal. All saddles shall be properly sized per the manufacturer product information and be installed according to the manufacturer's written instructions. Connections to HDPE mains shall not be made using narrower saddles similar to the Smith-Blair 325.~~

## 2.10 FLANGED ADAPTERS AND PLAIN END COUPLINGS

Plain end couplings and adapters shall be fusion-bonded epoxy coated carbon steel with Ethylene Propylene Diene Monomer (EPDM) rubber gaskets and stainless steel nuts, bolts and spacers. ~~Acrylonitrile butadiene (NBR) gaskets shall be used for potable water mains that are located in soil that is contaminated with low molecular weight petroleum products or non-chlorinated organic solvents or non-aromatic organic solvents. Fluorocarbon (FKM) gaskets shall be used for potable water mains that are located in soil that is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons. Fluorocarbon (FKM) gaskets shall be used for potable water mains if the soil is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons, and is also contaminated with low molecular weight petroleum products or organic solvents.~~ Couplings shall be Dresser Style 38, or another approved equal. Flange adapters shall have a plain end compression seal similar to the style 38, with an ANSI 125 Class flange on the opposite end, and shall be Dresser Style 128W or an approved equal. Stainless steel backup rings shall be used for force mains that are located in corrosive environments including wetwells and valve vaults.

## 2.11 HOSE BIBS (Not Used)

~~Hose bibs shall be 3/4" or 1" brass, polished chromium plated brass, with vacuum breaker as noted on the drawings.~~

## 2.12 SWING CHECK VALVES

- A. Check valves shall be swing type, weighted lever, conforming to AWWA C508. Valves shall be iron-body, bronze-mounted, single disk, 175 psi working pressure for 2- through 12-inch, 150 psi for 14- through 30-inch, with ANSI B16.1 Class 125 flanged ends, by Mueller; No. A-2600-6-01 (sewer), No. A-2602-6-01 (water), or AVK Series 41, or an approved equal.
- B. When there is no flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.
- C. Check valves shall have bronze seat and body rings, extended bronze or stainless steel hinge pins and stainless steel nuts and bolts on bolted covers.

- D. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an extended hinge arm with outside lever and weight.

## 2.13 HYDRANTS (Not Used)

~~Hydrants shall be dry barrel, nostalgic style, and shall be AVK Series 2780, American Darling B-84-B, Mueller Super Centurian 250, or approved equal and shall conform to AWWA C502 and UL/FM certified, and shall in addition meet the specific requirements and exceptions which follow:~~

- ~~A. Hydrants shall be according to manufacturer's standard pattern or nostalgic style and of standard size, and shall have one 5-inch Storz connection or equivalent with two 2½-inch hose nozzles.~~
- ~~B. Hydrant inlet connections shall have mechanical joints for 6-inch pipe.~~
- ~~C. Hydrant valve opening shall have an area at least equal to that area of a 5 1/4-inch minimum diameter circle and be obstructed only by the valve rod. Each hydrant shall be able to deliver 500-gpm minimum through its two 2 1/2-inch hose nozzles when opened together with a loss of not more than 2-psi in the hydrant per AWWA C502.~~
- ~~D. The upper and lower stem rod shall be stainless steel and shall have a breakable stem rod coupling of stainless steel, or cast iron or ductile iron with a fusion bonded epoxy coating, with stainless steel pins and clips.~~
- ~~E. Hydrants shall be hydrostatically tested as specified in AWWA C502 and shall be rated at 250 psi minimum.~~
- ~~F. The operating nut shall be 1½-inch pentagon-shaped with a protective weather cover, and open counter-clockwise.~~
- ~~G. All nozzle threads shall be American National Standard.~~
- ~~H. Each nozzle cap shall be provided with a Buna-N rubber washer.~~
- ~~I. All hydrants shall be traffic break-away type and allow for 360-degree rotation to position the Storz connection/nozzle in the desired direction after installation.~~
- ~~J. Hydrants must be capable of being extended without removing any operating parts.~~
- ~~K. Hydrant extensions shall be fusion bonded epoxy coated inside and outside with a stainless steel stem. The breakaway coupling can be fusion bonded epoxy coated or stainless steel. Only one hydrant extension is allowed per hydrant.~~
- ~~L. Weepholes shall be excluded from fire hydrants.~~

- ~~M. Hydrant main valve closure shall be of the compression type opening against the pressure and closing with the pressure. The main valve shall be faced or covered with EPDM elastomer, which shall seat on a bronze ring.~~
- ~~N. Hydrant bonnets, weather cover, nozzle section, caps and shoe shall be cast iron or ductile iron, and shall be holiday free fusion-bonded epoxy coated at the factory, per AWWA C550, inside and outside. Lower barrel shall be fusion-bonded epoxy coated inside and outside. Aboveground parts shall also have a top coat of Sherwin-Williams Acrolon 218 HS acrylic polyurethane or approved equal; color Safety Yellow for fire hydrants that are connected to the potable water system or Pantone 522C purple for fire hydrants that are connected to the reclaimed water system.~~
- ~~O. Exterior nuts, bolts and washers shall be stainless steel. Bronze nuts may be used below grade.~~
- ~~P. All internal operating parts shall be removable without requiring excavation.~~

## 2.14

### RESTRAINED JOINTS

- A. Pipe joints shall be restrained by ~~poured-in-place concrete thrust blocks or by other~~ mechanical methods, including tie rods, Stargrip and Allgrip, as manufactured by Star Pipe Products or Megaflange and 2000 PV, as manufactured by EBAA Iron Sales. Flanged joints may be used above ground.
- B. All T-bolts, bolts, nuts, washers, and all thread rods shall meet ASTM A-588 requirements (Cor-ten or equivalent) “weathering steel” or be 316 stainless steel. The use of rebar with welded thread is prohibited.  
  
A certification from the supplier shall be provided to the County during the shop drawing review process ensuring all T-bolts, bolts, nuts, washers, and all thread rods meet the A-588 requirements and shall state the project name and contractor in the certification letter. If stainless steel is to be used, no certification letter is required.
- C. Restrained joints may also be Lok-Ring, as manufactured by American Cast Iron Pipe Company, or an approved equal.
- D. Restrained joint designs, which require wedges and/or shims to be driven into the joints in order to disassemble the pipe shall not be allowed.

## 2.15

### TAPPING SLEEVES AND VALVES

- A. Tapping valves shall meet the requirements of AWWA C509/C515 with ductile iron body and shall be rated for a pressure of 250 psi. The valves shall be flanged with alignment ring by mechanical joint with a nonrising stainless steel stem. All bolts, nuts and washers shall be stainless steel. Manufacturer shall use Never-Seez or equivalent during assembly of bolt

and nut sets to prevent galling of similar metals. Stem seals shall be provided and shall be of the O-ring type, two above and one below the valve's thrust collar. Valve shall be designed for vertical burial and shall open counterclockwise. Operating nut shall be AWWA standard 2-inch square for valves 2 inches and up. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve to accommodate full size shell cutter. Gaskets shall cover the entire area of the flange surface and be 1/8-inch minimal thickness of red rubber. The wedge shall be ductile iron fully encapsulated with EPDM rubber. All bolts, nuts and washers between the sleeve and valve shall be stainless steel.

- B. Tapping sleeves and saddles shall be stainless steel, seal to the pipe by the use of a gasket compounded for water or sewer, and shall be able to withstand a pressure test of 180 psi for water lines or 150 psi for sewer force mains for one hour with no leakage in accordance with AWWA C110. A stainless steel 3/4-inch NPT test plug shall be provided for pressure testing. All bolts joining the two halves shall be stainless steel and shall be included with the sleeve or saddle; Romac SST III or Romac SST-H.

## 2.16 TRACER WIRE TEST STATION BOXES (Not Used)

~~Tracer wire test station boxes shall be provided at plug valves, butterfly valves, blowoff valves, gate valves, fire hydrants and backflow preventers as indicated in these Standards. Tracer wire test station boxes for yard service shall be 2 ½ inch diameter, 15 inch length, ABS plastic with a cast iron rim and lid, P200NFGT as manufactured by Bingham & Taylor, or equal approved by Manatee County. Where test boxes will be in streets or subject to vehicular traffic, use B&T Model P525RD, 5 ¼ inch diameter or equal, centered in a separate concrete pad similar to a valve box pad.~~

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in the location shown, true to alignment and rigidly supported. Any damage occurring to the above items before they are installed shall be repaired to the satisfaction of the County.
- B. After installation, all valves and appurtenances shall be tested at least two hours at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the County.
- C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.

- D. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections.
- E. Flanged joints and mechanical joints shall be made with high strength, low alloy Corten or 316 stainless steel bolts, nuts and washers.
- F. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.
- G. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8". Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6" from the end.
- H. Valve boxes with concrete bases shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and the top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

### 3.02 HYDRANTS (Not Used)

- ~~A. Hydrants shall be set at the locations designated by the County and/or as shown on the Drawings and shall be bedded on a firm foundation. A drainage pit on crushed stone as shown on the Drawings shall be filled with gravel or crushed stone and satisfactorily compacted. During backfilling, additional gravel or crushed stone shall be brought up around and 6" over the drain port. Each hydrant shall be set in true vertical alignment and shall be properly braced. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the plans. Felt paper shall be placed around the hydrant elbow prior to placing concrete. CARE MUST BE TAKEN TO INSURE THAT CONCRETE DOES NOT PLUG THE DRAIN PORTS. Concrete used for backing shall be as specified herein.~~
- ~~B. When installations are made under pressure, the flow of water through the existing main shall be maintained at all times. The diameter of the tap shall be a minimum of 2" less than the inside diameter of the branch line.~~
- ~~C. The entire operation shall be conducted by workmen thoroughly experienced in the installation of tapping sleeves and valves, and under the supervision of qualified personnel furnished by the manufacturer. The tapping machine shall be furnished by the Contractor if tap is larger than 12" in diameter.~~
- ~~D. The Contractor shall determine the locations of the existing main to be tapped to~~

~~confirm the fact that the proposed position for the tapping sleeve will be satisfactory and no interference will be encountered such as the occurrence of existing utilities or of a joint or fitting at the location proposed for the connection. No tap will be made closer than 30" from a pipe joint.~~

~~E. Tapping valves shall be set in vertical position and be supplied with a 2" square operating nut for valves 2" and larger. The valve shall be provided with an oversized seat to permit the use of full sized cutters.~~

~~F. Tapping sleeves and valves with boxes shall be set vertically or horizontally as indicated on the Drawings and shall be squarely centered on the main to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping operation. Sleeves shall be no closer than 30" from water main joints. Thrust blocks shall be provided behind all tapping sleeves. Proper tamping of supporting earth around and under the valve and sleeve is mandatory. After completing the tap, the valve shall be flushed to ensure that the valve seat is clean.~~

### 3.03 SHOP PAINTING

Ferrous surfaces of valves and appurtenances shall receive a coating of rust-inhibitive primer. All pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.

### 3.04 FIELD PAINTING

All metal valves and appurtenances specified herein and exposed to view shall be painted ~~green, safety blue.~~ Refer to the drawings and Coating specification for additional information.

### 3.05 INSPECTION AND TESTING

All pipelines shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipelines shall be subjected to a hydrostatic pressure and leak testing. Refer to Manatee County Public Works Utility Standards Part 1-Utility Standards Manual Section 1.8.7. Prior to testing, the pipe lines shall be supported in a manner approved by the County to prevent movement during tests.

All leaks shall be repaired and lines retested as approved by the County.

**END OF SECTION**

## SECTION 02720 SANITARY SEWER BYPASS PUMPING

### PART 1 GENERAL

#### 1.01 SCOPE

The Contractor shall furnish all labor, materials, equipment and incidentals required to maintain existing and anticipated flows within the affected portion of the collection system throughout the construction period. All existing facilities, including MLS 27A, shall remain in continuous operation throughout the construction process.

#### 1.02 PUBLIC IMPACTS

The contractor shall not create a public nuisance due to excessive noise or dust, nor impact the public with flooding of adjacent lands, discharge of raw sewage, or release of other potential hazards, nor shall he encroach on or limit access to adjacent lands. No extra charge may be made for increased costs to the contractor due to any of the above.

#### 1.03 SUBMITTALS

- A. The Contractor shall, within 30 days of the date of the Notice to Proceed, submit to the Project Manager a detailed Pumping Plan for **temporarily bypassing flow around MLS 27A.** ~~each site by-pass pumping will be needed.~~ The Pumping Plan shall address all measures and systems to prevent a sanitary sewer overflow (SSO) as defined by the EPA. The Plan shall include as a minimum:
1. Working drawings and sketches showing work location, pump location, piping layout & routing. Show all proposed encroachment and access impacts on adjacent properties or facilities.
  2. Pump, control, alarm and pipe specifications or catalog cuts. Detailed sketch of controls and alarm system.
  3. Power requirements and details on methods to provide by-pass power or fueling.
  4. Calculation and determination of response times to prevent an SSO after a high water alarm. If anticipated peak flows are 750 G.P.M. or greater, an operator is required on site at all times pump is in service. If the anticipated peak flows are less than 750 G.P.M. an operator may not be required to be on site at all times; show operator on-site schedule.
  5. Procedures to be taken in case of power, pump, or piping failures; including contact names and numbers for emergency notifications.
  6. Frequency and specific responsibility for monitoring pump operation, fuel levels, pump maintenance and entire length of piping.

**PART 2 PRODUCTS**

**2.01 EQUIPMENT**

A. Pumps:

1. By-pass pumping system shall consist of at least a primary pump and a backup pump. Each pump shall have a minimum pumping capacity of 100% of the anticipated peak flows. When bypassing a pump station, 100% of the lift station capacity (G.P.M. & T.D.H) shall be provided.
2. Pumps shall be low noise or sound attenuated. The noise level at any operating condition, in any direction, shall not exceed 70dBA at a distance of twenty three (23) feet (7 meters) from the pump and/or power source.

B. Controls:

The by-pass pump system shall be equipped with automatic controls and an alarm system. The automatic controls will automatically start the backup pump in the event of a high water condition or failure of the primary pump. The alarm system will immediately notify the Contractor of a pump failure or high water condition.

C. Pipe:

Pipe shall be of adequate size and capacity to match the pumps. Pipe type and materials will depend on the particulars of the site conditions, and shall be detailed in the Pumping Plan. Contractor will provide all connections.

**PART 3 EXECUTION**

**3.01 SITE CONDITIONS**

Site conditions will vary by site. Contractor is responsible to determine and address requirements such as traffic control, excavation, connections & fittings, impacts on access to adjacent properties, routing and support of by-pass piping, etc., in the Pumping Plan.

**3.02 ON-SITE MONITORING**

- A. All by-pass operations where the anticipated flow rates are 750 G.P.M or greater shall require an employee on-site at all times (full-time on-site monitoring attended by personnel experienced with the pumps and controls, with demonstrated ability to monitor, turn on & off, and switch between pumps while the by-pass pump system is in service.
- B. By-pass operations where the anticipated flow rates are less than 750 G.P.M may not require an employee on-site at all times while the by-pass pump system is in operation. The Contractor shall have personnel experienced with the pumps and controls on site within the calculated response time to prevent an SSO after a high water alarm.

- C. During by-pass operations, the Contractor shall have posted on site with the permit, a copy of the approved Plan and the name and 24 hour contact number of the primary response person, the job site superintendent, and the construction company owner.

**3.03 OPERATIONS**

- A. The Contractor is responsible for securing and providing power, fuel, site security, traffic control and all other supplies, materials and permits required for the by-pass pumping.
- B. Contractor shall demonstrate automatic pump switching and alarm system to the satisfaction of: the County inspector, Project Manager, or Lift Stations Superintendent prior to beginning by-pass pumping. Satisfactory demonstration shall be documented by the inspector's, PM's or Lift Station Superintendent's dated signature on the posted copy of the approved Pumping Plan.

**3.04 DAMAGE RESTORATION & REMEDIATION**

- A. The Contractor shall be responsible for any pre-pump notifications, all restoration ~~of to~~ pre-pump conditions and any damage caused by by-pass operations.
- B. Should there be an SSO caused by or as a direct result of the by-pass pumping, the contractor is responsible for all immediate & long term response, notifications, clean up, mitigation, etc. Copies of all written response plans, notifications, documentation, mitigation plans, etc., shall be submitted to the County Project Manager.

**END OF SECTION**

## DIVISION 3 CONCRETE

### SECTION 03200 CONCRETE REINFORCEMENT

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED

- A. Reinforcing steel bars and welded steel wire fabric for cast-in-place concrete, complete with tie wire.
- B. Support chairs, bolsters, bar supports and spacers, for reinforcing.

##### 1.02 QUALITY ASSURANCE

Perform concrete reinforcing work in accordance with ACI 318 unless specified otherwise in this Section.

##### 1.03 REFERENCES

- A. ACI 318 - Building Code Requirements for Reinforced Concrete.
- B. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- C. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- D. CRSI 63 - Recommended practice for placing reinforcing bars.
- E. CRSI 65 - Recommended practice for placing bar supports, specifications and nomenclature.
- F. ACI 315 - American Concrete Institute - Manual of Standard Practice.

##### 1.04 SHOP DRAWINGS

- A. Submit shop drawings in accordance with Contract Documents.
- B. Indicate bar sizes, spacings, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules and supporting and spacing devices.
- C. Manufacturer's Literature: Manufacturer's specifications and installation instructions for splice devices.

#### PART 2 PRODUCTS

##### 2.01 REINFORCING

- A. Reinforcing steel: Grade 60, Minimum Yield Strength 60,000 psi, deformed billet steel bars, ASTM A615; plain finish.
- B. Welded steel wire fabric: Deformed wire, ASTM A497; smooth wire ASTM A185 in flat

sheets; plain finish.

## **2.02 ACCESSORY MATERIALS**

- A. Tie wire: Minimum 16 gauge annealed type, or patented system accepted by County.
- B. Chairs, bolsters, bar supports, spacers: Sized and shaped for strength and support of reinforcing during construction conditions.
- C. Special chairs, bolsters, bar supports, spacers (where adjacent to architectural concrete surfaces): Stainless steel type sized and shaped as required.

## **2.03 FABRICATION**

- A. Fabricate concrete reinforcing in accordance with ACI 315.
- B. Locate reinforcing splices, not indicated on Drawings, at points of minimum stress. Location of splices shall be reviewed by County.
- C. Where indicated, weld reinforcing bars in accordance with AWS D12.1.

## **PART 3 EXECUTION**

### **3.01 PLACEMENT**

- A. Reinforcing shall be supported and secured against displacement. Do not deviate from true alignment.
- B. Before placing concrete, ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings which would reduce bond to concrete.

### **3.02 QUALITY ASSURANCE**

- A. Acceptable Manufacturers: Regularly engaged in manufacture of steel bar and welded wire fabric reinforcing.
- B. Installer Qualifications: Three years experience in installation of steel bar and welded wire fabric reinforcing.
- C. Allowable Tolerances:
  - 1. Fabrication:
    - a. Sheared length: +1 in.
    - b. Depth of truss bars: +0, -1/2 in.
    - c. Stirrups, ties and spirals:  $\pm 1/4$  in.
    - d. All other bends:  $\pm 1$  in.
  - 2. Placement:
    - a. Concrete cover to form surfaces:  $\pm 1/4$  in.
    - b. Minimum spacing between bars: 1 in.
    - c. Top bars in slabs and beams:
      - (1) Members 8 in. deep or less:  $\pm 1/4$  in.
      - (2) Members more than 8 in.:  $\pm 1/2$  in.
    - d. Crosswise of members: Spaced evenly within 2 in. of stated separation.

- e. Lengthwise of members: Plus or minus 2 in.
3. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1 bar diameter.

### **3.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Handle and store materials to prevent contamination.

### **3.05 INSTALLATION**

- A. Placement:
  1. Bar Supports: CRSI 65.
  2. Reinforcing Bars: CRSI 63.
- B. Steel Adjustment:
  1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
  2. Do not move bars beyond allowable tolerances without concurrence of County.
  3. Do not heat, bend, or cut bars without concurrence of County.
- C. Splices:
  1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
  2. Splice devices: Install in accordance with manufacturer's written instructions.
  3. Do not splice bars without concurrency of County, except at locations shown on Drawings.
- D. Wire Fabric:
  1. Install in longest practicable length.
  2. Lap adjoining pieces one full mesh minimum, and lay splices with 16 gauge wire.
  3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
  4. Offset end laps in adjacent widths to prevent continuous laps.
- E. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.
- F. Protection During Concreting: Keep reinforcing steel in proper position during concrete placement.

**END OF SECTION**

## **SECTION 03300 CAST-IN-PLACE CONCRETE**

### **PART 1 GENERAL**

#### **1.01 WORK INCLUDED**

Poured-in-place concrete slabs, thrust blocks, pile caps and pipe support cradles.

#### **1.02 QUALITY ASSURANCE**

Perform cast-in-place concrete work in accordance with ACI 318, unless specified otherwise in this Section.

#### **1.03 TESTING LABORATORY SERVICES**

- A. Inspection and testing will be performed by the testing laboratory currently under contract to Manatee County in accordance with the Contract Documents.
- B. Provide free access to work and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of work.
- D. Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.
- E. Three concrete test cylinders will be taken for every 100 cu. yds. or part thereof of each class of concrete placed each day. Smaller pours shall have cylinders taken as directed by the County.
- F. One slump test will be taken for each set of test cylinders taken.

#### **1.04 REFERENCES**

- A. ASTM C33 - Concrete Aggregates
- B. ASTM C150 - Portland Cement
- C. ACI 318 - Building Code Requirements for Reinforced Concrete
- D. ASTM C260 - Air Entraining Admixtures for Concrete
- E. ASTM C94 - Ready-Mixed Concrete
- F. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
- G. ACI 305 - Recommended Practice for Hot Weather Concreting

### **PART 2 PRODUCTS**

#### **2.01 CONCRETE MATERIALS**

- A. Cement: Moderate-Type II, High early strength-Type III, Portland type, ASTM C150.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.

## **2.02 ADMIXTURES**

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494 Type A - water reducing admixture.

## **2.03 ACCEPTABLE MANUFACTURERS**

Acceptable Products:

1. Pozzolith
2. WRDA

## **2.04 ACCESSORIES**

Non-shrink grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2400 psi in 2 days and 7000 psi in 28 days.

## **2.05 CONCRETE MIXES**

- A. Mix concrete in accordance with ASTM C94.
- B. Provide concrete of following strength:
  1. Required concrete strengths as determined by 28 day cylinders shall be as shown on the Drawings, but shall not be less than 3000 psi.
  2. Select proportions for normal weight concrete in accordance with ACI 301 3.8 Method 1, Method 2, or Method 3. Add air entraining agent to concrete to entrain air as indicated in ACI 301 Table 3.4.1.
  3. All mixes shall be in accordance with FDOT Specifications.
- C. Use set-retarding admixtures during hot weather only when accepted by County.
- D. Add air entraining agent to concrete mix for concrete work exposed to exterior.

## **2.06 FORMS**

- A. Forms shall be used for all concrete masonry, including footings. Form shall be so constructed and placed that the resulting concrete will be of the shape, lines, dimensions, appearance and to the elevations indicated on the Drawings.
- B. Forms shall be made of wood, metal, or other approved material. Wood forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots; where used for expose surfaces, boards shall be dressed and matched. Plywood shall be sanded smooth and fitted with tight joints between panels. Metal forms

shall be of an approved type for the class of work involved and of the thickness and design required for rigid construction.

- C. Edges of all form panels in contact with concrete shall be flush within 1/32-inch and forms for plane surfaces shall be such that the concrete will be plane within 1/16-inch in four feet. Forms shall be tight to prevent the passage of mortar and water and grout.
- D. Forms for walls shall have removable panels at the bottom for cleaning, inspection and scrubbing-in of bonding paste. Forms for walls of considerable height shall be arranged with tremies and hoppers for placing concrete in a manner that will prevent segregation and accumulation of hardened concrete on the forms or reinforcement above the fresh concrete.
- E. Molding or bevels shall be placed to produce a 3/4-inch chamfer on all exposed projecting corners, unless otherwise shown on the Drawings. Similar chamfer strips shall be provided at horizontal and vertical extremities of all wall placements to produce "clean" separation between successive placements as called for on the Plans.
- F. Forms shall be sufficiently rigid to withstand vibration, to prevent displacement or sagging between supports and constructed so the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.
- G. Forms, including new pre-oiled forms, shall be oiled before reinforcement is placed, with an approved nonstaining oil or liquid form coating having a non-paraffin base.
- H. Before form material is re-used, all surfaces in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn, all protrusions smoothed and in the case of wood forms pre-oiled.
- I. Form ties encased in concrete shall be designed so that after removal of the projecting part, no metal shall be within 1-inch of the face of the concrete. That part of the tie to be removed shall be at least 1/2-inch diameter or be provided with a wood or metal cone at least 1/2-inch in diameter and 1-inch long. Form ties in concrete exposed to view shall be the cone-washer type equal to the Richmond "Tyscru". Throughbolts or common wire shall not be used for form ties.

### **PART 3 EXECUTION**

#### **3.01 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304.
- B. Notify County minimum 24 hours prior to commencement of concreting operations.
- C. Verify anchors, seats, plates and other items to be cast into concrete are placed, held securely and will not cause hardship in placing concrete. Rectify same and proceed with work.
- D. Maintain records of poured concrete items. Record date, location of pour, quantity, air temperature and test samples taken.
- E. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

- F. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.
- G. Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- H. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solidly with non-shrink grout.
- I. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify County upon discovery.
- J. Conform to ACI 305 when concreting during hot weather.

### **3.02 SCREEDING**

Screed surfaces level, maintaining flatness within a maximum deviation of 1/8" in 10 feet.

### **3.03 PATCHING**

Allow County to inspect concrete surfaces immediately upon removal of forms. Patch imperfections as directed. All patching procedures shall be submitted to and approved by the County prior to use.

### **3.04 DEFECTIVE CONCRETE**

- A. Modify or replace concrete not conforming to required lines, details and elevations.
- B. Repair or replace concrete not properly placed resulting in excessive honeycomb and other defects. Do not patch, fill, touch-up, repair, or replace exposed architectural concrete except upon express direction of County for each individual area.

### **3.05 CONCRETE FINISHING**

Provide concrete surfaces to be left exposed, columns, beams and joists with smooth rubbed finish.

### **3.06 CURING AND PROTECTION**

Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for a period of 7 days or until concrete strengths reaches 75% of the 28 day design strength.

Protection against moisture loss may be obtained with spray on curing compounds or plastic sheets. Protection against heat or cold may be obtained with insulated curing blankets or forms.

### **3.07 CONCRETE DRIVEWAY RESTORATION**

Concrete driveways shall be restored with 6 inches of 3,000 psi concrete with W2.5 X W2.5, 6X6 wire mesh. Place ½ inch expansion joint between back of curb and new concrete. Area beneath restoration shall be mechanically tamped prior to placing concrete.

**3.08****CONCRETE SIDEWALK RESTORATION**

Concrete sidewalks across driveways shall be restored with 6 inches of 3,000 psi concrete with W2.5 X W2.5, 6X6 wire mesh. Place ½ inch expansion joint between back of curb and new concrete. Area beneath restoration shall be mechanically tamped prior to placing concrete.

Concrete sidewalks outside of driveways shall be restored with 4 inches of 3,000 psi concrete per FDOT Design Standards, Sections 522 & 310

**END OF SECTION**

## SECTION 03350 CONCRETE FINISHES

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required to finish cast-in-place concrete surfaces as specified herein.

#### 1.02 SUBMITTALS

Submit to the County as provided in the Contract Documents, the proposed chemical hardener manufacturer's surface preparation and application procedures.

#### 1.03 SCHEDULE OF FINISHES

- A. Concrete for the Project shall be finished in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another Section.
- B. The base concrete for the following conditions shall be finished as noted and as further specified herein:
  - 1. Exterior, exposed concrete slabs and stairs - broomed finish.
  - 2. Interior, exposed concrete slabs - steel trowel finish.
  - 3. Concrete on which process liquids flow or in contact with sludge - steel trowel finish.
  - 4. Concrete where not exposed in the finished work and not scheduled to receive an additional applied finish or material - off-form finish.
  - 5. Provide concrete surfaces to be left exposed such as walls, columns, beams and joists with smooth rubbed finish.

#### 1.04 RESPONSIBILITY FOR CHANGING FINISHES

- A. The surface finishes specified for concrete to receive additional applied finishes or materials are the finishes required for the proper application of the actual products specified under other Sections. Where different products are approved for use, it shall be the Contractor's responsibility to determine if changes in finishes are required and to provide the proper finishes to receive these products.
- B. Changes in finishes made to accommodate product different from those specified shall be performed at no additional cost to the County. Submit the proposed new finishes and their construction methods to the County for approval.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Portland cement and component materials required for finishing the concrete surfaces shall be as specified in the Contract Documents.
- B. Hardener shall be Lapidolith as manufactured by Sonneborn Building Products or approved equal. Hardener shall be used on all floors, stair treads and platforms.

## **PART 3 EXECUTION**

### **3.01 FORMED SURFACES**

- A. Forms shall not be stripped before the concrete has attained a strength of at least 50 percent of the ultimate design strength. This is equivalent to approximately five "100 day-degrees" of moist curing.
- B. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications, or corners when removing the forms or doing any work adjacent thereto.
- C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the County.
- D. Off-form finish. Fins and other projections shall be removed as approved. Tie cone holes and other minor defects shall be filled with non-shrink grout specified under the Contract Documents.

### **3.02 FLOORS AND SLABS**

- A. Floors and slabs shall be screeded to the established grades and shall be level with a tolerance of 1/8-inch when checked with a 10 foot straight edge, except where drains occur, in which case floors shall be pitched to drains as indicated. Failure to meet either of above shall be cause for removal, grinding, or other correction as approved by the County.
- B. Following screeding as specified above, power steel trowel as follows:
  - 1. Immediately after final screeding, a dry cement/sand shake in the proportion of 2-sacks of portland cement to 350-pounds of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 pounds per 1,000 square feet of floor. Neat, dry cement shall not be sprinkled on the surface. This shake shall be thoroughly floated into the surface with an approved disc type power compacting machine weighing at least 200 pounds if a 20-inch disc is used or 300 pounds if a 24-inch disc is used (such as a "Kelly Float" as manufactured by the Weisner-Rapp Corporation of Buffalo, New York). A mechanical blade-type float or trowel is not acceptable for this work.  
NOTE: This operation (application of the cement/sand shake) may be eliminated at the discretion of the County if the base slab concrete exhibits adequate fattiness and homogeneity.
  - 2. In lieu of power steel troweling, small areas as defined by the County shall be compacted by hand steel troweling with the dry cement/sand shake as ordered.
  - 3. The floor or slab shall be compacted to a smooth surface and the floating operation continued until sufficient mortar is brought to the surface to fill all voids. The surfaces shall be tested with a straight edge to detect high and low spots which shall be eliminated.
  - 4. Compaction shall be continued only until thorough densification is achieved and a small amount of mortar is brought to the surface. Excessive floating shall be avoided.
- C. After Paragraph 3.02 A and B procedures are accomplished, floors and slabs for particular conditions shall be completed as scheduled in one of the following finishes:
  - 1. Wood float finish. Hand wood float, maintaining the surface tolerance to provide a

- grained, nonslip finish as approved.
  - 2. Broomed finish. Hand wood float maintaining the surface tolerance and then broom with a stiff bristle broom in the direction of drainage to provide a nonslip finish as approved.
  - 3. Steel trowel finish. Hand steel trowel to a perfectly smooth, hard even finish free from high or low spots or other defects as approved.
- D. Floors, stair treads and platforms shall be given a floor hardener. Application shall be according to manufacturer's instructions.

**3.03 APPROVAL OF FINISHES**

- A. All concrete surfaces will be inspected during the finishing process by the County.
- B. Surfaces which, in the opinion of the County, are unsatisfactory shall be refinished or reworked until approved by the County.

**END OF SECTION**

## SECTION 03600 GROUTING

### PART 1 - GENERAL

1-1. SCOPE. This section covers procurement and installation of grout. Unless otherwise specified, only nonshrink grout shall be furnished.

Epoxy grouting and adhesive anchoring of anchor bolts, threaded rod anchors, and reinforcing bars is covered in the Anchorage in Concrete and Masonry section. Grouting of masonry is covered in the Masonry section.

1-2. SUBMITTALS. A letter of certification indicating the types of grout to be supplied and the intended use of each type shall be submitted in accordance with the Submittals Procedures section.

1-3. DELIVERY, STORAGE, AND HANDLING. Materials shall be handled, transported, and delivered in a manner which will prevent damage of any kind. Materials shall be protected from moisture.

### PART 2 - PRODUCTS

#### 2-1. MATERIALS.

Nonshrink Grout	Precision cementitious grout with demonstrated non-shrinking properties, minimum 28 day compressive strength of 9000 psi; L&M "Crystex", BASF "Masterflow 928", Sika "SikaGrout 328", or Dayton Superior "Sure-Grip High Performance Grout".
Water	Clean and free from deleterious substances.

2-2. CEMENTITIOUS GROUT. Cementitious grout shall be furnished factory premixed so that only water is added at the jobsite.

2-3. EPOXY GROUT. Epoxy grout shall be used in lieu of cementitious grout when required by the equipment manufacturer for performance or warranty requirements. Epoxy grout shall be a three component system consisting of a Part A (resin), Part B (hardener) and Part C (aggregate). All three components shall be products of the same manufacturer and be compatible. Epoxy grout products and installation procedures shall be submitted to Engineer for approval.

## PART 3 - EXECUTION

### 3-1. CEMENTITIOUS GROUT INSTALLATION.

3-1.01. Preparation. The concrete foundation to receive cementitious grout shall be saturated with water for at least 12 hours preceding grouting unless additional time is required by the grout manufacturer.

3-1.02. Mixing. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout, nor shall water content exceed the amount recommended by the manufacturer.

3-1.03. Temperature Restrictions. Grout shall be placed in accordance with the manufacturer's published temperature restrictions. Ambient temperature and grout temperature shall be a minimum of 40 degrees F and rising at time of placement. Grout shall not be placed on frost covered surfaces. Grout shall be protected from freezing until it has reached a minimum strength of 4,000 psi. Grout shall not be placed when the ambient or grout temperature exceeds 90 degrees F.

3-1.04. Placement. Unless otherwise specified or indicated on the Drawings, grout under baseplates shall be 1-1/2 inches [38 mm] thick. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the baseplates are completely filled without voids. Forms shall be provided where structural components of baseplates will not confine the grout.

3-1.05. Edge Finishing. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate.

3-1.06. Curing. Grout shall be protected against rapid loss of moisture by covering with wet cloths or polyethylene sheets. After edge finishing is completed, the grout shall be wet cured for at least 3 days and then an acceptable membrane curing compound shall be applied.

3-2. EPOXY GROUT INSTALLATION. Epoxy grout shall be installed in accordance with ACI 351.5.

End of Section

## SECTION 03920 CONCRETE SURFACE REPAIR

### PART 1 - GENERAL

1-1. SCOPE. This section covers the repair of existing concrete surfaces as indicated on the drawings, as specified, or as required to complete the Work. This specification covers the furnishing of all labor, equipment and materials required to repair, rehabilitate or reconstruct spalled, deteriorated, or structurally damaged concrete surfaces. Depth of repairs shall be adequate to restore concrete members to original dimensions and surface profiles.

1-2. SUBMITTALS. Specifications and data covering physical properties, the mixtures, application procedures, and curing procedures of the materials proposed shall be submitted in accordance with the Submittals Procedures section. Submittals shall include the approvals required from the material manufacturer.

### 1-3. QUALITY ASSURANCE.

1-3.01. Manufacturer's Field Services. The material manufacturer shall provide engineering field services to review the project and the selected material application prior to any preparation; to approve the applicator, the material used, and the procedure to be used; to observe and approve surface preparation; and to observe application and curing procedures. The field representative of the material manufacturer shall submit, in writing through Contractor, approvals of proposed materials, surface preparation, applicator, and application procedures. The field representative shall instruct the applicator, as needed, to assure that handling, mixing, placing, finishing, and curing of materials are in accordance with specifications and manufacturer's requirements. The field representative shall be an employee of the material manufacturer.

1-3.02. Applicator. The repair contractor shall have experience and proficiency specific to the repair type and shall be acceptable to Engineer and the material supplier. The applicator shall submit, through Contractor, a satisfactory experience record including references for previous application of the specified materials to concrete structures of similar design and complexity.

1-3.03. Pre-construction Meeting. At least 30 days prior to planned performance of the Work, Contractor shall conduct a meeting to review the detailed requirements for the Work. Site conditions, surface preparation, proposed equipment, procedures, material mixing, placing and finishing procedures, and curing methods shall be discussed and approved by Engineer and by the manufacturer's field representative. Contractor shall require the attendance of all involved parties, including but not limited to Contractor's superintendent, repair contractor if applicable, manufacturer's field representative and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by Contractor and distributed to all parties, including Engineer,

within 5 days after the meeting.

1-3.04. Site Conditions. Job conditions shall be maintained at standards that allow material placement within temperature and cleanliness requirements. Unusual conditions or unexpected additional deterioration uncovered during the course of Work by Contractor shall be brought to Engineer's attention for analysis and disposition. These conditions include but are not limited to poor quality base concrete, severely corroded reinforcing steel, random cracks, deep oil penetration and any other condition which would prevent completion of the Work in accordance with manufacturer's recommendations and this specification.

1-4. PRE-BID INSPECTION. Contractor shall visit the site prior to bid submittal to witness and verify the extent of the required repairs. Final bid shall include a lump sum for the Work with a unit price adjustment for each repair type. Unit prices shall be utilized to adjust the final project cost upon completion and acceptance of the Work based on actual quantities more than or less than the bid form estimated quantities.

## PART 2 - PRODUCTS

2-1. ACCEPTABLE PRODUCTS. Concrete repair products shall be manufactured by the Euclid Chemical Company, BASF Corporation, Sika Corporation, or equal as specified herein. Equivalent products of other manufacturers regularly producing high quality concrete repair materials, providing engineering field services, and meeting the specified quality assurance requirements may be furnished subject to acceptance by Engineer.

2-2. MATERIALS. Unless otherwise specified or authorized, materials shall conform to the requirements specified herein. Types of materials or concrete repair not specified herein shall be as specified in other sections, as indicated on the drawings or, in the absence of any definite requirement, as recommended by the manufacturer's field representative and acceptable to Engineer.

Products shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.

Where required, materials shall be NSF 61 certified.

2-2.01. Leveling Mortar or Surface Filler. Applied thickness less than one fourth inch. One-component or two-component, polymer-modified, cementitious product. Material shall have the following properties:

1. Minimum 6,000 psi compressive strength at 28 days per ASTM C109 using 2 inch (50 mm) cubes.
2. Bonding agent shall be a repair mortar scrub coat utilizing mixed product per manufacturer's printed installation instructions.

MasterEmaco N 300CI	BASF
Thin-Top Supreme	Euclid
SikaTop 121 Plus	Sika

2-2.02. Horizontal Repairs and Overlays.

2-2.02.01. Overlay thickness less than one inch. One-component or two-component, polymer-modified, cementitious product. Material shall have the following properties:

1. Minimum 7,000 psi compressive strength at 28 days per ASTM C109 using 2 inch (50 mm) cubes.
2. Minimum 1,200 psi flexural strength at 28 days per ASTM C348.
3. Minimum 2,100 psi bond strength at 28 days per ASTM C882 modified.
4. Bonding agent shall be a repair mortar scrub coat utilizing mixed product per manufacturer's printed installation instructions.

MasterEmaco T 310CI	BASF
Dural Top Flowable Mortar	Euclid
SikaTop 122 Plus	Sika

2-2.02.02. Overlay thickness equal to or greater than one inch. One-component, polymer-modified, silica-fume enhanced, cementitious product, containing integral corrosion inhibitor. Material shall have the following properties:

1. Minimum 6,500 psi compressive strength at 28 days per ASTM C109 using 2 inch (50 mm) cubes.
2. Minimum 1,000 psi flexural strength at 28 days per ASTM C348.
3. Minimum bond strength per ASTM C882 modified.
  - a. 500 psi at 1 day
  - b. 2,400 psi at 28 days
4. Maximum 1,000 coulombs rapid chloride permeability at 28 days per ASTM C1202.
5. Bonding agent shall be a repair mortar scrub coat utilizing mixed product per manufacturer's printed installation instructions.

MasterEmaco N 425	BASF
Concrete Top Supreme	Euclid
Sika Top 122 Plus	Sika

2-2.03. Vertical or Overhead (Non-sag) Repairs. One-component or two-component, polymer modified, cementitious mortar containing a migratory corrosion inhibiting admixture and suitable for interior or exterior use. Material shall have the following properties:

1. Minimum compressive strength per ASTM C109 using 2 inch (50 mm) cubes.
  - a. 2,000 psi at 1 day
  - b. 3,500 psi at 7 days
  - c. 5,500 psi at 28 days
2. Minimum flexural strength per ASTM C348.
  - a. 650 psi at 7 days
  - b. 1,000 psi at 28 days
3. Minimum 2,500 psi at 28 days shear bond strength per ASTM C882.
4. Bonding agent shall be a repair mortar scrub coat utilizing mixed product per manufacturer's printed installation instructions. The bonding agent shall be used for all trowel applied mortars.

MasterEmaco N 400	BASF
Verticoat Supreme	Euclid
Speed Crete PM	Euclid
SikaTop 123 Plus	Sika

2-2.04. Form and Pour. Thickness 6 inches or less. One-component, silica-fume enhanced, cementitious product, shrinkage compensated or polymer modified, containing migratory corrosion inhibiting admixture and suitable for interior or exterior use. Material shall have the following properties:

1. Minimum 6,500 psi compressive strength at 28 days per ASTM C109 using 2 inch (50 mm) cubes.
2. Minimum 770 psi flexural strength at 28 days per ASTM C348.
3. Minimum bond strength per ASTM C882 modified.
  - a. 1,200 psi at 1 day
  - b. 2,500 psi at 28 days
4. Maximum 1,000 coulombs rapid chloride permeability at 28 days per ASTM C1202.
5. Bonding agent shall be extended open time epoxy emulsion cement modified bonding agent, and shall be utilized in areas where form and pour repair products are being placed in a manner that exceeds the working life of the scrub coat, such as when enclosed forms are used.

MasterEmaco S 466CI	BASF
Eucocrete Supreme	Euclid
Sikacrete 211 SCC Plus	Sika

2-2.05. Penetrating Sealer. Silane-based sealer with minimum 40 percent active ingredient. Minimum water repellency 85 percent by ASTM C642. No scaling exhibited at 100 cycles by ASTM C672.

MasterProtect H 400	BASF
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Baracade Silane 40  
Sikagard 740 W

Euclid  
Sika

2-2.06. Water. Clean and free from deleterious substances.

2-2.07. Accessory Products.

2-2.07.01 Repair Mortar Scrub Coat Bonding Agent. For proprietary prepackaged repair mortars, utilize the material itself mixed to a scrub coat or slurry consistency per manufacturer's printed installation instructions.

2-2.07.03. Extended Open Time Epoxy Emulsion Cement Modified Bonding Agent. Protective coating for reinforcing steel and to bond repair material to reinforcing steel. Three-component, pre-proportioned, water based epoxy modified portland cement bonding agent containing migratory corrosion inhibitor. Product shall not form a vapor barrier and shall also serve as a anti-corrosion coating for reinforcing steel. Material shall have a minimum 2,000 psi bond strength at 7 days per ASTM C882.

MasterEmaco P 124  
Duralprep A.C.  
Armatec 110 EpoCem

BASF  
Euclid  
Sika

2-2.08. Coarse Aggregate Extension of Cementitious Mortar. In areas where depth of repair exceeds manufacturer's recommended limits for neat repair mortar, repair mortar may be extended with washed, graded, rounded, high-density, low-absorption coarse aggregate meeting ASTM C33. Aggregate shall be in size and volumes recommended by the product manufacturer. Aggregate extension shall not be permitted unless approved by Engineer.

### PART 3 – EXECUTION

3-1. GENERAL. Unless otherwise specified, Contractor shall prepare and apply all materials in strict accordance with the manufacturer's printed installation instructions which are hereby made part of this specification.

3-2. INSPECTION. Prior to the placement of repair material, the surface to be repaired shall be inspected by the material manufacturer's field representative to assure the surface conditions are correct for the type of repair and product/material is being used as specified.

3-3. PREPARATION.

3-3.01. Cleaning. The surface of existing concrete shall be clean and the pores free of any dirt or material that will be detrimental to the bond of the repair material. All oil, dirt, debris, paint, and unsound concrete shall be removed. Cleaning shall

include complete removal of all dust, dirt, and residue by high pressure washing.

3-3.02. Surface Preparation. All prepared surfaces shall conform to the requirements of the material manufacturer. All edges shall be square cut to avoid feather edges. As required, surfaces shall be prepared mechanically using a scabber, bushhammer, chipping hammer, shotblast, scarifier or hydrodemolition equipment which will give the specified surface profile. Means and methods selected by Contractor, subject to acceptance by Engineer, shall minimize surface micro-cracking (i.e. "bruising") and impact on areas surrounding the Work area.

Remove all loose and unsound concrete per International Concrete Repair Institute (ICRI) Guideline 310.1R "Guide for Surface Preparation." Unsound concrete surfaces shall have perimeter boundaries saw cut to minimum depth of one-half inch, or less if such depth will cause saw to come in contact with embedded reinforcing steel. Saw cuts shall be made perpendicular to the concrete surface and all concrete removal boundaries shall be straight and aligned parallel to opposite boundary edges resulting in repair areas that are rectangular in shape.

Contractor shall provide a surface profile which is suitable for bonding, as defined in repair manufacturer's printed installation instructions. In the absence of other instructions, the surface shall be roughened to 1/4 inch amplitude. If delamination, cracking, or unsound material exists beyond minimum removal depth, then removal shall continue until all unsound, delaminated, or cracked concrete has been removed from the repair area.

3-3.03. Cracks. Cracks shall be located and repaired, if required, in accordance with the Concrete Crack Repair specification. All cracks located within or adjacent to Work covered under this specification shall be repaired prior to performance of the Work covered under this specification.

3-3.04. Inspection and Replacement of Reinforcing Steel. Any exposed reinforcing steel shall be exposed to the extent that a minimum of three-quarter

inch of clear space is provided all around the steel to allow proper placement of repair material.

Contractor shall clean all exposed reinforcing steel to a bright finish prior to installation of repair materials.

Replace any reinforcing steel that has lost more than 20 percent of the original cross-sectional area within the surface repair area. Existing reinforcing steel which has been cut or otherwise damaged shall be replaced if the damage exceeds 20 percent of the original cross-sectional area. New reinforcing steel shall be either lapped or spliced with existing steel on both sides of the damaged or corroded portion of reinforcing steel. Either Class B laps or ACI 318 Type 2 mechanical connectors shall be used. Repaired reinforcing steel shall be inspected by

Engineer or Owner's representative prior to placement of concrete repair materials.

3-4. APPLICATION. Concrete repair work shall be performed in accordance with the following requirements.

3-4.01. Bonding and Priming. Bonding agent shall be applied per manufacturer's recommendations. The manufacturer's coverage rate shall be followed. For rough surfaces, scrub bonding agent into the surface with a stiff broom.

Apply all prepackaged bonding agent materials within recommended ambient and substrate temperatures published in the manufacturer's printed installation instructions. Do not apply materials over frozen or liquid filled surfaces.

Upon completion of all concrete and reinforcing steel demolition, surface preparation, and cleaning operations, apply specified bonding agent to substrate. Provide complete and thorough coverage of surface assuring that bonding agent has been fully worked into profile of surface.

In areas where bonding agents classified as a mortar scrub coat are to be applied directly to concrete surface, such surfaces shall be saturated with water one hour prior to placement of the scrub coat to provide a saturated substrate. Just prior to application of the scrub coat, water shall be removed by compressed air blasting. Compressed air shall be maintained free of oil and contaminants by filtration as needed.

In areas where bonding agents classified as an extended open time epoxy emulsion cement modified bonding agent are to be applied and all exposed reinforcing steel and other metal embedments, mix bonding agent and apply two uniform coats at manufacturer's published recommended coverage rates to properly prepared surfaces. Allow adequate time between coats per manufacturer's recommendations.

Special attention shall be given to timing of placement of bonding agents, so that the repair mortar is able to be placed within the allowable open time of the bonding agent or while any mortar scrub coats are wet and have not yet stiffened.

3-4.02. Treatment of Reinforcing Steel and Other Metal Embedments. All existing and new reinforcing steel shall be secured and properly positioned by tying to other secured bars or supplemental anchoring pins as needed. New reinforcing steel, which is not replacing existing reinforcing steel, shall be provided per the Drawings as applicable.

All exposed reinforcing steel and other metal embedments within the repair area shall be treated with two coats of anti-corrosion bonding agent.

3-4.03. Forming. Where forms are required, water-tight forms shall be constructed

with sufficient rigidity to withstand head pressure and prevent excessive deflection during material placement. For pumped applications without open top forms, provide a port connection or birdmouth of sufficient size to allow pumping into the form. After forms are removed, all birdmouths and other protrusions resulting from the placement method shall be carefully removed and the surface smoothed.

Tolerances for formed work shall be as stipulated in ACI 117 for cast-in-place concrete, unless otherwise indicated. Formed surfaces shall meet a Class C for both abrupt and gradual irregularities.

3-4.04. Shoring and Support. When removal and repair of deteriorated concrete may cause temporary weakness, excessive deflections, structural instability, or other unacceptable damage, shoring or other suitable supports shall be provided until completion of the repair and adequate curing of repair material.

3-5. FINISHING. All unformed surfaces shall receive a light broom finish unless directed otherwise.

3-6. CURING. Immediately following placement and finishing procedures, cure cementitious repair mortars for a minimum of seven days. Curing procedures shall be in accordance with ACI 308.1 and the manufacturer's printed installation instructions. The more stringent requirements shall control.

During cold weather conditions, as defined by ACI 306.1, cold weather concreting procedures shall be followed including thermal protection of repair materials and removal of wet curing 24 hours prior to exposure to freezing temperatures.

Unless specified otherwise, one or more of the following methods shall be used:

3-6.01. Water Curing. Keep concrete surfaces continuously wet with water during the curing period. The method used shall limit water runoff and any runoff shall be directed and controlled. The difference in temperature between the water used for curing and the concrete surface shall not exceed 20 degrees F except when deemed a significant safety hazard and acceptable to Engineer.

3-6.02. Wet Coverings Curing. Cover the surfaces with moisture retaining curing blankets, burlap, cotton mats, or other suitable moisture retaining materials. The coverings shall not stain or otherwise discolor the repair material or the surrounding surfaces, and shall keep the repair products fully saturated during the curing period. Lap all coverings at least 8 inches at joints.

3-6.03. Membrane Curing. Membrane curing compounds shall not be used as a method for curing repair materials except when water curing or wet coverings curing are not acceptable to the repair material manufacturer and the manufacturer's printed installation instructions requires membrane curing compounds to be used.

3-7. SEALING. Provide a penetrating sealer over the concrete repair product when recommended by the repair product manufacturer, or when no other sealer is specified on the drawings or other specifications. The penetrating sealer shall be applied in accordance with the manufacturer's instructions.

3-8. FIELD QUALITY CONTROL.

3-8.01. Material Storage and Handling. The material shall be delivered in original, unopened containers. Containers shall be labeled with the manufacturer's name, product name, and lot number. Materials shall be stored at the job site under dry conditions and at temperatures between 50 deg F and 90 deg F unless more stringent limitations are required by the manufacturer.

3-8.02. Environmental Conditions. Repair materials shall not be applied without protection in temperatures below 45 deg F, nor when the temperature is expected to fall below 45 deg F during the curing period, unless otherwise specified by the material manufacturer and cold weather concreting procedures are followed in accordance with ACI 306.1.

When ambient temperatures below 45 deg F are expected during the curing period, the repair material shall be maintained at 50 deg F for the full curing period. Sudden cooling shall not be permitted. Gradual temperature drop shall be maintained at not more than 20 deg F in any 24 hour period. Carbon dioxide or exhaust gases from combustion heaters shall not be allowed within enclosures or allowed to contact the repair material.

3-8.03. Protection. Repair areas shall be protected from other trades and weather for a minimum of 10 days after material is placed.

3-8.04. Cleaning. Work areas are to be cleaned each day in accordance with the Project Requirements section. Upon completion of the final cleanup, Contractor shall restore all areas affected by repair procedures to their original condition, leaving no trace of material piles or other wasted materials.

End of Section

## SECTION 03930 CONCRETE CRACK REPAIR

### PART 1 - GENERAL

1-1. SCOPE. This section covers the repair of concrete and shotcrete cracks and joints.

1-1.01. General Crack Repair. General crack repair is applicable only to new construction, and shall include the following:

- a. Sealing of all cracks and crack networks that are wider than 10 mils (0.01 inch) as measured at the exposed surface.
- b. All necessary repairs to structures that have failed a tightness test, including sealing of construction joints.

All costs for general crack repair shall be included in the Contract Price. General crack repair work is expected to be necessary due to cracks that commonly develop during concrete construction.

1-1.02. Engineer-Directed Crack Repair. Engineer-directed crack repair is applicable only to new construction, and shall only be performed when instructed by Engineer. The work shall include, but is not limited to, the following:

- a. Sealing of construction joints that are not otherwise required to be sealed as the result of a failure of a leakage test.
- b. Sealing of cracks and crack networks with a width of 10 mils (0.01 inch) or less as measured at the exposed surface.

Contractor shall include 150 linear feet of Engineer-directed crack repair in the Contract Price. The Engineer-directed crack repair may be either epoxy resin or foam resin, as determined by Engineer.

1-1.03. Pre-Defined Crack Repair. Pre-defined crack repair is applicable only to existing structures, and the extent of this type of repair is indicated on the Drawings.

Prior to beginning the repair work Contractor shall field verify and provide clear bright colored marking to the cracks to be repaired. Crack repair work shall not begin until marking is complete and has been approved by Engineer.

1-2. SUBMITTALS. Specifications and data covering physical properties, mixtures, application procedures, and curing procedures of the materials

proposed shall be submitted in accordance with the Submittals Procedures section. Submittals shall include the approvals from the material manufacturer.

### 1-3. QUALITY ASSURANCE.

1-3.01. Manufacturer's Field Services. The material manufacturer shall provide engineering field services to review the Work and the material application prior to any preparation; to approve the applicator, the material used, and the procedure to be used; to observe surface preparation; to approve surface preparation; and to observe application. The field representative of the material manufacturer shall submit, in writing through Contractor, approvals of proposed material, application procedures, applicator, and surface preparation. The field representative shall be an employee of the material manufacturer.

1-3.02. Applicator. The applicator shall submit through Contractor a satisfactory experience record including references from previous application of the specified materials to structures of similar design and complexity.

1-3.03. Pre-Construction Meeting. At least 30 days prior to concrete crack repairs, Contractor shall conduct a meeting to review the detailed requirements for rehabilitation work. Site conditions, surface preparation, proposed equipment, procedures, material mixing, placing procedures, and curing methods shall be discussed and approved by Engineer and by the manufacturer's field representative. Contractor shall require the attendance of all involved parties, including but not limited to Contractor's superintendent, repair contractor, manufacturer's field representative and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by Contractor and distributed to all parties within 5 days after the meeting.

1-3.04. Quality Assurance Certification. Material manufacturers shall be ISO 9001/9002 registered or shall provide proof of documented quality assurance. The documented quality assurance system shall be obtained through an independent auditing registrar.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

## PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS. Unless otherwise specified or authorized, repairs shall conform to the requirements specified herein. Types of repairs not specified herein shall be as specified in other

sections, as indicated on the Drawings, or, in the absence of any definite requirement, as recommended by the manufacturer's representative and subject to acceptance by Engineer. The following types of repairs shall be performed as required.

2-1.01. Pressure-Injected Epoxy Resin. Unless indicated otherwise on the drawings, pressure-injected epoxy resin shall be used to seal joints and cracks that are not intended to permit movement.

2-1.02. Pressure-Injected Foam Resin. Unless indicated otherwise on the drawings, pressure-injected foam resin shall be used to seal joints that are intended to permit movement.

2-1.03. Crack Sealant. Crack sealant shall be used to seal cracks in structures prior to pressure injection of resin.

2-2. ACCEPTABLE PRODUCTS. Repair products/materials shall be as specified herein. Equivalent products of other manufacturers regularly producing high quality concrete crack repair products/materials, providing engineering field services, and meeting the specified quality assurance requirements may be furnished subject to review and acceptance by Engineer.

2-3. MATERIALS. Materials shall be approved by the manufacturer for the type of application, including temperature and moisture conditions encountered.

Pressure-Injected Epoxy Resin	ASTM C881, Type I or Type IV, moisture tolerant or moisture insensitive.
Crack Sealant	As recommended by the manufacturer of the pressure-injected epoxy resin product.
Pressure-Injected Foam Resin	Hydrophilic polyurethane foam; Prime Resins "Prime-Flex 900 XLV", DeNeef "Sealfoam PURE", or Avanti "AV-333 Injectaflex".
Foam Resin Accelerator	As recommended by foam resin manufacturer.
Water	Clean and free from deleterious substances.

## PART 3 - EXECUTION

3-1. INSPECTION. Prior to the placement of the repair materials, the crack to be repaired shall be inspected by the material manufacturer to assure that preparation and conditions are correct for the type of repair and the product/material being used as specified herein.

3-2. PREPARATION. All cracks and surfaces around the cracks shall be free of objectionable substances and shall conform to the requirements of the material manufacturer. Concrete and shotcrete to be repaired shall be cleaned by methods acceptable to the material manufacturer so that the cracks are free of dirt, oil, grease, laitance, and other foreign matter. All loose and deteriorated existing concrete and shotcrete shall be removed down to sound materials. All concrete and shotcrete surfaces shall be checked for delamination to ensure that all surfaces are sound. All edges shall be square cut to avoid feather edges.

Any other preparation recommended by the material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

Concrete and shotcrete surfaces in the area of a crack to be repaired shall be cleaned by wire brushing, blasting, or other acceptable methods.

Wall surfaces shall be sandblasted clean to expose crack networks and construction joints. If there is active water seepage in the repair area, the seepage shall be stopped as recommended by the injection material manufacturer and as acceptable to Engineer. Injection ports shall be installed, when recommended by the injection material manufacturer.

3-2.01. Injected Epoxy Resin. Preparation for injected epoxy resin shall include sealing the surface at the crack, on both sides when possible, with crack sealant as recommended by the material manufacturer and as acceptable to Engineer for the pressure injection work. Injection ports for epoxy resin shall penetrate through the crack sealant into the cracks at spacings recommended by the material manufacturer.

3-2.02. Injected Foam Resin. Preparation for injected foam resin shall include drilling offset injection holes at an angle that will intersect the crack, joint, or crack network at approximately one-half the thickness of the concrete or shotcrete up to a thickness of 36 inches. Spacing of injection ports shall be determined as recommended by the injection material manufacturer and as acceptable to Engineer. When the injection material manufacturer certifies, in writing, that spacing of injection ports and installation procedures are acceptable, the injection ports may be installed directly into the crack, subject to review by Engineer.

3-3. APPLICATION. Concrete and shotcrete repair work shall be performed in accordance with the following requirements.

3-3.01. Crack Sealant. Crack sealant shall be trowel-applied to a minimum dried thickness of 1/8 inch, or thicker if directed by manufacturer's literature. The concrete surface where the sealant is applied shall be smooth, uniform, and free from irregularities. Crack sealant shall be removed after the injection of resin is completed, except for portions of wall faces that will be at least 12 inches below the finished grade.

3-3.02. Pressure-Injected Resin. The injected areas shall be prepared as specified and as recommended by the manufacturer. Pressure-injected resin shall be suitable for penetration of joints, cracks, and crack networks 2 mils (0.002 inch) wide and larger.

After the joints and cracks are prepared and before the injection of the resin, the joints shall be flushed with water. The water flush shall be terminated when the turbidity of the expelled water is equal to that of the flush water. Unless otherwise acceptable to resin manufacturer and Engineer, cracks shall be dry prior to injecting resin.

The pumping equipment used for the pressure injection of resin shall have pressure metering. Written procedures for use and quality control of the injection equipment shall be furnished to Engineer for review and acceptance. The pump shall be electric. The material and process used for the pressure injection of the resin shall have been in use a minimum of 5 years.

The joints and crack networks shall have a minimum of 90 percent penetration of resin into the joint or crack network. Core samples may be taken at Engineer's discretion.

3-3.02.01. Epoxy Resin. Epoxy resin shall be injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Epoxy resin shall be injected until the resin appears at the next injection port.

3-3.02.02. Foam Resin. Foam resin shall be premixed and injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Foam resin shall be injected into the structure until the resin appears at the next injection port.

Surfaces of cracks and joints may need to be sealed with crack sealant.

3-3.03. Cold Weather. When ambient temperatures below 40°F are expected during the curing period, the repair materials shall be maintained at a temperature of at least 50°F for 14 days or 75°F for 7 days after placement. Sudden cooling of the repair materials shall not be permitted.

3-4. PROTECTION. Post-placement curing and protection shall be as specified herein and in accordance with the manufacturer's recommendations.

3-5. CLEANING. Work areas shall be cleaned each day in accordance with the Project Requirements section. Upon completion of the final cleanup, Contractor shall restore all areas affected by the grouting procedures to their original condition, leaving no trace of material piles or other wasted materials.

End of Section

## DIVISION 4 MASONRY

### SECTION 04220 MASONRY

#### **PART 1 GENERAL**

##### **1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required to construct all masonry work as shown on the Drawings and specified herein.
- B. The work under this Section includes, but is not necessarily limited to the following:
  - 1. Concrete masonry units (CMU), including decorative masonry block.
  - 2. Reinforced CMU lintels.
  - 3. Masonry reinforcing, ties and anchors.
  - 4. Grouting required throughout the project.

##### **1.02 SAMPLES**

- A. Submit two samples each of concrete masonry units.
- B. Submit two samples of decorative, masonry block.
- C. Before commencing with the laying of any architectural masonry, construct on the site, where directed by the County, a sample 6 x 4 foot wall panel showing type and tooling of mortar and bond, for the County's approval. This sample wall shall remain in place for the duration of the masonry work. Remove sample panel at the completion of the work as directed by the County.

##### **1.03 PROTECTION OF MATERIALS**

- A. All perishable materials for the work of this Section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original container, plainly marked with identification of material and maker. Materials in broken containers or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.

All masonry shall be shipped stacked with hap or straw protection or other suitable protective device, and shall be similarly stacked off the ground on the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering approved by the County.

##### **1.04 COLD WEATHER CONSTRUCTION**

Masonry construction in cold weather shall conform to the applicable requirements of "Construction and Protection Recommendations for Cold Weather Masonry Construction" of the Technical Notes on Brick and Tile Construction by the Brick Institute of America.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS - MASONRY**

A. Concrete Masonry Units:

1. Standard and light weight concrete masonry units (CMU) shall conform to ASTM C-90, Grade N, Type I, two cell hollow, load bearing units of 8" x 16" nominal face size and bed dimension as shown on the Drawings. Masonry prism strength f'm shall be as shown on the drawings, but not less than 1250 psi.
2. CMU shall be free from substances that will cause staining for at least 18 hours and then air cured in covered storage for not less than 28 days before delivery. Units shall have a maximum linear drying shrinkage of 0.25 percent (ASTM C-426) and have a moisture content at time of delivery not exceeding 30 percent of total absorption.
3. CMU noted as fire-rated on the Drawings shall conform to Underwriters Laboratories, Inc., Standard for Concrete Masonry Units UL618, and shall have two (2) hour fire resistant rating.
4. All split rib CMU shall have 7-1/2 equally spaced 3/4-inch deep x 3/4-inch wide bevels. The projected face shall have a rough texture. Units shall be laid in horizontal stack bond.
5. Units shall be obtained from one manufacturer to insure even color and texture.
6. Provide special units required by the Drawings, including solid, corner, pilaster, lintels, and jamb units.
7. Decorative masonry block units shall be similar in quality to Number 1210, DeMaco Concrete Products, Sarasota, FL, or equal. Design pattern to be as shown on the Drawings.

- B. Acoustic concrete masonry units shall be Soundblox, Type R by the Proudfoot Company or equal. Units shall be fabricated on standard block machines using manufacturer's special molds; shall have a closed top and ends and slotted exposed face; shall have a noise reduction coefficient range (NRC) of 0.50 - 0.60 for Type R; and shall comply with ASTM-C90 for load bearing masonry units. Color of the Soundblox and mortar shall match interior color which will be submitted to the County. The Soundblox installation shall be laid in horizontal stackbond with flush joints.

## 2.02 REINFORCING, TIES, ANCHORS AND MISCELLANEOUS

- A. Reinforcing shall be welded wire units prefabricated in straight lengths of not less than 10 feet with matching corner and tee units fabricated from cold-drawn steel wire complying with ASTM-A82, with deformed continuous side rods and plain cross-rods, crimped for cavity wall construction, if required, and a unit width of 1-1/2 inches to 2 inches less than thickness of wall or partition. Reinforcement for decorative masonry block shall be 2 inches wide. Reinforcement shall be placed at every third course (24" o.c.).
- B. Single width reinforcement shall be truss type, fabricated with single pair of galvanized 9 gauge side rods and continuous 9 gauge cross-rods spaced not more than 16 inches on center.
- C. Galvanized dove-tailed anchor slots with anchors at 24 inches on center shall be furnished for anchorage to concrete framework or walls.
- D. Approved 16-gauge corrugated non-ferrous metal ties manufactured for use with the anchor slots provided shall be spaced at a maximum of 8 inches o.c. vertically and 30 inches o.c. horizontally.
- E. The Contractor shall provide and install miscellaneous anchors and attachment members,

required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.

- F. Control joints shall be factory extruded preformed rubber gaskets conforming to ASTM D-2000 2AA-205 and shall be as manufactured by Dur-O-Wal, Hohmann and Bernard, Inc., AA Wire Products or equal. Control joints shall be installed as shown on the Drawings.
- G. Weep holes shall be 1/4-inch O.D. by 4 inches long, clear plastic tubing that will not stain brickwork, by Hohmann and Barnard, Inc. or equal.
- H. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

## **2.03 MORTAR MATERIALS**

- A. Portland cement shall conform to ASTM C150 Type II. Masonry cements to be used when specifically approved for colored mortar.
- B. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.
- C. Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to the limits of ASTM C144. Sand for grout shall conform to ASTM C144 or C33 as required.
- D. Water shall be free from injurious amounts of oils, acids, alkalis or organic matter, and shall be clean and fresh.
- E. Mortar proportions shall conform to ASTM C270, Type M, or as otherwise approved by the County. Ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed.
- F. Grout for setting bearing plates, machinery, or any other equipment shall be mixed as recommended by the manufacturer to give the necessary consistency for placing and to give a minimum compressive strength (ASTM C-109) of 5000 psi at 7 days.
- G. All other grout shall be 1 part Portland cement and 1 part sand with a maximum aggregate size of 3/8 inch pea rock and a minimum comprehensive strength of 3000 psi in 28 days.
- H. Non-shrink non-metallic grout shall be 5 star grout as manufactured by the U.S. Grout Corp., or equal and be used in strict accordance with the manufacturer's instructions for the use intended.

## **2.04 FACE BRICK**

Non-load bearing burned clay or shale. Size, color and texture to match existing and as approved by the County.

## **PART 3 EXECUTION**

### **3.01 MORTAR**

- A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water

can be accurately and uniformly controlled. The mixing time shall not be less than five minutes, approximately two minutes of which shall be for mixing the dry materials and not less than three minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring a lime content, the Contractor will have the options of using the dry-mix method or first converting the hydrated lime into a putty.

- B. All CMU shall be laid in a full bed of mortar, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well-compacted vertical mortar joint for the full shell thickness. Units shall set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35 percent of the total absorption as determined by laboratory test. Decorative masonry units shall be laid in a full bed of mortar on all four sides.
- C. All masonry units shall be laid in stretcher (running) bond unless otherwise shown. Tool dense and neat.
- D. Sizes shall be specified and called for on the Drawings, and where "Soaps" and "Splits" are used, the space between these members and the backup material shall be slushed full of mortar.
- E. Joints of all masonry shall be tooled in accordance with the following:
  - 1. Wait until unit mortar is thumbprint hard before tooling joint. This may require as much as three hours in the shade and one hour in the sun in the summertime.
  - 2. The required personnel of the Contractor shall be kept on the job after hours, if necessary, to properly tool joints.
  - 3. Both vertical and horizontal joints shall be maintained uniform in spacing.
  - 4. Joints for CMU shall be 3/8 inch.
  - 5. Joints for structural block shall be 1/4 inch.
- F. Install all frames required to be set in masonry, set masonry tightly against frames, build in all frame anchors, and fill frames solid with mortar.
- G. Control joints shall be installed at the intersection of masonry walls with structural concrete and elsewhere as detailed on the Drawings. Joints shall be raked out to a depth of 3/4 inch for the full height of the wall suitable for caulking. The maximum length, horizontally, between vertical control joints shall be 40 ft., but joints shall be located only as directed or shown. Joints shall be equal in width to the standard mortar joint.
- H. All masonry slots, chases, or openings required for the proper installations of the work of other Section shall be constructed as indicated on the Drawings or in accordance with information furnished before the work is started at the point affected. No chase shall cut into any wall constructed of hollow units after it is built, except as directed and approved by the County.
- I. Surfaces shall be brushed as work progresses and maintained as clean as it is practicable. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind and before continuing work previously laid shall be swept clean. To tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means or waterproof paper, tarpaulins, boards or other means

approved by the County.

- J. The Contractor shall build-in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds, and exterior electric conduits and fixtures, and shall cooperate with other trades whose work is to be coordinated with the work under this Section.
- K. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
- L. All ties and reinforcing for masonry shall be furnished and installed by the Contractor.
- M. Loose steel lintels shall be as shown on drawings and installed under this Section.
- N. Loose lintels shall be set in full bed or mortar and supported by solid or mortar filled hollow concrete blocks as detailed on the Drawings.
- O. Bed and grout all steel, for equipment and machinery, and items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates, and seats in masonry walls, and build-in all items required for the completion of the building as they apply to masonry.

### **3.03 REINFORCED MASONRY**

- A. Provide vertical reinforcing in filled cores of masonry units of size, spacing and locations as indicated on the Drawings and specified herein. Unless otherwise shown on the Drawings, vertical reinforcing at all exterior infill walls shall be No. 4 bars as specified in the Contract Documents and shall be placed 8'-0" on center, and vertical reinforcing at all exterior free standing walls shall be No. 5 bars placed at each corner, each opening and not greater than 8'-0" centers along straight runs.
- B. All cores containing reinforcing shall be filled, full height, with 3/8" pump mix concrete  $f'c = 2,500$  psi with a slump of not less than 6 inches nor more than 8 inches.

### **3.04 CLEANING**

- A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar of same color as that of the original and adjoining work.
- B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progressed.
- C. All masonry shall be cleaned with approved detergent solution in accordance with manufacturer's printed directions. No acid or metal scrapers shall be used on masonry.
- D. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 square feet in a location approved by the County. No further cleaning work may proceed until the sample area has been approved by the County, after which time the same cleaning materials and method shall be used on the remaining wall area.

### **3.05 WALL FLASHING**

- A. Fabric wall flashing shall be installed above and below all openings in exterior masonry, at intersection of floors with exterior walls, and elsewhere as shown or noted on the Drawings. It shall be furnished and installed as shown on the Drawings.

**END OF SECTION**

## SECTION 05550 ANCHORAGE IN CONCRETE AND MASONRY

### PART 1 - GENERAL

1-1. SCOPE. This section covers the procurement and installation of anchors in concrete and masonry. It includes cast-in-place anchor bolts and anchor rods, adhesive anchors for both threaded rods and reinforcing bars, expansion anchors, and undercut anchors.

1-2. GENERAL. Unless otherwise specified or indicated on the Drawings all anchors shall be cast-in-place anchor bolts or anchor rods, with forged heads or embedded nuts and washers. Unless otherwise indicated, anchors for structural steel members connected to concrete shall have a diameter of at least 3/4 inch. Anchors designed by manufacturers of products such as railings, ladders, and non-structural components shall have a diameter of at least 1/2 inch.

Unless otherwise indicated on the Drawings, anchors used in the following locations and applications shall be of the indicated materials.

#### Cast-In-Place Anchor Bolts and Anchor Rods

Submerged locations	Stainless steel.
Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Galvanized steel.
Other exterior locations	Galvanized steel.
Other interior locations	Carbon steel.

#### Adhesive, Expansion, and Undercut Anchors

Submerged locations	Stainless steel.
Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Stainless steel.
Other exterior locations	Stainless steel.
Other interior locations	Carbon steel.

Adhesive, expansion, and undercut anchors may be used instead of cast-in-place anchors only where specifically indicated or permitted on the Drawings or with the specific acceptance by Engineer.

1-3. SUBMITTALS. Data, catalog cuts, and manufacturer's research reports (from independent organizations such as ICC-ES or IAPMO UES) indicating the manufacturer and types of adhesive anchors, expansion anchors, and undercut anchors to be supplied shall be submitted in accordance with the Submittals Procedures section.

If Contractor requests use of products other than those indicated herein, calculations may be required as part of the submittal package. Calculations shall be prepared by a professional engineer licensed in the state of the project, using methods and procedures required by the building code. Contractor shall demonstrate that the proposed substitute anchors are equivalent in all necessary criteria, including strength, spacing and edge distance limitations, embedment depth limitations, temperature limitations, and any other criteria required by Engineer.

1-4. DELIVERY, STORAGE, AND HANDLING. Materials shall be handled, transported, and delivered in a manner which will prevent damage or corrosion. Damaged materials shall be promptly replaced. Materials shall be shipped and stored in original manufacturer's packaging.

## PART 2 - PRODUCTS

2-1. MATERIALS. Unless otherwise indicated on the drawings, materials shall be as indicated below.

### Cast-In-Place Anchor Bolts and Anchor Rods

Carbon steel	ASTM F1554, Grade 36 with compatible nuts.
Galvanized steel	ASTM F1554, Grade 36 with compatible nuts; hot-dip galvanized, ASTM F2329.
Stainless steel	Bolts, ASTM F593, Alloy Group 2; nuts, ASTM F594, Alloy Group 2.
Flat Washers	ANSI B18.22.1; of the same material as anchor bolts and nuts.

Expansion Anchors in Concrete	Products shall be single component anchors tested in accordance with ICC AC193, and shall have a manufacturer’s research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces. Hilti "Kwik-Bolt TZ" or Powers Fasteners “Power-Stud+SD2” (carbon steel), “Power-Stud+SD4” (304 stainless steel), and “Power-Stud+SD6” (316 stainless steel).
Expansion Anchors in Grouted Concrete Masonry Units	Products shall be single component anchors tested in accordance with ICC AC01, and shall have a manufacturer’s research report in compliance with the applicable building code. Hilti “Kwik-Bolt TZ Masonry Anchors”, Simpson “Wedge-All”, or Powers Fasteners “Power-Stud+ SD1”.
Undercut Anchors in Concrete	Products shall be tested in accordance with ICC AC193, and shall have a manufacturer’s research report in compliance with the applicable building code. Hilti “HDA Undercut Anchor” (carbon steel) and “HDA-R Undercut Anchor” (stainless steel), or Powers Fasteners “Atomic+ Undercut Anchor” (A36 carbon steel).
Adhesive Anchors in Concrete	Products shall be tested in accordance with ICC AC308, and shall have a manufacturer’s research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Threaded Rods and Nuts (Carbon Steel)	ASTM A36 or ASTM F1554 Grade 36.

Threaded Rods and Nuts (Carbon Steel)	ASTM F593, CW.
Reinforcing Bars	ASTM A615, Grade 60, deformed.
Reinforcing Bars, weldable	ASTM A706, Grade 60, deformed.
Adhesive	Hilti "HIT-HY 200", or Powers Fasteners "Pure 110+".
Adhesive Anchors in Grouted Concrete Masonry Units	Products shall be tested in accordance with ICC AC58, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts (Carbon Steel)	ASTM A36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593 CW (Hilti or Powers systems), or ASTM A193 Grades B6, B8, or B8M (for Simpson system).
Adhesive	Hilti "HIT HY 70", Powers "AC100+ Gold", or Simpson "SET XP".
Adhesive Anchors in Hollow Concrete Masonry Units	Products shall be tested in accordance with ICC AC58, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts (Carbon Steel)	ASTM A36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593 CW (Hilti or Powers systems), or ASTM A193 Grades B6, B8, or B8M (for Simpson system).
Adhesive	Hilti "HIT HY 70", Powers "AC100+ Gold", or Simpson "SET XP".
Screen Tubes	As recommended by the manufacturer.

Adhesive Anchors in Unreinforced Brick Masonry	Products shall be tested in accordance with ICC AC60, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts	ASTM A307.
Adhesive	Hilti "HIT HY 70", Simpson "SET".
Screen Tubes	As recommended by the manufacturer.

2-2. ANCHORS.

2-2.01. Cast-in-Place Anchor Bolts and Anchor Rods. Cast-in-place anchor bolts and anchor rods shall be delivered in time to permit setting prior to the placing of structural concrete or masonry grout. Anchor sleeves shall not be used unless acceptable to Engineer. Unless installed in sleeves, anchor bolts and anchor rods shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or the supporting template. Two nuts, a jam nut, and a washer shall be furnished for cast-in-place anchor bolts and anchor rods indicated on the Drawings to have locknuts; two nuts and a washer shall be furnished for cast-in-place anchor bolts and anchor rods without locknuts.

2-2.02. Adhesive, Expansion, and Undercut Anchors. When adhesive, expansion, or undercut anchors are indicated on the Drawings, only acceptable systems shall be used. Acceptable systems shall include only those systems and products specified or specifically indicated by product name on the Drawings. Alternative anchoring systems may be used only when specifically accepted by Engineer.

Unless otherwise required, single nuts and washers shall be furnished for adhesive anchors, expansion anchors, and undercut anchors. Adhesive anchors shall be free of coatings that would weaken the bond with the adhesive.

Adhesive anchors in hollow CMU masonry and unreinforced brick masonry shall utilize screen tubes as recommended by the manufacturer.

PART 3 - EXECUTION

3-1. GENERAL. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchors immediately before tightening of the nuts.

3-1.01. Compliance With Manufacturer's Instructions. Post-installed anchors shall be installed in accordance with the manufacturer's printed installation instructions and all applicable requirements of the manufacturer's research report for the

specific anchor system. If conflicts are found between the Drawings, the manufacturer's printed installation instructions, and the manufacturer's research report installation requirements, Contractor shall notify Engineer for resolution.

3-1.02. Special Inspection. Special inspection requirements for cast-in-place and post-installed anchors shall be as indicated in the Code-Required Special Inspections and Procedures section. Anchorage work shall be performed in a manner that allows the inspections to take place without adversely impacting the schedule.

3-2. CAST-IN-PLACE ANCHOR BOLTS AND ANCHOR RODS. Cast-in-place anchor bolts and anchor rods shall be carefully positioned with templates and secured in the forms prior to placing concrete, or in the bond beams prior to placing masonry grout. Contractor shall verify that anchorage devices are positioned in accordance with the Drawings and with applicable equipment or structure submittal drawings.

Threads, bolts, and nuts spattered with concrete or masonry grout during placement shall be cleaned prior to final installation of the bolts and nuts.

Sleeves shall be filled with non-shrink grout.

3-3. ADHESIVE ANCHORS. Adhesive shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.

Anchors or bars shall be installed in holes hammer drilled into hardened concrete or masonry. Drill shall be set to rotation-only mode when drilling into hollow CMU or into brick. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod or bar unless recommended otherwise by the anchor system manufacturer. Holes shall be prepared by removing all dust and debris using procedures recommended by the adhesive manufacturer.

Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed and the rods or bars shall be set in accordance with the recommendations of the manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids.

3-3.01. Concrete Installation. Unless indicated otherwise on the Drawings, reinforcing bars shall be embedded to a depth of 15 bar diameters, and threaded rods shall be embedded to a depth that will develop the yield strength of the rod.

Adhesive anchors in concrete shall be installed under the following conditions.

Minimum Age of Concrete Prior to Anchor Installation	21 days.
Concrete Temperature Range	Maximum short-term temperature 162 F, maximum long-term temperature 110 F.
Moisture Condition	Dry concrete.
Type of Lightweight Concrete	N/A
Hole Drilling and Preparation	Hammer drill only.

Installation of adhesive anchors into concrete that are either horizontal or upwardly inclined shall be performed only by personnel certified by the ACI/CRSI Adhesive Anchor Installation Certification Program.

3-3.02. Masonry Installation. Anchors shall be installed to meet all criteria in the manufacturer's installation instructions and ICC-ES reports, including but not limited to minimum compressive strength at time of installation, minimum edge distances, minimum clearances from mortar joints, minimum anchor spacing, and use of screen tubes.

3-4. EXPANSION AND UNDERCUT ANCHORS. Expansion and undercut anchors shall be installed using all procedures and accessory devices recommended by the anchor manufacturer.

End of Section

# Manatee County Administration Building Roof Replacement

## 1.1 **GENERAL**

## 1.2 **REQUIREMENTS**

- A. Furnish and install a new weather and watertight High Performance Thermoplastic Roofing System on a Lightweight Concrete deck that is dry and structurally sound.

## 1.2 **PROJECT SCOPE**

- A. Roofing Contractor shall furnish all labor, materials, tools, equipment and supervision necessary to complete the installation of a new High Performance Membrane including roof related insulation and/or cover-boards, flashings, accessories and related metalwork in strict accordance with the contract, and High Performance Membrane Roof System Manufacturer's (MRSM) most current specifications and details.
- B. The roofing contractor shall be an "Authorized Roofing Contractor" of the MRSM in good standing and be fully knowledgeable of all the requirements within the contract documents as well as all job site conditions that could affect their work.
- C. The roofing contractor shall confirm all given information and notify the building owner / owner's representative, prior to bid, of any conflicts that will affect the quality or cost of the proposal.
- D. Failure to submit a timely pre-qualification proposal will be grounds for total rejection of the contractor's proposal.

## 1.3 **QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: The High-Performance Membrane Manufacturer shall be an American owned company with no less than 25 years performance track record in the state of Florida.
- B. Installer Qualifications: A licensed roofing contractor, authorized by the MRSM to install the type of roof system specified for this project.
- C. Source Limitations: Obtain all components including roof insulation and/or cover-board, fasteners adhesives and other accessories as required, from the approved MRSM.
- D. The specified membrane roofing system must consist of the materials required and be installed under the following criteria.
  - 1. UL Listing; provide materials bearing Underwriters Laboratories (UL) marking / label on the packaging or containers indicating materials have been produced under UL classification and follow-up services.
  - 2. FM Listing; provide membrane roofing system and materials that have been evaluated by FM Global (FM) for spread of flame, seam leakage, hail resistance and wind uplift. Identify materials with FM Approved marking / label.
    - i Fire/Windstorm Classification: FM 1-90
    - ii Hail Resistance: SH

- E. The roofing contractor shall maintain an adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods necessary for the proper performance of the work. No allowance will be made for lack of skill on the part of the workers.
- F. Any deviations from contract specifications must be submitted in writing for approval prior to implementation to the professional representing the owner and the MRSM for acceptance / approval by both parties.
- G. Upon completion of the roof installation the roofing contractor shall arrange for a quality assurance / warranty inspection by the Technical Service Department of the approved MRSM. Notice of the inspection date and time will be given to the owner / owner's representative at least 72 hours prior to the inspection taking place.

#### 1.4 REFERENCES

- A. ASTM D6754 Standard Specification for Ketone Ethylene Ester Based Sheet Roofing
- B. ASTM D 751 Test Methods for Coated Fabrics
- C. UL 790 Underwriters Laboratories (UL) - Fire Hazard Classifications
- D. FM 4470 GM Global (FM) - Roof Assembly Classifications
- E. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual

#### 1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: completed high performance membrane roof system and base flashing shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation or other defects in construction.
- B. Material Compatibility: provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by the MRSM based upon field evidence of the roofing membrane/systems service life cycle greater than 20-years.
- C. Roofing System Design: provide high performance membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated according to ASCE-7.
- D. Energy Performance: provide high performance membrane roofing system that is listed on the EPA website as ENERGY STAR qualified and has an initial Solar Reflective Index equal to or greater than 78.

#### 1.6 SUBMITTAL REQUIREMENTS

- A. Prior to mobilization and commencement of work, the roofing contractor shall submit the following:
- B. Sample of MRSM Commercial Roofing Warranty
- C. If pre-finished metal is called for, submit a color chart for the pre-finished metal in order for a color selection to be made.
- D. Submit an assembly letter and/or an approved Pre-Installation Notice / Request for

Warranty from the high-performance membrane roof system manufacturer certifying compliance with the system requirements described in the Quality Assurance section of this specification.

- E. Lay down schedule depicting the direction the new roofing membrane will be attached.

## 1.7 **PRODUCTS AND/OR WORK NOT INCLUDED IN THIS SPECIFICATION**

- A. Rough Carpentry; wood nailers and wood blocking
- B. Masonry; waterproofing, through wall flashing, scupper openings
- C. Plumbing; installation of any roof drains
- D. Electrical; rooftop electrical penetrations
- E. Mechanical; rooftop HVAC equipment installation

## 1.8 **PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver all materials to the job site in manufacturer's original, unopened containers, with legible labels and in sufficient quantity to allow for continuity of work.
- B. Select and operate material handling equipment in a safe manner, guarding against damage to existing construction or newly applied roofing and conforming to manufacturer's recommendations of handling and storage.
- C. All rolls of membrane shall be stored, lying down, elevated above the roof deck and completely protected from moisture with tarpaulins. (Manufacturer's packaging is not considered adequate for outdoor storage.)
- D. Insulation and cover board materials shall be elevated on pallets and fully protected from moisture with tarpaulins. (Manufacturer's packaging is not considered adequate protection from moisture.)
- E. Adhesives and sealants shall be safely stored between 50° F and 80°F prior to use.
- F. Flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow all precautions as outlined in manufacturer's Material Safety Data Sheets.
- G. Materials, having been determined by the owner/owner's representative to be damaged, shall be immediately removed from the construction site and replaced at no cost to the owner.

## 1.9 **COORDINATION**

- A. Prior to installation of materials, a pre-roofing conference shall be held with the roofing contractor, general contractor, owner/owner's representative(s) and representatives of all trades that may be working on the roof / completed membrane to discuss the specified roofing system, coordinate its proper application and the expectations of all parties involved. The authorized roofing contractor and the owner/owner's representative shall notify all parties a minimum of fourteen days prior to the meeting.
- B. Plan and coordinate the installation of the roofing system with other trades in such a manner to avoid membrane damage, keeping the complete installation weather tight and in accordance with all approved details and warranty requirements.

- C. A Technical Representative of the MRSM shall be available to make recommendations necessary to ensure compliance with project specifications and specification alternatives due to unforeseen job conditions.
- D. Topics of discussion at the pre-construction meeting may include the following:
  - 1. Utility Usage
  - 2. Sanitary Facilities
  - 3. Material Storage Areas
  - 4. Roof loading areas
  - 5. Site Access
  - 6. Roof Access
  - 7. Project security
  - 8. Rooftop Penetrations
  - 9. Completed Roof Protection
  - 10. Employee parking
  - 11. Location of Walk Pads

#### 1.10 **JOB CONDITIONS**

##### A. Safety

- 1. Take all necessary precautions regarding worker health and safety when using solvents, adhesives and hot asphalt.
- 2. Store flammable liquid and materials away from open sparks, flames and extreme heat.
- 3. Take necessary precautions when using solvents and adhesives near fresh air intakes.
- 4. Comply with all OSHA requirements for construction. It is the roofing contractor's responsibility to comply with all state, federal and local codes, guidelines and safety requirements.
- 5. Daily site cleanup shall be performed to minimize debris and hazardous congestion.
- 6. Roof work involves handling combustible and heavy materials at height, on some occasions directly over other trades working below the roof deck or in cases of occupied buildings, over building occupants. Extreme caution will be utilized when installing the roof to prevent injury to roofing personnel, other trades, building occupants and to property. Listed below is a partial list of safety requirements, additional requirements exist in order to comply with OSHA and jobsite regulations.
- 7. Safety Data Sheets (SDS) shall be maintained on the jobsite for any and all roofing materials being stored or installed on the project.

8. Fire suppression equipment will be readily available on the roof top whenever combustible roofing material is being handled. Protect against fire and flame spread at all times.
9. Roofing contractor will establish a safety plan and rooftop evacuation procedures and brief his personnel on appropriate emergency actions.

**B. Protection**

1. Schedule installation sequence to limit access and utilization of the newly installed membrane for material storage, construction staging, mechanical and/or excessive foot traffic.
2. Provide proper protection on all newly completed roofing to avoid damage to the new roofing system.
3. Traffic should be minimized on a freshly laid roof.
4. Protect building walls, rooftop units, windows, and other components during installation.

**C. Additional Precautions**

1. Adverse weather conditions e.g., extreme temperature, high winds, high humidity and moisture, could have a detrimental effect on adhesives, general production efforts and/or the quality of the finished installation. Contact MRSM Technical Services for recommendations and acceptable tolerances.
2. Daily production schedules of new roofing shall be limited to only that which can be made 100% watertight at the end of the day, including all flashing and night seals.
3. All surfaces to receive new roof system, including insulation and flashing, shall be free from all dirt, debris and be thoroughly dry.
4. Comply with local EPA requirements as published by Local, State and Federal authorities.
5. All construction debris shall be removed from the construction site and legally dispose of offsite.
6. If a condition is discovered that is not covered by the project specifications notify the general contractor and owner's representative immediately and resolve the conflict. Take appropriate steps to prevent water intrusion into the roof system until such conflict is resolved and roofing operations are continued.

**1.11 WARRANTY**

- A. Provide manufacturer's 20 Year NDL (No Dollar Limit). All materials to be warrantied shall be manufactured or supplied by approved membrane manufacturer.
- B. Provide contractor's warranty covering leaks caused by material defects and or installation workmanship for a period of two years.

## 2.0 **PRODUCTS**

### 2.1 **GENERAL**

- A. All roofing system components shall be manufactured or supplied by approved MRSM.
- B. Unless approved otherwise prior to project bid, all roofing components are to be manufactured or supplied through approved MRSM and be included in the warranty coverage.
- C. Product shall be **FiberTite, Duro-Last, TremPly**, or approved equal.

### 2.2 **KEE MEMBRANE**

- A. Nominal 45-mil ketone ethylene ester (KEE) membrane, reinforced with a 5-oz yd<sup>2</sup> knitted polyester fabric and a 4-oz yd<sup>2</sup> non-woven polyester heat bonded to the backside, conforming to the typical physical properties as outlined below. Membrane color shall be white.

### **PHYSICAL PROPERTIES**

<b><u>ASTM D 6754-02 Test Method(s)</u></b>	<b><u>ASTM D6754 Min. Req.</u></b>
Thickness, mm (in.) <i>ASTM D 751</i>	0.79 (0.031)
Thickness over Fiber mm (in) <i>Optical method (inches)</i>	0.15 (0.006)
Breaking Strength N (lbf) <i>ASTM D 751 proc. B – strip</i>	1175 (265)
Elongation at Break % <i>ASTM D 751 - strip</i>	15

Tear Strength N (lbf) <i>ASTM D 751 proc. B. tongue tear</i>	335 (75)
Linear Dimensional Change % <i>ASTM D 1204 max %</i>	1.3
Fabric Adhesion N/m (lbf/in) <i>ASTM D 751</i>	225 (13)
Low Temperature Bend <i>ASTM D 2136 (°F)</i>	-30
Retention of Properties after Heat Aging <i>ASTM D 3045 – 176°F/156 days</i>	
Breaking Strength Strip % Original:	90
Elongation at Break Strip % Original:	90
Low Temperature Bend after Heat Aging	-30
Change in Weight after Exposure in Water <i>ASTM D 471 158°F, 166h, one side only, max %</i>	0.0 +6.0
Factory Seam Strength N (lbf) <i>ASTM D 751 Grab Method</i>	1780 (400)
Hydrostatic Resistance Mpa (psi) <i>ASTM D 751</i>	3.5 (500)
Static Puncture Resistance <i>ASTM D 5602 (99lbf)</i>	Pass
Dynamic Puncture Resistance (J) <i>ASTM D 5635</i>	10
Accelerated Weathering <i>Practice G 155 / xenon</i>	5,000 hr.
Cracking or Crazing at 7x magnification	None
Accelerated Weathering <i>Practice G 154 / UVA</i>	5,000 hr.
Cracking or Crazing at 7x magnification	None
Fungi Resistance: <i>Practice G 21, 28 days</i>	
Sustained Growth	None
Fungi Resistance: Discoloration	None
Abrasion Test Cycles <i>ASTM D 3389 H-18 wheel / 1,000 g load</i>	1,500
Solar Reflective Index (SRI) <i>Color: DC 196 off white</i>	n/a

### 2.3 **KEE MEMBRANE**

- A. 45 mil SM membrane shall be used for all flashing requirements to match the field membrane and warranty expectations selected for the roofing system.

### 2.4 **ROOF ACCESSORIES**

- A. Furnish accessories manufactured, marketed or approved by MRSM required to complete the roof installation to manufacturer's specification.

## 3.1 **EXECUTION**

### 3.2 **GENERAL**

- A. The latest manufacturer specifications and installation techniques are to be followed along with the following additional requirements. These specific minimum requirements must be accounted for in the contractors bid / proposal and shall not be altered.
- B. The roofing contractor is responsible for providing a suitable substrate surface for the proper installation of the Membrane Roofing System, roof insulation and specified components.
- C. The roofing contractor shall examine all areas and conditions whereby work in this section is to be installed.
- D. Notify the Building Owner / Owner Representative of any and all conditions detrimental to the proper and timely execution of the work. Do not proceed until such conditions have been corrected to the satisfaction of the owner / owner's representative.
- E. Commencement of roofing operations indicates the roofing contractor's acceptance of the roofing substrate for roof application.

### 3.3 **SUBSTRATE PREPARATION**

- A. Surfaces scheduled to receive new membrane roofing shall be free of any standing water, dew, ice, loose debris or any other contaminate that could impair the quality of the installation.
- B. Substrate shall be smooth, clean and free of sharp edges and or projections and obvious depressions that would interfere with the installation of a high-quality high performance
- C. Examine all the areas and conditions whereby work in this section is to be installed. Correct any and all conditions detrimental to the proper and timely execution of the work. Do not proceed until such conditions have been corrected to the satisfaction of the owner / owner's representative.
- D. Lightweight "Cellular" Insulating Concrete
  - 1. Lightweight Insulating Cellular Concrete, herein after referred to as LWIC, shall be installed by trained applicators, approved in writing by the LWIC Manufacturer.

2. LWIC shall be installed in strict accordance with the LWIC manufacturer's installation requirements and standard industry practices.
3. The finished LWIC installation shall exhibit an oven dry density of a nominal 50 pounds per cubic foot and a minimum compressive strength equal to or greater than 300 psi.
4. Newly installed LWIC shall be protected from the intrusion of free water/rain infiltration.
5. Intruded water must be removed prior to the installation of the new FiberTite Roofing System. Consult the appropriate LWIC manufacturer for methodology.
6. Finished LWIC shall be a minimum thickness of 2 inches, properly cured and dry with a moisture content less than 20% by weight and falling toward a target equilibrium of 7%, prior to the installation of the new FiberTite Roofing System.
7. All LWIC decks shall be vented using one way breather vents; large opening vents (>6 inch diameter) shall be installed at a rate of one (1) vent per 1,500 sf (15 square) and small opening vents (<6 inch diameter) shall be installed at a rate of one (1) vent per 1,000 sf (10 square) of installed membrane.

### **3.4 INSTALLATION – GENERAL**

- A. Perform all related work specified in other sections of the contract documents necessary for the proper installation of the high-performance roof membrane.
- B. Ensure mechanical fasteners do not penetrate items located within or secured to the bottom of the deck: i.e., electrical conduit, post tension cables or other miscellaneous items.
- C. Outside ambient air temperatures must be 40°F and rising during the use of any and all adhesives.

### **3.5 INSTALLATION OF WOOD NAILERS (IF REQUIRED)**

- A. Install treated lumber at the same heights as insulation layer or adjacent construction ± 1/4-inch Continuous treated wood nailers are to be installed at all perimeters, around roof projections and penetrations as shown in approved details.
- B. Where wood nailers are installed directly on the substrate, the substrate shall be carefully examined to confirm that the entire area provides a suitable fastening surface. All defects shall be repaired by the appropriate trade prior to installation.
- C. Nailers shall be at least 3½ inches wide and 1 1/2 inches high and installed and anchored in such a manner to resist a force of 250 lbs. per linear foot of wood blocking in any direction.

### **3.6 MEMBRANE INSTALLATION**

- A. Quality Control
  1. It will be the responsibility of the roofing contractor to initiate and maintain a QC program to govern all aspects of the installation of the Membrane Roofing System.
  2. The project foreman and or supervisor will be responsible for the daily execution

of the QC program which will include but is not limited to the supervision, inspection and probing of all heat welding incorporated within the Membrane Roofing System.

3. If inconsistencies in the quality of the application of the composite, membrane and/or welds are found, all work shall cease until corrective actions are taken to ensure the continuity the installation.

#### B. General

1. Work shall be coordinated to ensure that sequencing of the installation promotes a 100% watertight installation at the end of each day.
2. Restrictions regarding outside ambient air temperature are relative only to the exposure limits of the workers and/or adhesives.
3. When using adhesives outside ambient air temperature shall be above 40°. Curing or drying time of the adhesive will be affected by ambient temperatures and must be taken into consideration when determining flashing lengths.
4. Humidity can affect the drying time of solvent borne adhesives and/or cause condensation to form on the newly applied adhesive.
5. Moisture may not be present on the adhesive prior to mating or application of Membrane Roofing System.
6. New Membrane Roofing Systems shall only be installed over properly prepared and sound substrates, free from excessive surface roughness, dirt, debris and moisture.

### 3.7 HOT AIR WELDING

#### A. General

1. All field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
2. All field seams must be clean and dry prior to initiating any field welding.
3. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.

#### B. Hand Welding

1. The lap or seam area of the membrane should be intermittently tack welded to hold the membrane in place.
2. Properly hand welded seams shall utilize a 1-1/2-inch-wide nozzle, to create a homogeneous weld, a nominal 1-1/2 inches in width.

#### C. Automatic Machine Welding

1. Follow all manufacturers' instructions for the safe operation of the automatic welder.
2. Follow local code requirements for electric supply grounding and surge protection.
3. Properly Automatic Machine welded seams shall utilize a 1-1/2-inch-wide nozzle, to create a homogeneous weld, a nominal 1-1/2 inches in width.

### **3.8 INSPECTION**

- A. The job foreman and/or supervisor shall initiate daily inspections of all completed work which shall include but is not limited to the probing of all field welding with a dull pointed instrument to assure the quality of the application and ensure that any equipment or operator deficiencies are immediately resolved.
- B. Ensure that all aspects of the installation (sheet layout, attachment, welding, flashing details, etc.) are in strict accordance with the most current MRSM Specifications and Details.
- C. Excessive patching of field seams because of inexperienced or poor workmanship will not be accepted at time of FINAL INSPECTION FOR WARRANTY ACCEPTANCE.

### **3.9 FLASHING**

- A. Clean all vents, pipes, conduits, tubes, walls, and stacks to bare metal. All protrusions must be properly secured to the roof deck with approved fasteners.
- B. Flash all curbs, parapets and interior walls in strict accordance with approved MRSM details.
- C. The base flange of all membrane flashing shall extend out on to the plane of the deck, beyond the wood nailers to a maximum width of 8 inches.
- D. Vertical flashing shall be terminated no less than 8 inch above the plane of the deck with approved termination bar and counterflashing or metal cap flashing.
- E. Complete all inside and outside corner flashing details with MRSM pre-formed corners or an approved field fabrication detail.
- F. Probe all seams with a dull, pointed probe to ensure the weld has created a homogeneous bond.

### **3.10 METAL FLASHING**

- A. All perimeter edge details are to be fabricated from Polymeric-Clad Metal or utilize a prefabricated Fascia System.
- B. Fasten all metal flashing to wood nailers or approved substrate with approved fasteners 8 inches on center.
- C. Install metal flashing in accordance with MRSM Published Specifications and Construction Details.

### **3.11 ROOF DRAINS**

- A. Flash all roof drains in accordance with MRSM roof drain details.
- B. Minimum 60-mil non-reinforced membrane shall be used for flashing the drain assembly.
- C. The drain target sheet should be sized and installed to provide for a minimum of 12 inch of exposed 60-mil on all sides of the drain

### **3.12 PITCH PANS**

- A. EVERY REASONABLE effort shall be made to eliminate the need for pitch pans

- including the removal of all existing pans.
- B. In the event of no alternative, fabricate pitch pans from Polymeric-Clad metal, installed in accordance with MRSM details.
  - C. Pitch Pans and the sealant will require periodic maintenance by the building owner's maintenance personnel.

### **3.13 EXPANSION JOINTS**

- A. Flash all expansion joints in accordance with authorized/approved details. Fasten all expansion joint material according to MRSM specifications. Ensure the expansion material has sufficient material to expand to the widest point in expansion without causing undue stress on the expansion joint material.
- B. If the expansion joint is a "pre-formed" system, the manufacturer, description and a drawing illustrating the method of installation must be included in the contractor's submittals.

### **3.14 SEALANTS**

- A. Apply authorized sealant(s) to all surface mounted reglets and per project requirements. Sealant(s) are to shed water. Follow all manufacturer's instructions and installation guides.
- B. Use primer when recommended by the manufacturer.
- C. Sealants will require periodic maintenance by the building owner's maintenance personnel.

### **3.15 TEMPORARY SEALS**

- A. At the end of each working day or at the sign of rain, install temporary, 100% watertight seal(s) where the completed new roofing adjoins the uncovered deck.
- B. If water can enter beneath the newly completed roofing, the affected area(s) shall be removed and replaced at no additional expense to the building owner.
- C. Prior to the commencement of work, cut out and remove all contaminated membrane, insulation, roof cement or sealant and properly dispose off-site.

### **3.16 WALKWAYS**

- A. Walkways and protection pads shall be installed at staging areas for roof top equipment maintenance or areas subject to regular foot traffic as designated by contract and/or drawings.

### **3.17 LIGHTNING PROTECTION**

- A. The installation of lightning protection must be coordinated with the authorized roofing contractor, certified lightning contractor and the building owner.
- B. The lightning protection must be installed in such a manner that base plates, air terminals and cables do not penetrate the roofing membrane without the use of pre-approved flashing details.

### **3.18 COMPLETION**

- A. Remove any and all debris, excess materials and scrap of any kind from the roof and surrounding premises prior to demobilization.
- B. Inspect all field welds, detailing and terminations to ensure a 100% the watertight installation.

### **3.19 WARRANTY INSPECTION**

- A. Upon completion of the project, the authorized roofing contractor shall complete and submit the MRSM Project Completion Notice.
- B. Upon receipt of the notice of completion, a Technical Representative of the MRSM shall schedule an inspection with a representative of the authorized roofing contractor to thoroughly review the installation and verify compliance with MRSM specifications.
- C. Any corrections or modifications necessary for compliance with the specifications and acceptance for warranty (punch list) will be noted on the Final Inspection for Warranty Form.
- D. Upon completion of all punch list items and final acceptance of the installation, a warranty as authorized by the MRSM will be issued.

## SECTION 07600 SHEET METAL

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers sheet metal associated with rainwater drainage and miscellaneous flashings around roof and wall openings. The following sheet metal items are covered in other sections:

- a. Ductwork, and other sheet metal for the heating, ventilating, and air conditioning system.
- b. Steel roof deck.

**1-2. GENERAL.** Installation of wall and roof flashings shall be as indicated on the Drawings.

Flashing members to be built into concrete, masonry, or roofing shall be delivered at the proper time for incorporation into the work.

When installing sheet metal items, care shall be taken to avoid marring and improper bending. All components shall be stored in clean, dry storage areas. Contact with corrosive or staining materials shall be prevented. All damaged sections shall be replaced and only undamaged units shall be installed.

**1-3. SUBMITTALS.** Complete specifications, data, and catalog cuts or drawings covering the items furnished under this section shall be submitted in accordance with the Construction Schedule & Project Restraints section.

### PART 2 - PRODUCTS

#### 2-1. MATERIALS.

Stainless Steel	ASTM A167, Type 302 or 304, AISI 2B finish unless otherwise specified.
Sheet Aluminum	ASTM B209, Alloy 3003-H14, mill finish.
Extruded Aluminum	ASTM B221, Alloy 6053 or 6063.
Solder	ASTM B32, Alloy Grade 50A (50-50).

Soldering Flux

For Stainless Steel

Zinc chloride type, Fed Spec 0-F-506, Type II.

For Other Metals

Acid type, Fed Spec O-F-506, Type I, Form A.

Fasteners

Same metal as sheet metal being fastened.

Coal Tar Epoxy

High-build coal tar epoxy; PPG Amercoat "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

Acrylic Sealant

Pecora "Unicyrylic" or Tremco "Mono".

**2-2. EXPOSED METAL.** All exposed or contacting metal and flashings shall be of the same material.

**2-2.01. Types and Materials.**

Downspouts

Pre-finished .032 inch aluminum with an oven baked 70 percent "Kynar 500" fluoropolymer coating; flush surface, complete with strap hangers. Size and color shall match existing. Replace existing where indicated on the Drawings.

Scuppers

Prefinished .032 inch aluminum with an oven baked 70 percent "Kynar 500" fluoropolymer coating; size and profile as shown in the Drawings. Color shall match existing. Replace existing where indicated on the Drawings.

Fascia Trim

Pre-finished .032-inch aluminum with an oven baked 70 percent "Kynar 500" fluoro-polymer coating; smooth finish with concealed fasteners. Metal-Era "Anchor-Tite Canted Fascia" or approved equal. Profile, dimensions, and color shall match existing. Replace existing where indicated on the Drawings.

Miscellaneous Metal Flashings

Stainless steel, 26 gauge.

**2-3. SCUPPERS AND DOWNSPOUTS.** Metal scuppers and downspouts shall be provided and installed as indicated on the Drawings and specified herein. The scuppers and downspouts shall be furnished and installed complete with all accessories as specified or required to complete the installation.

Scuppers and downspouts shall be well constructed, watertight, properly secured to the structure, and installed according to the Drawings and recommendations of SMACNA (latest edition). Downspouts shall be supported at the top and bottom and at 6'-0" maximum intermediate spacings.

Downspouts shall be constructed from aluminum and shall have all exterior surfaces covered with a baked enamel finish.

**2-4. FASCIA TRIM.** Fascia trim shall be replaced where indicated on the Drawings with fasteners approved by the panel manufacturer. Drip flashing, sub-flashing, and other miscellaneous flashing required for a complete weathertight installation shall be provided by the fascia trim manufacturer.

**2-5. MISCELLANEOUS METAL FLASHING.** Metal flashings shall be provided for vents, sleeves, and similar projections through the walls.

### **PART 3 - EXECUTION**

**3-1. WATERTIGHT JOINTS.** Joints in sheet metal work shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Joints in aluminum or between aluminum and other metals shall be sealed with acrylic sealant.

All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

**3-2. PROTECTION.** Adequate protection shall be provided during shipment, site storage, and installation, to prevent damage to materials or finished work.

Aluminum to be placed in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

**END OF SECTION**

## SECTION 07900 JOINT SEALANTS

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers caulking and sealing.

**1-2. GENERAL.** The terms "caulking" and "sealing", as used on the Drawings and in these Specifications, are synonymous. Both terms indicate the materials specified herein. Oil-base caulking shall not be used on this Project.

**1-3. APPROVALS.** All caulking shall meet the requirements of the standards specified herein. All caulking and sealing to be used in contact with potable water shall meet the requirements of ANSI/NSF Standard 61.

**1-4. SUBMITTALS.** Specifications and data covering the materials proposed for use, together with samples or color cards showing the manufacturer's full line of sealant colors, shall be submitted in accordance with the Construction Schedule & Project Restraints section.

### PART 2 - PRODUCTS

#### 2-1. MATERIALS.

Thiokol Sealants (polysulfides)	Fed Spec TT-S-00227E, Class A or ASTM 920 Type M; polysulfide rubber, two component.
Self-Leveling, nonsubmerged	A. C. Horn "Hornflex Traffic Grade"; Polymeric Systems "PSI-350".
Urethane Sealants (Polyurethanes)	Fed Spec TT-S-00227E, Class A, Type 2 and ASTM C920, Type M, Grade NS, two component.
Self-Leveling, Nonsubmerged Service	Bostik "Chem-Calk 550"; Tremco "Vulkem 245"; Pecora "Urexpan NR-200"; Polymeric Systems "RC-2SL"; Tremco "THC-900".
Acrylic Sealant	Fed Spec TT-S-230; ASTM C834.
	Bostik "Chem-Calk 600"; Pecora "AC20"; Tremco "Mono 555".
Primer	As recommended by the sealant manufacturer.

Backup Material	Polyethylene or polyurethane foam as recommended by the sealant manufacturer; Dow "Ethafoam SB" or Plateau "Denver Foam".
Bondbreaker Tape	Adhesive-backed polyethylene tape as recommended by the sealant manufacturer.

**2-2. COLORS.** Colors of sealants shall be as selected by Engineer from the manufacturer's standard line of colors. Different colors may be required for different locations.

**2-3. LOCATIONS TO BE CAULKED.**

**2-3.01. With Thiokol or Urethane Sealant (Nonsag) - Submerged Service.** Not used.

**2-3.02. With Thiokol or Urethane Sealant (Nonsag) - Nonsubmerged Service.**

Entire perimeter of frames for exterior doors.

Entire perimeter of metal louvers.

Entire perimeter of metal dampers and metal shutters.

Entire perimeter of aluminum windows.

Control joints in masonry walls.

Perimeter of aluminum entrances and assemblies, except exterior side of exterior sills.

Joints on the underside of prestressed, precast roof members where exposed to view.

Around service sinks.

Joints between masonry and cast-in-place concrete, where indicated on the Drawings.

Other locations where caulking is indicated on the Drawings, specified in other sections, or required for weatherproofing.

**2-3.03. With Thiokol or Urethane Sealant (Self-Leveling).**

Horizontal joints in walks or drives.

Horizontal joints in traffic-bearing decks and slabs.

#### **2-3.04. With Acrylic Sealant.**

Watertight joints in sheet metal work.

### **PART 3 - EXECUTION**

**3-1. JOINT PREPARATION.** All surfaces to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax. Concrete surfaces which have been contaminated by form oil, paint, or other foreign matter which would impair the bond of the sealant to the substrate shall be cleaned by sandblasting. All surfaces shall be wiped with a clean cloth saturated with xylol or other suitable solvent, and shall be primed before the sealant is applied.

Unless otherwise recommended by the sealant manufacturer and permitted by the Engineer, the depth of sealant in a joint shall be equal to the width of the joint, but not more than 1/2 inch. Backup material shall be provided as necessary to control the depth of sealant and shall be of suitable size so that, when compressed 25 to 50 percent, the space will be filled. Backup material shall be rolled or pressed into place in accordance with the manufacturer's installation instructions, avoiding puncturing and lengthwise stretching. If depth of the joint does not permit use of backup material, bondbreaker tape shall be placed at the bottom of the joint to prevent three-sided adhesion.

**3-2. SEALING.** Sealing work shall be done before any field painting work is started. The air temperature and the temperature of the sealed surfaces shall be above 50°F when sealing work is performed.

Upon completion of the sealing work, each sealed joint shall have a smooth, even, tooled finish, flush with the edges of the sealing recess, and all adjacent surfaces shall be clean. Sealant shall not lap onto adjacent surfaces. Any sealant so applied as to prevent the painting of adjacent surfaces to a clean line, or with an excess of material outside the joint and feathered onto surfaces, shall be removed and the joint resealed.

**END OF SECTION**

## SECTION 08410 FLUSH ALUMINUM DOORS AND FRAMES

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers flush aluminum doors. All products specified herein shall be provided by a single manufacturer.

Caulking is covered in the Joint Sealants section. Finish Hardware is covered in the Finish Hardware section.

**1-2. GENERAL.** Aluminum doors shall be furnished and installed as specified herein and in accordance with the details and arrangements indicated on the Drawings.

**1-3. SUBMITTALS.** Complete specifications and drawings covering the aluminum doors shall be submitted in accordance with the Construction Schedule & Project Restraints section. Drawings shall show an elevation of each door, details of construction, assembly and installation details, profiles and thickness of materials, anchors, reinforcements, and finish.

Drawings shall be accompanied by the manufacturer's installation manual containing standard recommendations and details of installation.

### PART 2 - PRODUCTS

**2-1. MATERIALS.** Materials used in aluminum assemblies shall be as follows:

Flush Aluminum Doors

Cline "Series 100BE" heavy-duty flush aluminum doors or approved equal with Florida Building Code Product Approval. 1-3/4-inch thick door construction, minimum 5-ply construction with composite skin thickness of .125-inch. Exterior door ply shall be one-piece .040-inch smooth 5005-H14 stretcher-leveled aluminum alloy facing. Medium Bronze or Dark Bronze anodized finish to match existing. Provided with manufacturer 10-year warranty.

Internal Door Core	Marine grade honeycomb core with high compression strength of 94 psi minimum.
Removable Transom	Removable transom panel and removable horizontal transom frame shall match construction and finish of door and door frame.
Frame	Aluminum heavy-duty frames, extruded 6063-T5 aluminum with 1/8-inch minimum thickness, box-type frame with fully enclosed sides, 6-inch depth.
Anchoring Devices	18-8 stainless steel.
Astragals	5/16" x 2-1/2" x door height, flat bar astragal, aluminum construction matching door color, required for all exterior double doors.

**2-2. ALUMINUM DOORS.** Doors indicated on the Drawings as aluminum construction shall be as specified herein. Doors shall be prepared to receive the hardware specified in the Finish Hardware section.

All exterior double doors shall be provided with an exterior flat bar astragal attached to the active leaf. Astragal gasketing shall be provided as specified in the Finish Hardware section.

Doors shall be rigid, neat in appearance, and free from defects. All joints on exposed surfaces shall be smooth so that they are invisible after finishing.

Doors shall be 1-3/4 inches thick, of the sizes and design indicated. Clearances for doors shall be 1/8 inch at jambs and heads, 1/4 inch at meeting stiles of pairs of doors, and 3/4 inch at bottom unless otherwise indicated or specified.

Doors shall be constructed with at least 0.040 inch aluminum outer sheets. Side edges of doors shall be flush and closed watertight. All seams shall be continuously sealed. Doors shall be prepared at the factory for hardware and for glazing as indicated on the Drawings and as specified. Outswinging exterior doors shall be finished flush at the top, with all seams and joints closed watertight as specified for side edges.

Reinforcing units shall be provided for locksets. Reinforcing plates shall be provided for mortised and surface-applied hardware according to manufacturer's standards. The location of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".

## **2-3. CONSTRUCTION.**

**2-3.01. Finish.** Exposed surfaces of aluminum doors and frames shall have a color anodized finish to match the existing Dark Bronze or Medium Bronze doors and exterior aluminum trim on each building.

## **PART 3 - EXECUTION**

**3-1. INSTALLATION.** Framing members shall be installed plumb and true by skilled mechanics in accordance with the manufacturer's recommendations and the instructions in standard installation manuals, subject to the following modifications.

Framing members shall be anchored to masonry per the manufacturer's installation recommendations. Anchors for head, jamb, and sill members shall be spaced not more than 24 inches apart.

Member-to-member connections shall be made with appropriate profile clips or with aluminum angles at each side or level of the members jointed. Each clip or angle shall be fastened to each member with at least two stainless steel or zinc plated screws. Connections exposed to weather shall be watertight and shall be sealed during installation in accordance with the manufacturer's recommendations and standard details.

Aluminum surfaces that are to be placed in contact with concrete, mortar, plaster, or dissimilar metals shall be given a coat of coal tar epoxy.

**3-2. PROTECTION AND CLEANING.** Framing assemblies shall be protected during fabrication, shipment, site storage, and installation to prevent damage to materials or finished work. Damaged framing members will be rejected and shall be replaced with satisfactory units.

After completion of construction, protective materials shall be removed and all aluminum work shall be washed with a mild solution of soap and water and then rinsed with clean water.

## **END OF SECTION**

## SECTION 08700 FINISH HARDWARE

### PART 1 - GENERAL

**1-1. SCOPE.** This Section covers finish hardware for flush aluminum doors on the existing Lift Station and the new precast Electrical Building.

**1-2. GENERAL.** Items included in this section shall conform with the following:

Florida Building Code  
NFPA 70, NFPA 80, NFPA 101  
ANSI/BHMA Certified Product Standards – A156 Series

**1-3. SUBMITTALS.** Contractor shall submit a complete schedule of finish hardware in accordance with the requirements specified in the Construction Schedule & Project Restraints section. The schedule shall indicate each item of hardware required for each opening, manufacturer's name, manufacturer's number or symbol, and finish.

**1-4. PACKAGING.** Each item of hardware shall be packaged separately in an individual container complete with screws, keys, special wrenches, instructions, and installation templates necessary for accurately locating, setting, adjusting, and attaching the hardware. Each container shall be marked with the number of the opening to which the hardware item is to be applied.

#### **1-5. COORDINATION.**

**1-5.01. Templates.** Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

**1-5.02. Door and Frame Preparation.** Related Division 08 section Flush Aluminum Doors and Frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

#### **1-6. WARRANTY**

**1-6.01. General Warranty.** Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

**1-6.02. Warranty Period.** Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

**1-6.03. Standard Warranty Period.** Three years from date of Substantial Completion, unless otherwise indicated.

**1-6.04. Special Warranty Periods.**

1. Seven years for heavy duty cylindrical (bored) locks and latches.
2. Five years for exit hardware.
3. Ten years for manual door closers.

## **PART 2 - PRODUCTS**

**2-1. ACCEPTABLE MANUFACTURERS.** The catalog numbers which appear in the Hardware Schedule identify products of the listed manufacturers herein for each hardware item. Equivalent products of the other manufacturers listed herein will also be acceptable.

Hinges	McKinney, Hager, Stanley
Locksets, Latchsets, and Cylinders	Sargent, Yale, Corbin Russwin
Exit Devices	Sargent, Yale, Corbin Russwin, Von Duprin
Closers	Sargent, Norton, LCN, Corbin Russwin
Thresholds, Cast Abrasive	Pemko, Wooster, American Abrasive or Stubbs.
Drip Caps, Extruded	Pemko, Reese, Zero
Gasketing/Weatherstripping	Pemko, Reese, Zero

**2-2. FINISH.** The required finish shall be as indicated by the catalog number listed in the Hardware Schedule herein. Exterior surfaces of door closers shall be finish painted with shop-applied powder coated finish, plated finishes, or special coatings as indicated in the schedule. Machine screws, bolts, and other exposed attachments shall be finished to match hardware.

**2-3. KEYING.** All cylinder locks shall be keyed in groups. All cylinders shall be furnished with interchangeable cores. After the finish hardware submittals have been accepted by the Engineer, the Owner will meet with the Contractor and the hardware consultant to determine the keying groups. All locks in each group shall be keyed alike and each group shall be keyed differently. Two "Do Not Duplicate" keys shall be provided with each lock where required by the Owner.

### **PART 3 - EXECUTION**

**3-1. INSTALLATION.** Hardware shall be accurately fitted, securely applied, carefully adjusted, and lubricated in accordance with the manufacturer's instructions.

**3-1.01. Location.** Unless otherwise directed by the Engineer, the locations of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".

**3-1.02. Thresholds.** The ends of thresholds shall be notched to fit the applicable door frame profile. Thresholds shall be field drilled to receive flush bolts where required. Thresholds shall be anchored to concrete by means of 5/16-inch diameter stainless steel flat head countersunk machine screws and expansion anchors spaced at 8-inch centers. Thresholds shall be set in asphalt roofing cement conforming to ASTM D4586, Type II.

**3-2. ADJUSTING.** Each supplier of finish hardware shall provide the services of a trained and experienced hardware consultant to service and adjust installed hardware.

**3-3. PROTECTION.** Special care shall be taken to protect finished surfaces of hardware during installation. Hardware on which the finish has been damaged prior to final acceptance of the work shall be replaced with new hardware at no additional cost to the Owner.

**3-4. HARDWARE SCHEDULE.** Hardware shall be furnished in accordance with the following schedule. Doors are listed by group number. A complete set of hardware is listed for each group, as follows:

<b>Set #1</b> (Exterior, Pair 3'-0" x 8'-0" with 1'-2" high transom panel, Locked, Panic) Doors 101A				
<b>Item</b>	<b># Req'd</b>	<b>Catalog No.</b>	<b>Finish</b>	<b>Manufacturer</b>
Hinges	8	T4A3386 4-1/2x4-1/2 NRPxSSF	32D	McKinney
Exit Device	1	8713 x ETL (surface vertical rod)	630	Sargent
Closer	1	SRI 351 CPSH	EN	Sargent
Surface Bolts	2	585-12	US26D	Rockwood
Overhead Hold	1	19000 Series	US32D	Rockwood
Gasketing	1 set	2891AS head & 290AS jamb		Pemko
Bottom Sweep	2	18061CNB		Pemko
Threshold	1	252X2-A-FG		Pemko
Raindrip	1	346 C		Pemko
Notes: 1. Install surface bolts and overhead hold on inactive leaf, closer and exit device on active leaf.				
<b>Set #2</b> (Exterior, 3'-0" x 7'-0" with 1'-6" high transom panel, Locked, Panic) Door 101B				
<b>Item</b>	<b># Req'd</b>	<b>Catalog No.</b>	<b>Finish</b>	<b>Manufacturer</b>
Hinges	3	T4A3386 4-1/2x4-1/2 NRPxSSF	32D	McKinney
Exit Device	1	8813 x ETL (rim)	630	Sargent
Closer	1	SRI 351 CPSH	EN	Sargent
Threshold	1	252X2-A-FG		Pemko
Gasketing	1 set	2891AS head & 290AS jamb		Pemko
Raindrip	1	346 C		Pemko
Bottom Sweep	1	18061CNB		Pemko
<b>Set #3</b> (Exterior, Pair 3'-0" x 7'-0" with 1'-4" high transom panel, Locked, Panic) Precast Electrical Building double door				
<b>Item</b>	<b># Req'd</b>	<b>Catalog No.</b>	<b>Finish</b>	<b>Manufacturer</b>
Hinges	8	T4A3386 4-1/2x4-1/2 NRPxSSF	32D	McKinney
Exit Device	1	8713 x ETL (surface vertical rod)	630	Sargent

Closer	1	SRI 351 CPSH	EN	Sargent
Surface Bolts	2	585-12	US26D	Rockwood
Overhead Hold	1	19000 Series	US32D	Rockwood
Gasketing	1 set	2891AS head & 290AS jamb		Pemko
Bottom Sweep	2	18061CNB		Pemko
Threshold	1	252X2-A-FG		Pemko
Raindrip	1	346 C		Pemko
Notes:				
1. Install surface bolts and overhead hold on inactive leaf, closer and exit device on active leaf.				
<b>Set #4</b> (Exterior, 3'-0" x 7'-0", Locked, Panic) Precast Electrical Building single door				
<b>Item</b>	<b># Req'd</b>	<b>Catalog No.</b>	<b>Finish</b>	<b>Manufacturer</b>
Hinges	3	T4A3386 4-1/2x4-1/2 NRPxSSF	32D	McKinney
Exit Device	1	8813 x ETL (rim)	630	Sargent
Closer	1	SRI 351 CPSH	EN	Sargent
Threshold	1	252X2-A-FG		Pemko
Gasketing	1 set	2891AS head & 290AS jamb		Pemko
Raindrip	1	346 C		Pemko
Bottom Sweep	1	18061CNB		Pemko

**END OF SECTION**

## DIVISION 9 PAINTING

### SECTION 09150 CEMENT PLASTER (STUCCO)

#### **PART 1 GENERAL**

##### **1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required to install cement plaster (stucco).

##### **1.02 QUALITY ASSURANCE**

- A. Portland Cement Plastering Standards - ASTM A42.2 and A42.3.

##### **1.03 SUBMITTALS**

- A. Submit to the County, as provided in Section 01340, a listing of brand names and types of materials proposed for use in the work of this Section.

##### **1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; store on pallets in dry, well ventilated space, protected from the weather, under cover and handle in accordance with manufacturer's recommendations.

##### **1.05 JOB CONDITIONS**

- A. Examine the substrates of the areas to receive the stucco and the conditions under which the work is to be performed. Notify the County, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Environmental conditions: Maintain a minimum temperature of 50 degrees F in spaces being plastered. Maintain adequate continuous ventilation in plastered spaces until plaster is dry. Protect plaster from freezing and too rapid drying. Do not plaster on rusted metal materials.
- C. Protect other work from soiling, spattering, moisture deterioration and other harmful effects which may result from plastering operations.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Stucco Accessories
  - 1. Stucco accessories shall be produced from weatherproof PVC as manufactured by VinylTech Accessories, Plastic Components, Inc., or equal.
  - 2. Corner beads shall be No. 1 Corner Bead.
  - 3. Soffit external corner beads shall be No. 540 Drip Screed.
  - 4. Casing beads shall be No. 10 Casing Bead.
  - 5. Control joints shall be No. 20M Joint.

B. Plaster Materials

1. Portland cement shall conform with ASTM C150, Type I or IA.
2. Lime shall be special finishing hydrated lime conforming to ASTM C206, Type S.
3. Sand shall be clean, sharp, washed, natural and free from soluble salts and organic matter. Sand shall comply with ASTM C35 and when dry, shall pass No. 4 sieve.
4. Fiber shall be pure manilla, glass or synthetic fiber, good quality 1/2" to 2" in length, free from grease, oil, dirt and other impurities. No asbestos will be allowed.
5. Water shall be clean, fresh, potable water.

**PART 3 EXECUTION**

**3.01 THREE COAT PLASTERING**

A. Portland cement plaster shall be three-coat work on CMU walls with a minimum thickness of 3/4". Exterior three-coat cement plaster (stucco) shall be made waterproof during and/or after application of one or more coats. Waterproofing materials shall be a product of Thoro System Products, Miami, Florida, or equal. Contractor shall be responsible for scheduling a review meeting with the supplier's technical representative and the County to determine the specific product and application techniques most appropriate for the masonry walls prior to the beginning of the stucco work.

B. Proportions and Mixing

1. All plaster shall be proportioned by weight. The materials shall be weighed by an approved weighing device. Measuring with a shovel will not be permitted.
2. All plaster shall be mechanically mixed. Hand mixing will not be permitted. Mixer to be cleaned after each batch is dumped. Retempering of partially set material is not permitted. Discard plaster which has begun to stiffen.
3. Scratch and brown coats shall be 100 lbs. Portland cement, 10 lbs. hydrated lime and not more than 300 lbs. sand. Add 2 lbs. fiber to scratch coat.
4. Finish coat shall be mixed in proportions of 100 lbs. Portland cement to 10 lbs. hydrated lime mixed with 200 lbs. sand.

C. Moisture Retention and Curing

1. Dampen previous plaster coats which have dried out prior to time for applications of next coat. Dampen with water as required for uniform suction.
2. Determine the most effective procedure for curing and the time lapse between application of coats based on climatic and job conditions. Plaster which is cracked or crazed due to improper timing and curing will not be accepted. Remove and replace defective plaster including plaster base materials, if damaged during removal of defective plaster.

**3.03 CUTTING AND PATCHING**

A. Cut, patch, point-up and repair plaster as necessary to accommodate other work and to restore cracks, dents and imperfections. Repair or replace work to eliminate blisters, excessive crazing and check cracking, dryouts, efflorescence, sweat-outs and similar defects, including areas of the work which do not comply with specified tolerances, and where bonding to the substrate has failed.

- B. Provide approved procedures for protection of plaster from deterioration and damage during the remainder of the construction period.

**END OF SECTION**

## SECTION 09865 SURFACE PREPARATION AND SHOP PRIME PAINTING

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless steels, as specified herein.

#### 1.02 SUBMITTALS

- A. Submit to the County for approval, as provided in the Contract Drawings for shop drawings, manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thickness.
- B. Submit representative physical samples of the proposed primers, if required by the County.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Submerged Services: Shop primer for ferrous metals which will be subject to splash action or which are specified to be considered submerged service shall be sprayed with one coat of Koppers 654 epoxy Primer or Koppers Inertol Primer 621-FDA, dry film thickness 3.5 to 4.5 mils by Koppers Co., Inc., or equal.
- B. Nonsubmerged Services: Shop primer for ferrous metals other than those covered by paragraph 2.01 A shall be sprayed with one coat of Koppers Pug Primer, dry film thickness 3.0 to 4.0 mils by Koppers Co., Inc. or equal.
- C. Nonprimed Surfaces: Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the County up to the time of the final acceptance.
- D. Compatibility of Coating Systems: Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in the Contract Documents for use in the field and which are recommended for use together.

### PART 3 EXECUTION

#### 3.01 APPLICATION

- A. Surface Preparation and Priming:
  - 1. Non submerged components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming. Submerged components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC-SP-10. Near White, immediately prior to priming.

2. Surfaces shall be dry and free of dust, oil, grease, dirt, rust, loose mill scale and other foreign material before priming.
3. Shop prime in accordance with approved paint manufacturer's recommendations.
4. Priming shall follow sandblasting before any evidence of corrosion has occurred and within 24 hours.

**END OF SECTION**

## SECTION 09900 PAINTING

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, tools, materials, equipment, scaffolding or other structures and incidentals necessary to complete this Contract in its entirety.
- B. The work includes painting and finishing of all new interior and exterior exposed items above and below grade and surfaces, such as structural steel, miscellaneous metals, ceilings, walls, floors, doors, frames, transoms, roof fans, construction signs, guardrails, posts, fittings, valves, tanks, equipment and all other work obviously required to be painted unless otherwise specified herein or on the Drawings. The omission of minor items in the Schedule of Work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the Specification as stated herein.
- C. The following items shall not be painted:
  - 1. Any code-requiring labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.
  - 2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.
  - 3. Aluminum handrails (except where in contact with concrete) walkways, windows, louvers and grating unless otherwise specified herein.
  - 4. Signs and nameplates.
  - 5. Finish hardware.
  - 6. Chain link fence.
  - 7. Piping buried in the ground or embedded in concrete.
  - 8. Concealed surfaces of pipe or crawl space.
  - 9. Nonferrous metals, unless specifically noted otherwise.
  - 10. Electrical switchgear and motor control centers.
  - 11. Stainless steel angles, tubes, pipe, etc.
  - 12. Products with polished chrome, aluminum, nickel or stainless steel finish.
  - 13. Plastic switch plates and receptacle plates.
  - 14. Flexible couplings, lubricated bearing surfaces, insulation and metal and plastic pipe interior.
  - 15. Sprinkler heads.
  - 16. Lifting chain on cranes and hoists
  - 17. Electrical cable, festooned conductor system, cables, collector pole brackets, etc.
- D. All work shall be done in strict accordance with this Specification, the Design Drawings and the painting package, including manufacturer's printed instructions.
- E. The Contractor will obtain, at its own expense, all permits, licenses and inspections and shall comply with all laws, codes, ordinances, rules and regulations promulgated by authorities having jurisdiction which may bear on the Work. This compliance will include Federal Public Law 91-596 more commonly known as the "Occupational Safety and Health Act of 1970".

## **1.02 DEFINITIONS**

- A. Field Painting is the painting of new or rebuilt items at the job site. Field painting shall be the responsibility of the Contractor.
- B. Shop Painting is the painting of new or rebuilt items in the shop prior to delivery to the jobsite.
- C. Abbreviations The abbreviations and definitions listed below, when used in this specification, shall have the following meanings:
  - 1. SSPC - Steel Structures Painting Council
  - 2. Exterior - Outside, exposed to weather
  - 3. Interior Dry - Inside, concealed or protected from weather
  - 4. Interior Wet - Inside, subject to immersion services
  - 5. ASTM - American Society of Test Materials
  - 6. NACE - National Association of Corrosion Engineers
  - 7. NSF - National Sanitation Foundation
  - 8. AWWA - American Water Works Association
- D. Dry Film Thickness shall be in Mils.

## **1.03 RESOLUTION OF CONFLICTS**

- A. It shall be the responsibility of the Contractor to arrange a meeting prior to the start of painting, or flooring installation between the Contractor, the Paint Manufacturer, whose products are to be used, and the County. All aspects of surface preparation, application and coating systems as covered by this Specification will be reviewed at this meeting.
- B. Clarification shall be requested promptly from the County when instructions are lacking, conflicts occur in the Specifications, or the procedure seems improper or inappropriate for any reason.
- C. Copies of all manufacturer's instructions and recommendations shall be furnished to the County by the Painting Contractor.
- D. It shall be the responsibility of the Coating Manufacturer to have their factory representative meet in person with the Contractor and County a minimum of three times during the job as a consultant on surface preparation, mil thickness of coating and proper application of coating unless meeting is determined to be unnecessary by the County.

## **1.04 SUBMITTALS**

- A. Contractor shall submit catalog data and cut sheets for the painting system being used if not the TNEMEC materials specified.
- B. Samples as detailed in 3.01 B shall be submitted regardless of system being used, showing each color to be used.
- C. Hazardous Material Disposal documentation shall be submitted if applicable.

## **PART 2 PRODUCTS**

### **2.01 EQUIPMENT**

- A. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practicable from the compressor.
- B. All equipment for application of the paint and the completion of the work shall be furnished by the Contractor in first-class condition and shall comply with recommendations of the paint manufacturer.
- C. Contractor will provide free of charge to the County a "Nordson-Mikrotest" or "Positest" dry film thickness gauge for ferrous metal and an OG232 "Tooke" gauge or equal for non-ferrous and cementitious surface, to be used to inspect coatings by the County and Contractor. The gauges may be used by the Contractor and returned each day to the County. County will return gauges to Contractor at completion of job.

## 2.02 MATERIALS

- A. All materials specified herein are manufactured by the TNEMEC Company, Inc., North Kansas City, Missouri. These products are specified to establish standards of quality and are approved for use on this Project.
- B. Equivalent materials of other manufacturers may be substituted on approval of the County. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance and an independent laboratory certification that their product meets the performance criteria of the specified materials.
- C. Abrasion - Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load.
- D. Adhesion - Elcometer Adhesion Tester.
- E. Exterior Exposure - Exposed at 45 degrees facing the ocean (South Florida Marine Exposure)
- F. Hardness - ASTM D3363-74
- G. Humidity - ASTM D2247-68
- H. Salt Spray (Fog) - ASTM B117-73
- I. Standard practice for Operating the Severe Wastewater Analysis Testing Apparatus ASTM G210-13
- I. Substitutions which decrease the total film thickness, change the generic type of coating, or fail to meet the performance criteria of the specified materials shall not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.
- J. All coatings to be shop applied must meet the requirements for volatile organic compounds (VOC) of not more than 3.5 lbs/gallon after thinning.
- K. Colors, where not specified, shall be as selected by the County or their Representative.
- L. All coatings in contact with potable water need to be NSF Certified in accordance with

ANSI/NSF Standard 61.

- M. All above ground potable water mains and appurtenances shall be painted safety blue.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION OF SURFACES**

- A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be subject to inspection by the County. Any defects or deficiencies shall be corrected by the Contractor before application of any subsequent coating.
- B. Samples of surface preparation and of painting systems shall be furnished by the Contractor to be used as a standard throughout the job, unless omitted by the County.
- C. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the County, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor's expense. Recoating times of manufacturer's printed instructions shall be adhered to.
- D. Coating thickness shall be determined by the use of a properly calibrated "Nordson-Mikrotest" "Positest" Coating Thickness Gauge (or equal) for ferrous metal or an OG232 "Tooke" Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note that use of the "Tooke" gauge is classified as a destructive test.

#### **3.02 SURFACE PREPARATION**

The surface shall be cleaned as specified for the paint system being used. All cleaning shall be as outlined in the Society for Protective Coatings (SSPC) Surface Preparation Specification, And the International Concrete Repair Institute (ICRI) unless otherwise noted. If surfaces are subject to contamination, other than mill scale or normal atmospheric rusting, the surfaces shall be pressure washed, and acid or caustic pH residues neutralized, in addition to the specified surface preparation.

#### **3.03 STANDARDS FOR SURFACE PREPARATION**

- A. Chemical and/or Solvent Cleaning: Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter and contaminates, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning.
- B. Hand Tool Cleaning: Removal of loose rust, loose mill scale and loose paint to a clean sound substrate by hand chipping, scraping, sanding and wire brushing.
- C. Power Tool Cleaning: Removal of loose rust, loose mill scale and loose paint to a clean sound substrate by power tool chipping, descaling, sanding, wire brushing and grinding.
- D. Flame Cleaning: Dehydrating and removal of rust, loose mill scale and some light mill scale by use of flame, followed by wire brushing.
- E. White Metal Blast Cleaning: Complete removal of all mill scale, rust, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.
- F. Commercial Grade Blast Cleaning: Complete removal of all dirt, rust scale, mill scale,

foreign matter and previous coating, etc., leaving only shadows and/or streaks caused by rust stain and mill scale oxides. At least 66% of each square inch of surface area is to be free of all visible residues, except slight discoloration.

- G. Brush-Off Blast Cleaning: Removal of rust scale, loose mill scale, loose rust and loose coatings, leaving tightly-bonded mill scale, rust and previous coatings. On concrete surfaces, brush-off blast cleaning shall remove all laitance, form oils and solid contaminants. Blasting should be performed sufficiently close to the surface so as to open up surface voids, bugholes, air pockets and other subsurface irregularities, but so as not to expose underlying aggregate.
- H. Pickling: Complete removal of rust and mill scale by acid pickling, duplex pickling or electrolytic pickling (may reduce the resistance of the surface to corrosion, if not to be primed immediately).
- I. Near-White Blast Cleaning: Removal of all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale and small specks of previous coating. At least 95% of each square inch of surface area is to be free of all visible residues and the remainder shall be limited to slight discoloration.
- J. Power Tool Cleaning to Bare Metal: Complete removal of rust, rust scale, mill scale, foreign matter and previous coatings, etc., to a standard as specified on a Commercial Grade Blast Cleaning (SSPC-SP-6, NACE-3) by means of power tools that will provide the proper degree of cleaning and surface profile.
- K. Surface Preparation of Concrete (SSPC-SP13)
- L. Visual standards "Pictorial Surface Preparation Standards for Painting Steel Surfaces", and the National Association of Corrosion Engineer, "Blasting Cleaning Visual Standards" TM-01-70 and TM-01-75 shall be considered as standards for proper surface preparation.
- M. Oil, grease, soil, dust, etc., deposited on the surface preparation that has been completed shall be removed prior to painting according to Solvent Cleaning under this Specification.
- N. Weld flux, weld spatter and excessive rust scale shall be removed by Power Tool Cleaning as per these Specifications.
- O. All weld seams, sharp protrusions and edges shall be ground smooth prior to surface preparation or application of any coatings.
- P. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the County.
- Q. All areas which require field touch-up after erection, such as welds, burnbacks, and mechanically damaged areas, shall be cleaned by thorough Power Tool as specified in these Specifications.
- R. Touch-up systems will be same as original specification except that approved manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the County's attention; otherwise, Contractor assumes full responsibility.

### **3.03 PRETREATMENTS**

When specified, the surface shall be pretreated in accordance with the specified pretreatment prior to application of the prime coat of paint.

### **3.04 STORAGE**

Materials shall be delivered to the job site in the original packages with seals unbroken and with legible un mutilated labels attached. Packages shall not be opened until they are inspected by the County and required for use. All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials stored by himself at the job site. Empty coating cans shall be required to be neatly stacked in an area designated by the County and removed from the job site on a schedule determined by the County. County may request a notarized statement from Contractor detailing all materials used on the Project.

### **3.05 PREPARATION OF MATERIALS**

- A. Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer's instructions; thorough hand mixing will be allowed for small amounts up to one gallon. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer's instructions. Otherwise, intermittent hand mixing shall be done to assure that no separation occurs. All mixing shall be done in accordance with SSPC Vol. 1, Chapter 4, "Practical Aspects, Use and Application of Paints" and/or with manufacturer's recommendations.
- B. Catalysts or thinners shall be as recommended by the manufacturer and shall be added or discarded strictly in accordance with the manufacturer's instruction.

### **3.06 APPLICATION**

- A. Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless otherwise allowed by the paint manufacturer. Except as provided below, painting shall not be permitted when the atmospheric temperature is below 50 deg F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.
- B. No coatings shall be applied unless surface temperature is a minimum of 5 Degrees above dew point; temperature must be maintained during curing.
- C. See coating schedule for actual coating systems to be used on this project.

3.07

DEW POINT CALCULATION CHART

DEW POINT CALCULATION CHART

Ambient Air Temperature - Fahrenheit

Relative Humidity	20	30	40	50	60	70	80	90	100	110	120
90%	18	28	37	47	57	67	77	87	97	107	117
85%	17	26	36	45	55	65	76	84	95	104	113
80%	16	25	34	44	54	63	73	82	93	102	110
75%	15	24	33	42	52	62	71	80	91	100	108
70%	13	22	31	40	50	60	68	78	88	96	105
65%	12	20	29	38	47	57	66	76	85	93	103
60%	11	20	27	36	45	55	64	73	83	92	101
55%	9	17	25	34	43	53	61	70	80	89	98
50%	6	15	23	31	40	50	59	67	77	86	94
45%	4	13	21	29	37	47	56	64	73	82	91
40%	1	11	18	26	35	43	52	61	69	78	87
35%	-2	8	16	23	31	40	48	57	65	74	83

SURFACE TEMPERATURE AT WHICH CONDENSATION OCCURS

Dew Point

Temperature at which moisture will condense on surface. No coatings should be applied unless surface temperature is a minimum of 5deg above this point. Temperature must be maintained during curing.

Example

If air temperature is 70 deg F and relative humidity is 65%, the dew point is 57 deg F. No coating should be applied unless surface temperature is 62 deg F minimum.

- A. No coating shall be applied unless the relative humidity is below 85%.
- B. Suitable enclosures to permit painting during inclement weather may be used if provisions are made to control atmospheric conditions artificially inside the enclosure, within limits suitable for painting throughout the painting operations.
- C. Field painting in the immediate vicinity of, or on, energized electrical and rotating equipment, and equipment and/or pipes in service shall not be performed without the approval of the County.
- D. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.
- E. The Contractor's scaffolding shall be erected, maintained and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect buildings and equipment. All surfaces required to be clear for visual observation shall be cleaned immediately after paint application.

- F. Painting shall not be performed on insulated pipe within three (3) feet of insulation operations or on insulation whose covering and surface coat have not had time to set and dry. Painting shall not be performed on uninsulated pipe within one (1) foot of any type of connection until the connection has been made, except as directed by the County.
- G. The prime coat shall be applied immediately following surface preparation and in no case later than the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.
- H. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities such as lifting or loss of adhesion.
- I. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.
- J. Finish colors shall be in accordance with the COLOR SCHEDULE and shall be factory mixed (i.e., there shall be no tinting by the Contractor, unless authorized by the County).
- K. All edges and weld seams in immersion service shall receive a "stripe coat" (applied by brush) of the 2nd coat prior to application of the full 2nd coat.
- L. All open seams in the roof area of tanks shall be filled after application of the topcoat with a flexible caulking such as Sika Flex 1A.

### **3.08 WORKMANSHIP**

- A. The Contractor must show proof that all employees associated with this Project shall have been employed by the Contractor for a period not less than six (6) months.
- B. Painting shall be performed by experienced painters in accordance with the recommendations of the paint manufacturer. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work which shows carelessness, lack of skill, or is defective in the opinion of the County, shall be corrected at the expense of the Contractor.
- C. The Contractor shall provide the names of at least three other projects of similar size and scope that they have successfully completed under their current company name.

### **3.09 APPLICATION OF PAINT**

- A. By Brush and/or Rollers
  - 1. Top quality, properly styled brushes and rollers shall be used. Rollers with a baked phenol core shall be utilized.
  - 2. The brushing or rolling shall be done so that a smooth coat as nearly uniform in thickness as possible is obtained. Brush or roller strokes shall be made to smooth the film without leaving deep or detrimental marks.
  - 3. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or sheepskins, and paint mitt.
  - 4. It may require two coats to achieve the specified dry film thickness if application is by brush and roller.

B. Air, Airless or Hot Spray

1. The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied and shall be equipped with suitable pressure regulators and gauges.
2. Paint shall be applied in a uniform layer, with a 50% overlap pattern. All runs and sags should be brushed out immediately or the paint shall be removed and the surface resprayed.
3. High build coatings should be applied by a cross-hatch method of spray application to ensure proper film thickness of the coating.
4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or sheepskins shall be used, as authorized by the manufacturer.
5. Special care shall be taken with thinners and paint temperatures so that paint of the correct formula reaches the receiving surface.
6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer of the paint being sprayed.
7. The first coat on concrete surfaces in immersion service should be sprayed and back rolled.

**3.10 PROTECTION AND CLEANUP**

- A. It shall be the responsibility of the Contractor to protect at all times, in areas where painting is being done, floors, materials of other crafts, equipment, vehicles, fixtures, and finished surfaces adjacent to paint work. Cover all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of painting work.
- B. At the option of the County during the course of this project, the Contractor will contain all spent abrasives, old paint chips, paint overspray and debris by means suitable to the County, including, but not limited to, full shrouding of the area.
- C. If shrouding is required, the Contractor must provide a complete design of the intended shroud or cover. Care must be taken not to modify or damage the structure during the use of the shroud. If damage should occur, the Contractor is held responsible for all repairs.
- D. At completion of the work, remove all paint where spilled, splashed, spattered, sprayed or smeared on all surfaces, including glass, light fixtures, hardware, equipment, painted and unpainted surfaces.
- E. After completion of all painting, the Contractor shall remove from job site all painting equipment, surplus materials and debris resulting from this work.
- F. The Contractor is responsible for the removal and proper disposal of all hazardous materials from the job site in accordance with Local, State and Federal requirements as outlined by the Environmental Protection Agency.
- G. A notarized statement shall be presented to the County that all hazardous materials have been disposed of properly including, but not limited to: name of disposal company, disposal site, listing of hazardous materials, weights of all materials, cost per pound and EPA registration number.

### 3.11 TOUCH-UP MATERIALS

The Contractor shall provide at the end of the Project at least one (1) gallon of each generic topcoat in each color as specified by the County for future touch-up. Two gallons may be required for (2) component materials.

### 3.12 ON-SITE INSPECTION

During the course of this Project, the County will reserve the option of incorporating the services of a NACE Level III inspection service. The inspection service will be responsible for assuring the proper execution of this Specification by the successful Contractor.

### 3.13 STEEL - STRUCTURAL, TANKS, PIPES AND EQUIPMENT

#### A. EXTERIOR EXPOSURE (NON-IMMERSION)

##### 1. System No. 1095-1: Epoxy/High Build Urethane

This system is highly resistant to abrasion, wet conditions, corrosive fumes and chemical contact. Provides 3-4 times the color and gloss retention of conventional paints. Second coat to be close to finish color but not the same color. This system should be used for above ground exterior steel surfaces that are neither submerged, nor buried.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Shop Coat: 66HS-1211 Epoxoline Primer	3.0 - 4.0
2nd Coat: 66HS-Color Hi-Build Epoxoline	2.0 - 3.0
3rd Coat: 1095-Endura-Shield III	<u>2.0 - 3.0</u>
Dry Film Thickness	7.0 - 10.0
Minimum	8.0 Mils

##### 2. System No. 1095-2: High Build Urethane for Marginally Cleaned Surfaces or Topcoating Existing System

This system can be used over factory finish paint or cover non-sandblasted steel and offer the high performance of a urethane coating. Specify Series 1074U Endura-Shield for gloss finish.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning or SSPC-SP3 Power Tool Cleaning

Shop Coat: Manufacturer Standard Primer (or existing coating)	3.0-5.0
2nd Coat: 135 Chembuild	3.0 - 5.0
3rd Coat: 1095-Color Endura-Shield	<u>2.0 - 3.0</u>
Dry Film Thickness	8.0 - 13.0
Minimum	9.5 Mils

##### 4. System 90-97: Zinc/Epoxy/Urethane

This system offers the added corrosion protection of a zinc rich primer. Series 90-97 Tneme-Zinc is an organic zinc-rich primer that can be used for field touch up of a

zinc primer or for touch up of galvanized surfaces that are damaged.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Shop Coat: 90-97 Tneme-Zinc	2.5 - 3.5	
2nd Coat: 66HS-Color Hi-Build Epoxoline	2.0 - 3.0	
3rd Coat: 1095 Endurashield	<u>2.0 - 3.0</u>	
	Dry Film Thickness	6.5 - 9.5
	Minimum	8.0 Mils

B. INTERIOR EXPOSURE (NON-IMMERSION)

1. System No.66HS-1: High Build Epoxy

This system will provide chemical and corrosion resistance against abrasion, moisture, corrosion fumes, chemical contact and immersion in non-potable water. Primer coat must be touched-up before second coat is applied. Substitute Series 161HS for low temperature cure or quick recoats. Use this system for interior exposed, non submerged metals.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Shop Coat: 66HS-1211 Epoxoline Primer	3.0 - 5.0	
2nd Coat: 66HS-Color Hi-Build Epoxoline	<u>4.0 - 6.0</u>	
	Dry Film Thickness	7.0 - 11.0
	Minimum	9.0 Mils

2. System No. 66HS-2: High Build Epoxy (Over OEM Finishes)

This system is to be used over standard manufacturer's primer to offer a high performance epoxy finish. Excellent for areas of rust not able to be completely cleaned.

Surface Preparation: Spot SSPC-SP6 Commercial Blast Cleaning or SSPC- SP11 Power Tool Cleaning to Bare Metal

Shop Coat: Manufacturer's Standard (or existing coating)	1.0 - 2.0	
2nd Coat: 27WB	2.5 - 4.0	
3rd Coat: 66HS-Color Hi-Build Epoxoline	<u>2.0 - 4.0</u>	
	Dry Film Thickness	5.5 - 10.0
	Minimum	7.0 Mils

C. IMMERSION

1. System No. 104-1: High Solids Epoxy (Non-Potable Water)

This system will provide chemical and corrosion resistance for protection against abrasion, moisture, corrosive fumes, chemical contact and immersion in *mild to moderate* Wastewater, such as clarifiers, chlorine contact basins, aeration basins, settling basins and other open top (aerobic) structures. Primer coat must be touched-up before second coat is applied. Scarify the surface before topcoating if the Series 66HS has been exterior-exposed for 60 days or longer. Substitute Series

161HS for low temperature cure or quick recoats.

Surface Preparation: SSPC-SP10 Near-White Blast Cleaning

Shop Coat: 66HS-1211 Epoxoline Primer	3.0 - 5.0
2nd Coat: 104-Color Hi-Build Epoxoline	6.0-8.0
3rd Coat: 104-Color Hi-Build Epoxoline	<u>6.0-8.0</u>
Dry Film Thickness	15.0 - 21.0
Minimum	11.0 Mils

2. System No. 20HS-1: Epoxy-Polyamide (Potable Water)

This system meets American Water Works Association AWWA D 102 Inside Paint System Number 1. Series 20HS meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series FC20HS for low temperature cure or quick recoats.

Surface Preparation: SSPC-SP10 Near-White Blast Cleaning

Shop Coat:20HS-WH02 Pota-Pox (Tank White)	3.0 - 5.0
2nd Coat: 20HS-1255 Pota-Pox (Beige)	4.0 - 6.0
3rd Coat: 20HS-WH02 Pota-Pox (Tank White)	<u>4.0 - 6.0</u>
Dry Film Thickness	11.0 - 17.0
Minimum	12.0 Mils

**3.14 OVERHEAD METAL DECKING, JOIST**

A. INTERIOR EXPOSURE

System No. 115-1: Uni-Bond

This system should be used on ceiling areas where a one-coat system is desired. Can be applied over steel, galvanized and aluminum decking, joist, shop primed beams, conduits and concrete.

Surface Preparation: Surfaces must be dry, clean and free of oil, grease and other contaminates. Allow concrete to cure 28 days.

Coating: 115-Color Uni-Bond Dry Film Thickness 2.5 - 4.0

B. EXTERIOR EXPOSURE

System No. 1029-1: Enduratone

This system can be applied over a wide variety of coatings and factory finishes. It can also be applied direct to galvanized aluminum decking, joists, & conduits

Surface Preparation: Pressure clean to remove all dirt, oil, grease, chemicals and foreign contaminates. Remove loose paint and all rust by hand and power tool cleaning (SSPC-SP 2 & 3)

1st Coat:	1029-Color Endura-tone	2.0-3.0
2nd Coat:	1029-Color Enduratone	<u>2.0-3.0</u>
	Dry Film Thickness	4.0-6.0

3.16 GALVANIZED STEEL - PIPE AND MISCELLANEOUS FABRICATIONS

A. EXTERIOR / (NON-IMMERSION)

System No. 1095-3: Epoxy/High Build Urethane

Series 66HS has excellent adhesion to galvanized steel. This system is highly resistant to abrasion, wet conditions, corrosive fumes and chemical contact. Provides 3-4 times the color and gloss retention of conventional paints. First coat to be same color as or close to the finish color. Specify Series 1074U Endura-Shield for gloss finish.

Surface Preparation: SSPC-SP1 Solvent Cleaning, followed by Sweep Abrasive Blasting (SSPC-SP7)

1st Coat: 66HS-Color Hi-Build Epoxoline	2.0 - 4.0	
2nd Coat: 1095-Color Endura-Shield	<u>2.0 - 4.0</u>	
	Dry Film Thickness	4.0 - 8.0
	Minimum	5.0 Mils

B. INTERIOR EXPOSURE (NON IMMERSION) AND ALUMINUM IN CONTACT WITH CONCRETE

System No. 66HS-3: Polyamide Epoxy

Surface Preparation: SSPC-SP1 Solvent Cleaning

1st Coat: 66HS-Color Hi-Build Epoxoline	2.0 - 4.0	
2nd Coat: 66HS-Color Hi-Build Epoxoline	<u>2.0 - 4.0</u>	
	Dry Film Thickness	4.0 - 8.0
	Minimum	5.0 Mils

3.18 CONCRETE

A. EXTERIOR - ABOVE GRADE

1. System No. 1026-1: Acrylic Emulsion Low Sheen

*If semi-gloss finish is desired, use Series 1029 Tneme-Cryl SG as the second coat.*

Surface Preparation: Allow new concrete to cure for 28 days. Surface must be clean and dry.

1st Coat: 1026-Color Tneme-Cryl	2.0 - 3.0	
2nd Coat: 1026-Color Tneme-Cryl	<u>2.0 - 3.0</u>	
	Dry Film Thickness	4.0 - 6.0
	Minimum	5.0 Mils

2. System No. 156-1: Modified Acrylic Elastomer

If texture is needed, use 157 Enviro-Crete TX (medium texture) For application over previously applied coatings, use TNEMEC Series 151 Elasto-Grip at 1.0 - 2.5 mils DFT prior to the application of Series 156 Enviro-Crete.

Surface Preparation: Surface must be clean and dry.

1st Coat: 156-Color Enviro-Crete	4.0 - 8.0	
2nd Coat: 156-Color Enviro-Crete	<u>4.0 - 8.0</u>	
	Dry Film Thickness	8.0 - 16.0
	Minimum	10.0 Mils

B. EXTERIOR - BELOW GRADE

1. System No. 46-31: Coal Tar-Epoxy

Surface Preparation: Surface shall be clean and dry.

One Coat: 46H-413 Hi-Build Tneme-Tar	Dry Film Thickness	14.0 - 20.0
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C. EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)

1. System No. 1026-2: Acrylic Emulsion, Low Sheen (Interior/Exterior)

This system will provide a decorative coating with good exterior durability, color retention, and a high vapor transmission rate. ***For Semi-Gloss finish, use 1029-Color Tneme-Cryl S/G.***

Surface Preparation: Surface shall be clean and dry. Allow concrete to cure for 28 days.

Block Filler (CMU only): 1254 Epoxoblock	125 SF/GL	
1st Coat: 1026-Color Tneme-Cryl	2.0 - 3.0	
2nd Coat: 1026-Color Tneme-Cryl	<u>2.0 - 3.0</u>	
	Dry Film Thickness	4.0 - 6.0
	Minimum	5.0 Mils

\*Does not include Block Filler

2. System No. 66HS-4: Epoxy-Polyamide (Interior)

***Series 66HS provides excellent protection from abrasion, moisture, corrosive fumes and chemical contact..***

Surface Preparation: Surfaces shall be clean and dry. Allow concrete to cure for 28 days. All surfaces must be clean and dry.

Block Filler (CMU only): 1254 Epoxoblock	125 SF/GL	
1st Coat: 66HS-Color Hi-Build Epoxoline	3.0 - 5.0	
2nd Coat: 66HS-Color Hi-Build Epoxoline	<u>4.0 - 6.0</u>	
	Dry Film Thickness	7.0 - 11.0*
	Minimum	9.0 Mils

\*(Does not include Block Filler)

D. IMMERSION - POTABLE & NON-POTABLE WATER

1. System No. 104-2: High Solids Epoxy (Non-Potable Water). This system will provide chemical and corrosion resistance for protection against abrasion, moisture, corrosive fumes, chemical contact and immersion in *mild to moderate* Wastewater, such as clarifiers, chlorine contact basins, aeration basins, settling basins and other open top (aerobic) structures.

Surface Preparation: Allow new concrete to cure for 28 days. Sweep abrasive blast per SSPC-SP13 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Apply Tnemec Series 218 to all surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, mitigate concrete outgassing, and to create a monolithic, paintable surface.

1st Coat: 104-1255 H.S. Epoxy Primer	6.0 - 8.0
2nd Coat: 104 Color H.S. Epoxy	<u>6.0 - 8.0</u>
3 <sup>rd</sup> Coat: 104 Color H.S. Epoxy	<u>6.0-8.0</u>
	Dry Film Thickness
	Minimum
	18.0 - 240.0 20.0 Mils

2. System No. 20HS-2 Epoxy-Polyamide (Potable Water)

This system meets American Water Works Association AWWA D 102 Inside System No. 1. Series 20HS meets the requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61.

Surface Preparation: Allow new concrete to cure for 28 days. Sweep abrasive blast per SSPC-SP13 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Apply Tnemec Series 218 to all surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, and to create a monolithic, paintable surface.

1st Coat: 20HS-15BL Pota-Pox	4.0 - 6.0
2nd Coat: 20HS-1255 Pota-Pox Finish	<u>4.0 - 6.0</u>
3 <sup>rd</sup> Coat: 20HS -15BL	<u>4.0-6.0</u>
	Dry Film Thickness
	Minimum
	12.0 - 17.0 13.0 Mils

E. INTERIOR EXPOSURE (NON-IMMERSION)

1. System No. 66HS-5: High Solids Epoxy

This system will produce a slick, tile-like finish that has excellent chemical and water resistance. Surface will be easy to clean.

Surface Preparation: Allow new concrete to cure for at least 28 days. Surface to be clean and dry.

1st Coat: 66HS-Color H.S. Epoxy	6.0 - 8.0
2nd Coat: 66HS-Color H.S. Epoxy	<u>6.0 - 8.0</u>
Dry Film Thickness	12.0 - 16.0
Minimum	14.0 Mils

2. System No. 113-1: Acrylic-Epoxy Semi-Gloss

This system will provide high performance and can be applied directly over existing coatings without lifting. Can be used when low odor is required during application. Specify Series 114 Tneme-Tufcoat for Gloss Finish.

Surface Preparation: Allow new concrete to cure for at least 28 days. Surface must be clean and dry.

One or Two Coats: 113-Color Tneme-Tufcoat

Dry Film Thickness	4.0 - 6.0
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3.19 CONCRETE FLOORS

A. EPOXY FLOOR COATINGS

1. System No. 290-1: Epoxy- Chemical Resistant Urethane

*This system will provide a durable, long-wearing coating that bonds tightly to concrete and stands up under heavy foot traffic, frequent cleaning, spillage of water, oil, grease, or chemical, and UV Exposure.*

Surface Preparation: Allow new concrete to cure for 28 days. Mechanically abrade or Sweep Abrasive Blast Cleaning

Moisture vapor transmission should not exceed three lbs per 1,000 sq ft in a 24 hour period. (Reference ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.") Relative humidity should not exceed 80%. (Reference ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes.")

**Note: For moisture content up to 10 lbs per 1,000 sq ft or relative humidity up to 90%, Series 208 may be substituted for Series 201 as the primer.**

1st Coat: 201- Epoxoprime	5.0-7.0
2nd Coat: 237-Color Tneme-Glaze	<u>8.0-10.0</u>
3 <sup>rd</sup> Coat: 290 CRU	<u>2.0-3.0</u>
Dry Film Thickness	15.0- 20.0
Minimum	17.0 Mils

For a non-skid finish, broadcast 30-50 mesh clean, dry silica sand into the 2nd coat at a rate of 5 lbs per 150 square feet.

2. System No. 241/222: Decorative Quartz Flooring (Non-Slip)

This system provides a decorative, chemical, abrasion, impact resistant, non-slip, seamless flooring system with a moisture mitigating base coat that resists up to 20 lbs of moisture vapor pressure.

Surface Preparation: Allow new concrete to cure for 28 days. Mechanically abrade or Sweep abrasive Blast to provide a minimum surface profile equal to ICRI CSP3

1st Coat: 241 Ultra-Tread MVT	70 square feet per small kit
2nd Coat: 222 Deco-Tread	(1 ct. @ 1/16" ea.)
3rd Coat: 284 Tneme-Glaze (clear)	<u>8.0 - 12.0</u>
	Minimum Dry Film Thickness 1/8"+

**3.20 POROUS MASONRY**

**A. EXTERIOR/INTERIOR EXPOSURE**

1. System No. 156-2: Modified Epoxy - Sand Texture

Modified Waterborne Acrylate. This system offers long term protection against wind-driven rain, mold/mildew growth, chalking & fading, and bridges hairline cracks.

Surface Preparation: Surface shall be clean and dry.

1st Coat: 157-Color Envirocrete	6.0-9.0
2nd Coat: 157 Envirocrete	6.0-9.0
Dry Film Thickness	12.0-18.0
Minimum DFT:	14.0 mils

2. System No. 104-3: High Solids Epoxy (Interior Only)

This system will produce a film thickness of 16 mils. The surface will be tile-like for easy cleaning and will provide protection against chemical attack, corrosive fumes, high humidity and wash down. Backroll first coat to fill porosity.

Surface Preparation: Surface to be clean and dry.

1st Coat: 104-Color H.S. Epoxy	8.0 - 10.0
2nd Coat: 104-Color H.S. Epoxy	<u>8.0 - 10.0</u>
Dry Film Thickness	16.0 - 20.0
Minimum	18.0 Mils

3. System No. 113-2: Acrylic-Epoxy Semi-Gloss (Interior Only)

Series 113 Tneme-Tufcoat has very low odor and can be used when painting in occupied areas.

***Specify Series 114 Tneme-Tufcoat for a gloss finish.***

Surface Preparation: Surface must be clean and dry.

1st Coat: 1254 Epoxoblock WB	125 SF/Gal
2nd Coat: 113-Color Tneme-Tufcoat*	<u>4.0 - 6.0</u>
	**4.0 - 6.0

\* ***Two coats may be required if applied by roller***  
 \*\* ***Total Dry Film Thickness of Topcoats Only***

4. System No. 156-3: Modified Acrylic Elastomer

If texture is needed, use 157 Enviro-Crete TX For application over previously applied coatings, use TNEMEC 151 Elasto-Grip at 1.0 - 2.5 mils DFT in lieu of Series 1254.

Surface Preparation: Surfaces must be clean and dry.

1st Coat: 1254 Epoxoblock WB	125 SF/Gal
2nd Coat: 156-Color Enviro-Crete	4.0 - 8.0
3rd Coat: 156-Color Enviro-Crete	<u>4.0 - 8.0</u>
Dry Film Thickness	8.0 - 16.0
Minimum	10.0 Mils

**3.21 GYPSUM WALLBOARD**

A. INTERIOR EXPOSURE

1. System No. 113-3: Acrylic-Epoxy

Surface Preparation: Surface must be clean and dry.

1st Coat: 51PVA Sealer	1.0 - 2.0
2nd Coat: 113 H.B. Tneme-Tufcoat*	<u>4.0 - 5.0</u>
Dry Film Thickness	5.0 - 7.0
Minimum	6.0 Mils

\*Two coats may be required if application is by brush and roller.

2. System No. 66HS-5: Hi-Build Epoxoline

Surface Preparation: Surface must be clean and dry.

1st Coat: 51PVA Sealer	1.0 - 2.0
2nd Coat: 66HS-Color Hi-Build Epoxoline*	<u>4.0 - 6.0</u>
Dry Film Thickness	5.0 - 8.0
Minimum	5.0 Mils

\*Two coats may be required if applied by roller

3. System No. 1026--3: Acrylic Emulsion, Low Sheen (Interior/Exterior Exposure)

This system is designed for mild use areas like office walls, laboratory ceilings, stairwells, etc. For Semi-Gloss finish, use 1029-color Tneme-Cryl S/G.

Surface Preparation: Surface must be dry and clean.

1st Coat: 1026-Color Tneme-Cryl	2.0 - 3.0
2nd Coat: 1026-Color Tneme-Cryl	<u>2.0 - 3.0</u>
Dry Film Thickness	4.0 - 6.0
Minimum	5.0 Mils

**3.22 WOOD**

A. EXTERIOR/INTERIOR EXPOSURE

1. System No. 1029-2: Acrylic Emulsion Semi-Gloss

*Specify Series 1028 Hi-Build Tneme-Gloss for High Gloss finish.*

Surface Preparation: Surface shall be clean and dry.

1st Coat: 10-99W Undercoater	2.0-3.0
2nd Coat: 1029 Enduratone	1.5 - 3.5
3rd Coat: 1029 Enduratone	<u>1.5 - 3.5</u>
Dry Film Thickness	5.0 - 10.5
Minimum	6.0 Mils

**3.23 PVC PIPE**

A. EXTERIOR OR INTERIOR

System No. 1095-4: Acrylic Polyurethane

Surface Preparation: SSPC-SP1 followed by hand or power sanding to scarify / degloss surface.

Two Coats: 1095 Endurashield      Dry Film Thickness    2.0-3.0 mils per coat.

**3.24 INSULATED PIPE**

A. INTERIOR EXPOSURE

System No. 1026-4: Acrylic Emulsion, Low Sheen

*For semi-gloss finish, use 1029-Color Tneme-Cryl S/G.*

Surface Preparation: Surface shall be clean and dry.

1st Coat: 1026-Color Tneme-Cryl	2.0 - 3.0
2nd Coat: 1026-Color Tneme-Cryl	<u>2.0 - 3.0</u>
Dry Film Thickness	4.0 - 6.0
Minimum	5.0 Mils

**3.25 HIGH HEAT COATING**

A. EXTERIOR/INTERIOR EXPOSURE

1. System No. 1528-1: Inert Multipolymeric Matrix (1200 deg F Maximum)

Surface Preparation: SSPC-SP10 Near-White Blast Cleaning - 1.5 Mil Surface Profile

1st Coat: 1528-Color Endura-Heat DTM	2.0-4.0
2nd Coat: 1528-Color Endura-Head DTM	<u>2.0-4.0</u>
Dry Film Thickness	4.0-6.0

**3.26 SURFACES EXPOSED TO H2S/H2SO4 (SEVERE EXPOSURE/IMMERSION)**

**A. CEMENTITIOUS SURFACES**

System No. 434-1: Polyamine Epoxy Mortar system

Surface Preparation: Allow new concrete to cure for 28 days. Sweep abrasive blast per SSPC-SP13 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Apply Tnemec Series 218 to all surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, mitigate concrete outgassing, and to create a monolithic, paintable surface.

1st Coat: 434 Perma-Shield	125 mils
2nd Coat: 435 Perma-Glaze	<u>18.0-20.0</u>
Dry Film Thickness	143-145
Minimum	144.0

**B. FERROUS METAL SURFACES**

System No. 142-1: Flake /Aluminum Oxide Filled Polyamine Epoxy

Surface Preparation: SSPC-SP-10 Near White Metal Blast Cleaning (1.5 Mil Profile)

1st Coat: Series 1 Omnithane	2.5-3.5
2nd Coat: 142 Epoxoline	<u>14 - 18.0</u>
Dry Film Thickness	16.0 - 23.5.0
Minimum	20.0 Mils

**3.27 EXTERIOR OF PRESTRESSED CONCRETE TANKS**

**A. System No. 156-4: New Tanks**

Surface Preparation: Allow new concrete to cure for at least (3) days. Surface to be clean and dry.

1st Coat: 156-Color Envirocrete	4.0 - 6.0
2nd Coat: 156-Color Envirocrete	<u>4.0 - 6.0</u>
Dry Film Thickness	8.0 - 12.0
Minimum	10.0 Mils

**B. System No. 156-5: Existing Tanks (Previously Painted)**

Surface Preparation: Remove all dirt, oil, grease, chalk, and loose paint per high pressure water blast (min. 3500 psi).

1st Coat: 151 Elasto-Grip	1.0 - 2.5
Stripe Coat: Stripe all hairline cracks with a brushed coat of Series 156 Envirocrete	3.0 - 5.0

Topcoat: 156-Envirocrete

4.0 - 6.0  
Dry Film Thickness (Cracks) 8.0 - 13.5  
Dry Film Thickness (Other) 5.0 - 8.5

### 3.28 SECONDARY CONTAINMENT AREAS

#### A. System No. 239SC-1: Modified Novolac Epoxy

**This system offers superior chemical resistance to a wide range of aggressive chemicals, including Sulfuric Acid, Hydrofluosilicic Acid, Sodium Hydroxide, Sodium Hypochlorite, Polymer Emulsion, and hydrocarbons.**

Surface Preparation: Allow new concrete to cure for 28 days. Sweep abrasive blast per SSPC-SP13 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Moisture vapor transmission should not exceed three lbs per 1,000 sq ft in a 24 hour period. (Reference ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.") Relative humidity should not exceed 80%. (Reference ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes.") Note: For moisture content up to 10 lbs per 1,000 sq ft or relative humidity up to 90%, Series 241 may be substituted for the primer. Refer to the Series 241 product data sheet for more information.

Apply Tnemec Series 218 to all vertical surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, and to create a monolithic, paintable surface.

Apply Tnemec Series 215 or 218 as needed to fill voids in horizontal surfaces.

Primer: Tnemec Series 239SC RCK	6.0-8.0
Basecoat: Tnemec Series 239SC MCK	60.0-80.0
Fiberglass Mat: Tnemec Series 211-0215SC	NA
Saturant Coat: Tnemec Series 239SC RCK	10.0-12.0
Top Coat: Tnemec Series 282	8.0-10.0
Dry Film Thickness	84.0-110.0

**Notes:**

1. See Tnemec's *Fiberglass Mat Reinforced Mortar Application Guide for System details*
2. Series 282 is not color stable. For extended color and gloss retention, apply a finish coat of Tnemec Series 290 CRU @ 2.0-3.0 mils DFT

#### B. System No. 61-1: Cycloaliphatic Amine Epoxy

**This system offers superior resistance to gasoline, diesel fuel, and other hydrocarbons. Use TNE MEC Series 215 between coats as a filler and surfacer wherever it is required.**

Surface Preparation: Allow new concrete to cure for 28 days. Sweep abrasive blast per SSPC-SP13 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Moisture vapor transmission should not exceed three lbs per 1,000 sq ft in a 24 hour period. (Reference ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission

Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.") Relative humidity should not exceed 80%. (Reference ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes.") Note: For moisture content up to 10 lbs per 1,000 sq ft or relative humidity up to 90%, Series 241 may be applied prior to the "Primer" coat. Refer to the Series 241 product data sheet for more information.

Apply Tnemec Series 218 to all *vertical* surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, mitigate concrete outgassing, and to create a monolithic, paintable surface.

Apply Tnemec Series 215 or 218 as needed to fill voids in *horizontal* surfaces.

Primer: 61-5002 Tneme-Liner (Beige)	8.0 - 12.0
Topcoat: 61-5001 Tneme-Liner (Gray)	<u>8.0 - 12.0</u>
	Dry Film Thickness 16.0 - 24.0

**3.29 CLEAR WATER REPELLENT FOR CONCRETE, MASONRY AND BRICK**

A. Silane /Siloxane Sealer (Min. 42% Solids)

Surface Preparation: Allow new concrete to cure 28 days. All surfaces must be clean, dry, and free of oils, curing compounds, form release oils, and other contaminants that might interfere with the penetration of the sealer.

COATING: BRICK, CONCRETE  
Tnemec Series 662 ....Two Coats @ 75-200 SF/GAL

SPLIT FACED OR POROUS MASONRY  
Tnemec Series 662..... Two Coats @ 35-100 SF/GAL

**3.30**

**3.31 CANAL PIPE (AERIAL) CROSSINGS**

A. System 701-1: NEW. Zinc/Epoxy/Fluoropolymer for New Pipe or Existing Pipe Requiring Removal of Existing Coatings

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Primer: 90-97 Tneme-Zinc	2.5 - 3.5
2nd Coat: 66HS-Color Hi-Build Epoxoline	2.0 - 3.0
3rd Coat: 701-Color Hydroflon	<u>2.0 - 3.0</u>
	Dry Film Thickness 6.5 - 9.5
	Minimum 8.0 Mills

B. System No. 701-2: EXISTING. High Build, Semi- Gloss Fluoropolymer for Marginally Cleaned Surfaces or Topcoating Over Existing Systems

Surface Preparation: High Pressure Water Blast (min. 3500 psi) or Solvent Clean (SSPC-SP1) and Spot Hand or Power Tool Clean (SSPC-SP 2 - 3) or Brush Blast (SSPC-SP7). Existing coatings must be clean, dry and tightly adhering prior to application of coatings.

Spot Coat: 135-Color Chembuild	3.0 - 5.0
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Prime Coat: 135-Color Chembuild  
2nd Coat: 701-Color Hydroflon

3.0-5.0  
2.0 - 3.0

Minimum Dry Film Thickness (NIC Spot Coat)? 6.0

### 3.32 PROJECT DESIGNER SYSTEMS REFERENCE GUIDE

#### A. STEEL

##### EXTERIOR (NON-IMMERSION)

- A.1 System No. 1095-1-1: Epoxy/High Build Urethane
- A.2 System No. 1095-2: High Build Urethane
- A.4 System 90-97: Zinc/Epoxy/Urethane

##### INTERIOR EXPOSURE (NON-IMMERSION)

- B.1 System No. 66HS-1: High Solids Epoxy
- B.2 System No. 66HS-2: High Build Epoxy

##### IMMERSION

- C.1 System No. 104-1: High Solids Epoxy (Non-Potable)
- C.2 System No. 20HS-1: High Build Epoxy (Non-Potable)
- C.3

#### B. OVERHEAD METAL DECKING, JOIST (INTERIOR EXPOSURE)

System No. 115-1: Uni-Bond

#### C. OVERHEAD METAL DECKING, JOINT (EXTERIOR EXPOSURE)

System No. 1029-1 Enduratone

#### D. GALVANIZED STEEL-PIPE AND MISCELLANEOUS FABRICATORS

System No. 1095-3: Epoxy/High Build Urethane

#### E. GALVANIZED STEEL-INTERIOR EXPOSURE (NON-IMMERSION) AND ALUMINUM IN CONTACT WITH CONCRETE

System No. 66HS-3: Polyamide Epoxy

#### F.

#### G.

#### I. CONCRETE

##### EXTERIOR-ABOVE GRADE

- A.1 System No. 1026-1: Acrylic Emulsion Low Sheen
- A.2 System No. 156-1: Modified Acrylic Elastomer

EXTERIOR-BELOW GRADE

- B.1 System No. 46-61: Coal Tar Pitch Solution
- B.3

EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)

- C.1 System No. 1026-2: Acrylic Emulsion Low Sheen
- C.2 System No. 66HS-4: Epoxy-Polyamide

IMMERSION (POTABLE & NON-POTABLE)

- D.1 System No. 104-2: High Solids Epoxy (Non-Potable)
- D2 System No. 20HS-2: Epoxy Polyamide (Potable)

INTERIOR EXPOSURE (NON-IMMERSION)

- E.1 System No. 66HS-5: High Solids Epoxy
- E.2 System No. 113-1: Acrylic Epoxy Semi-Gloss

J. CONCRETE FLOORS

- A.1 System No. 290-1: Epoxy-Polyamide
- A.5 System No. 241/222: Decorative / Functional Flooring (Non-Slip)

K. POROUS MASONRY - EXTERIOR/INTERIOR EXPOSURE

- A.1 System No. 156-2: Modified Epoxy-Sand Texture
- A.2 System No. 104-3: High Solids Epoxy (Interior Only)
- A.3 System No. 113-2: Acrylic Epoxy Semi-Gloss (Interior Only)
- A.4 System No. 156-3: Modified Acrylic Elastomer

L. GYPSUM WALLBOARD

- A.1 System No. 113-3: Acrylic Epoxy
- A.2 System No. 66HS-5: Hi-Build Epoxoline
- A.3 System No. 1026-3: Acrylic Emulsion, Low Sheen

M. WOOD EXTERIOR/INTERIOR EXPOSURE

- A.1 System No. 1029-2: Acrylic Emulsion Semi-Gloss
- A.2 System No. 6-5: Acrylic Latex

N. PVC PIPE EXTERIOR/INTERIOR EXPOSURE

- A.1 System No. 1095-5: Acrylic Polyurethane

O. INSULATED PIPE-INTERIOR EXPOSURE

- A.1 System No. 1026-4: Acrylic Emulsion, Low Sheen

P. HIGH HEAT SURFACES-FERROUS METAL

A.1 System No. 1528-1: Silicone Aluminum (1200deg F Maximum)

Q. SURFACES EXPOSED TO H<sub>2</sub>S/H<sub>2</sub>SO<sub>4</sub> (SEVERE EXPOSURE/IMMERSION)

A.1 System No. 434-1: Polyamine Epoxy Mortar Systems

A.2 System No. 142-1: Flake / Aluminum Oxide Filled Polyamine Epoxy

R. EXTERIOR OF PRESTRESSED CONCRETE TANKS

A. System 156-4 New Tanks

B. System 156-5: Existing Tanks (Previously Painted)

S. SECONDARY CONTAINMENT AREAS

A. System No. 239SC-1: Modified Novolac Epoxy

B. System No. 61-1: Cycloaliphatic Amine Epoxy

T. CLEAR WATER REPELLENT FOR CONCRETE, MASONRY AND BRICK

A. Silane /Siloxane Sealer (Min. 42% Solids)

V. CANAL PIPE (AERIAL) CROSSINGS

A. System No. 701-1: Zinc/Epoxy/Fluoropolymer

B. System No. 701-2: High Build/Fluoropolymer

C. Ductile Iron Pipe Above Grade: Series 66 High Build Epoxy

**3.33 COATING SCHEDULE - TO BE DEVELOPED BY PROJECT AS NEEDED**

**END OF SECTION**

## SECTION 09940 PROTECTIVE COATINGS

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers field applied protective coatings, including surface preparation, protection of surfaces, inspection, and other appurtenant work for equipment and surfaces designated to be coated with heavy-duty maintenance coatings. Regardless of the number of coats previously applied, at least two field coats in addition to any shop coats or field prime coats shall be applied to all surfaces unless otherwise specified.

Refer to the County Standard Painting specification (Division 9) for painting specifics. These specifications are provided to supplement the County Standard Specifications.

**1-2. GENERAL.** Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. When equivalent products are acceptable to Engineer, Contractor shall comply with this Specification and the coating manufacturer's recommendations.

**1-2.01. Governing Standards.** All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of the following AWWA, ANSI, NACE, SSPC, NSF, and ASTM.

**1-2.02. Delivery and Storage.** All coating products shall be received and stored in accordance with the coating manufacturer's recommendations.

#### **1-2.03. Coatings, Painting, and Linings Covered in Other Sections.**

Architectural painting.

**1-3. SUBMITTALS.** Contractor shall submit color cards for all coatings proposed for use, together with complete descriptive specifications, manufacturer's product data sheet and the completed Coating System Data Sheets, to Engineer for review and color selection. Each product data sheet shall include application temperature limits including recoat time requirements for the ambient conditions at the site, including temperatures up to 130°F. Requests for review submitted directly to Engineer by coating suppliers will not be considered.

When the proposed products will be in contact with treated or raw water in potable water treatment facilities, Contractor shall submit certifications that the proposed systems are in compliance with ANSI/NSF 61.

Contractor shall submit a Coating System Data Sheet for each separately identified surface in the Metal Surfaces Coating Schedule, Concrete and Masonry Surfaces Coating Schedule, and the Miscellaneous Surfaces Coating Schedule that will be used in the Project, using the appropriate Coating System Data Sheet forms (Figures 1-09940 and 2-09940) at the end of this section. Each field coating system shall be acceptable to the coating material manufacturer.

Coating System Data Sheets shall be assigned a unique number with a prefix letter based on the following:

Prefix	Surfaces	Fig.09940
A	Iron and steel (coated entirely in field)	1
A	Iron and steel (shop primed)	2
C	Concrete and concrete block	1
E	Equipment - submerged	1
E	Equipment – nonsubmerged	2
F	Nonferrous metal	1
G	Galvanized	1
H	High temperature	1
P	PVC and FRP	1

Each coating system that will be applied entirely in the field shall be assigned only a prefix letter and no suffix letter. Fig.1-09940 shall be submitted for each surface coated entirely in the field.

Each shop-applied coating system that includes one or more field applied coats shall be assigned both a prefix letter and suffix letter “F”. Fig.2-09940 shall be submitted for each surface having a shop applied coating and one or more field applied finish coats.

A separate Coating System Data Sheet shall be developed and submitted for each surface scheduled to be coated or variation or change in a coating system. The number identifying the surface and coating system shall be of the form A1<sub>1</sub> or A1<sub>2</sub>-F. The subscript number shall be assigned by the Contractor so that each surface and coating system combination is uniquely identified. For example:

A1<sub>1</sub>-F may be assigned to “Epoxy – one coat to metal curbs for skylights and power roof ventilators that have been shop primed.”

A2<sub>1</sub> may be assigned to “Epoxy – two coats to non-galvanized structural and miscellaneous steel exposed to view inside buildings.”

C2<sub>1</sub> may be assigned to “Epoxy – two coats to all concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view.”

C2<sub>2</sub> may be assigned to “Epoxy – two coats to walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment as indicated on the Drawings.”

#### **1-4. QUALITY ASSURANCE.**

**1-4.01. Coating System Data Sheet Certifications.** The coating applicator and coating manufacturer shall review and approve in writing the coating manufacturer's written recommendations for the coating system and the intended service. Any variations from the Specifications or the coating manufacturers published recommendations shall be submitted in writing and approved by the coating manufacturer.

### **PART 2 - PRODUCTS**

#### **2-1. ACCEPTABLE MANUFACTURERS.**

**2-1.01. Alternative Manufacturers.** In addition to the coatings listed herein, equivalent products of other manufacturers that distribute globally will also be acceptable.

**2-1.02. Equivalent Coatings.** Whenever a coating is specified by the name of a proprietary product or of a particular manufacturer or vendor, it shall be understood as establishing the desired type and quality of coating. Other manufacturers' coatings will be accepted, provided that sufficient information is submitted to enable Engineer to determine that the proposed coatings are equivalent to those named. Information on proposed coatings shall be submitted for review in accordance with the Construction Schedule & Project Restraints section. Requests for review of equivalency will be accepted only from Contractor, and will be considered only after the contract has been awarded.

**2-2. MATERIALS.** All coatings shall be delivered to the job in original, unopened containers, with labels intact. Coatings shall be stored indoors and shall be protected against freezing. No adulterant, unauthorized thinner, or other material

not included in the coating formulation shall be added to the coating for any purpose.

All coatings shall conform to the air quality regulations applicable at the location of use. Coating materials that cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

With the exception of heat resistant coatings, the coatings specified have been selected on the basis of the manufacturer's statement that the VOC content of the product is 2.8 lbs per gallon or less; however, it shall be the Contractor's responsibility to use only coating materials that are in compliance with the requirements of all regulatory agencies. Local regulations may require some coatings to have a lower VOC content than specified herein. The coatings specified may meet the VOC limits in the unthinned (as shipped) condition, but may exceed the limits if thinned according to the manufacturer's recommendations. In such case, the coatings shall not be thinned beyond the 2.8 lbs per gallon limit, and if the product cannot be thinned to suit the application method or temperature limits, another manufacturer's coating shall be used, subject to acceptance by Engineer.

Contractor shall be responsible for ensuring the compatibility of field coatings with each other or with any previously applied coatings. Coatings used in successive field coats shall be produced by the same manufacturer. The first field coat over shop coated or previously coated surfaces shall cause no wrinkling, lifting, or other damage to underlying coats.

All coatings used on surfaces that will be in contact with potable or treated water shall be certified as being in compliance with ANSI/NSF 61. Coatings that cannot be so certified, whether or not specified by manufacturer and by product designation, shall not be used.

All intermediate and finish coating materials that will be in contact with wastewater atmosphere shall be guaranteed by the manufacturer to be fumeproof and suitable for wastewater plant atmosphere that contains hydrogen sulfide. Coatings that cannot be so guaranteed shall not be used. Lead-free, chromium-free, and mercury-free coatings shall be used.

### 2-2.01 Primers.

Universal Primer (tie coat)	PPG Amercoat "Amercoat 385 Epoxy", Carboline "Rustbond", ICI Devoe "Devran 224HS", Tnemec "Series 27 F.C. Typoxy", or Sherwin-Williams "Dura Plate 235".
Zinc Primer	PPG Amercoat "Dimetate 9 Series", Carboline "Carbo Zinc II Series", ICI Devoe "Catha-Coat 304V", or Sherwin-Williams "Zinc Clad II Series".

### 2-2.02. Fillers and Surfacer.

Epoxy Concrete Block Filler	PPG Amercoat "Amerlock 400BF Epoxy Block Filler", Carboline "Sanitile 600", ICI Devoe "Truglaze 4015", Tnemec "Series 54-562", or Sherwin-Williams "Kem Cati-Coat HS".
Epoxy Concrete Filler and Surfacer	Tnemec "Series 218 MortarClad", PPG Amercoat "NuKlad 114A", Carboline "Carboguard 510", or Sherwin-Williams "Steel Seam FT910".

### 2-2.03. Intermediate and Finish Coatings.

Epoxy (NSF certified systems)	
Ferrous Metal Surfaces and Concrete Surfaces in Contact with Treated or Raw Water in Potable Water Facilities	PPG Amercoat "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", ICI Devoe "Bar-Rust 233H" Tnemec "Series N140 Pota-Pox Plus", or Sherwin-Williams "Dura Plate 235 NSF"; immersion service.

## Epoxy

Concrete Floors	PPG Amercoat "Amerlock 400", Carboline "Carboguard 890", ICI Devoe "Devran 224HS", Tnemec "Series N69 Hi-Build Epoxoline II", or Sherwin-Williams "Armorseal 1000HS"; nonskid.
Ferrous Metal Surfaces and Masonry or Concrete Surfaces Other Than Floors	PPG Amercoat "Amercoat 385 Epoxy", Carboline "Carboguard 890", ICI Devoe Devran "224HS", Tnemec "Series N69 Hi-Build Epoxoline II", or Sherwin-Williams "Dura Plate 235".
Flake-Filled Epoxy	Carboline "Plasite 4500/4500S", Sherwin-Williams "Sher-Glass FF"
Aliphatic Polyurethane	PPG Amercoat "Amercoat 450H", Carboline "Carbothane 134HG", ICI Devoe "Devthane 379H" Tnemec "Series 1074 Endura-Shield II", or Sherwin-Williams "Acrolon 218HS".
Coal Tar Epoxy	High-build coal tar epoxy; PPG Amercoat "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy"
Medium Consistency Coal Tar	Carboline "Bitumastic 50" or Tnemec "46-465 H.B. Tnemecol".
Vinyl Ester	Tnemec "Series 120 Vinester" Carboline "Plasite 4110" or Sherwin-Williams "Magnalux 304FF".
Heat-Resistant	Suitable for temperatures up to 400°F ; PPG Amercoat "Amerlock 400", Carboline "Thermaline 450", Tnemec "43-36 Chrome Aluminum", or Sherwin-Williams "Silver-Brite Aluminum".

High Heat-Resistant

Suitable for temperatures up to 1000°F ; PPG Amercoat "Amercoat 878", Carboline "Thermaline 4700 VOC", or Sherwin-Williams "Silver-Brite Hi-Heat Silicone Aluminum".

## **PART 3 - EXECUTION**

**3-1. SURFACE PREPARATION.** All surfaces to be coated shall be clean and dry and shall meet the recommendations of the coating manufacturer for surface preparation. Freshly coated surfaces shall be protected from dust and other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss on previously coated surfaces shall be dulled if necessary, for proper adhesion of topcoats.

Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film, except for concrete block construction where a rough surface is an inherent characteristic.

When applying touchup coating or repairing previously coated surfaces, the surfaces to be coated shall be cleaned as recommended by the coating manufacturer, and the edges of the repaired area shall be feathered by sanding or wire brushing to produce a smooth transition that will not be noticeable after the coating is applied. All coatings made brittle or otherwise damaged by heat of welding shall be completely removed.

**3-1.01. Galvanized Surfaces.** Galvanized surfaces shall be prepared for coating according to the instructions of the manufacturer of the epoxy. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clean water.

**3-1.02. Ferrous Metal Surfaces.** Ungalvanized ferrous metal surfaces shall be prepared for coating by using one or more of the following cleaning procedures specified here-in: solvents (SSPC-SP1); abrasive blasting (SSPC-SP5, -SP10, -SP6, or -SP7) power tools (SSPC-SP3 or -SP11); or hand tools (SSPC-SP2). Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other cleaning method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter. Tools which produce excessive roughness shall not be used.

All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before

installation. Motors, drive trains, and bearings shall be protected during surface preparation in accordance with the equipment manufacturer's recommendations.

All cut or sheared edges shall be ground smooth to a 1/8 inch minimum radius for all material 1/4 inch thickness and larger. For material thickness less than 1/4 inch all cut or sheared edges shall be ground smooth to a radius equal to 1/2 the material thickness. Grinding of rolled edges on standard shapes with a minimum radius of the 1/16 inch will not be required.

All ferrous metal surfaces shall have all welds ground smooth and free of all defects in accordance with NACE Standard SP0178, Appendix C, Designation C and sharp edges ground smooth, if not previously prepared in the shop. Instead of blending of the weld with the base metal as required by the NACE standard, it will be acceptable to furnish a welded joint that has a smooth transition of the weld to the base metal. All welds shall be ground smooth to ensure satisfactory adhesion of paint.

The cleaning methods and surface profiles specified herein are minimums, and if the requirements printed in the coating manufacturer's data sheets exceed the limits specified, the value printed on the data sheets shall become the minimum requirement.

**3-1.02.01. Ferrous Metal Surfaces – Non-immersion Service.** Ferrous metal surfaces, including fabricated equipment, in non-immersion service shall be cleaned to the degree recommended by the coating manufacturer for surfaces to be coated with coal tar epoxy, epoxy, and heat-resistant coatings, except galvanized surfaces. Surface preparation of ferrous metal surfaces in non-immersion service shall consist of abrasive blast cleaning to SSPC-SP6, and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 2.0 mils.

**3-1.02.02. Ferrous Metal Surfaces - Immersion Service.** Surface preparation of ferrous metal surfaces in immersion service shall consist of abrasive blast cleaning to at least SSPC-SP10 and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 3.5 mils.

**3-1.03. Concrete Surfaces.** All concrete surfaces shall be free of objectionable substances and shall meet the coating manufacturer's recommendations for surface preparation. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6. Any other surface preparation recommended by the

coating material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

All concrete surfaces shall be dry when coated and free from dirt, dust, sand, mud, oil, grease, and other objectionable substances. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started.

New concrete shall have cured for at least 4 weeks before coating is applied as recommended by the material manufacturer. Concrete surfaces shall be tested for capillary moisture in accordance with ASTM D4263. There shall be no capillary moisture when coatings are applied on concrete.

All surfaces to be coated shall be cleaned in accordance with ASTM D4258 and abraded in accordance with ASTM D4259. Surface profile shall be at least 25 percent of the dry film thickness specified for the coating system. Prior to application of the coating, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. Spalled areas, voids, and cracks shall be repaired in accordance with the Concrete section and as acceptable to the Engineer. Fins and other surface projections shall be removed to provide a flush surface before application of coating.

Except where epoxy is applied as damp-proofing, the concrete surfaces, including those with bug holes less than 1 inch in any dimension, shall be prepared as recommended by the manufacturer, using an epoxy concrete filler and surfacer. Where coating with a vinyl ester the concrete filler and surfacer shall be as recommended by the manufacturer to be compatible with vinyl ester.

**3-1.04. Concrete Block Surfaces.** Voids and openings in concrete block surfaces shall be pointed. All exposed exterior surfaces and surfaces to be coated with epoxy, including the joints, shall be filled so that a continuous unbroken coating film is obtained.

**3-1.05. Copper Tubing.** All flux residue shall be removed from joints in copper tubing. Immediately before coating is started, tubing shall be wiped with a clean rag soaked in xylol.

**3-1.06. Plastic Surfaces.** All wax and oil shall be removed from plastic surfaces that are to be coated, including PVC and FRP, by wiping with a solvent compatible with the specified coating.

**3-1.07. Hardware.** Hardware items such as bolts, screws, washers, springs, and grease fittings need not be cleaned prior to coating if there is no evidence of dirt, corrosion, or foreign material.

**3-1.08. Aluminum.** When a coating system is required, remove all oil or deleterious substance with neutral detergent or emulsion cleaner or blast lightly with fine abrasive.

**3-1.09. Stainless Steel.** When a coating system is required, surface preparation shall conform to the coating manufacturer's recommendations.

**3-2. MIXING AND THINNING.** Coating shall be thoroughly mixed each time any is withdrawn from the container. Coating containers shall be kept tightly closed except while coating is being withdrawn.

Coating shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied coating be reduced, by addition of coating thinner or otherwise, below the thickness recommended by the coating manufacturer. Thinning shall be done in compliance with all applicable air quality regulations.

**3-3. APPLICATION.** Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be thoroughly dry and hard before the next coat is applied. Each coat shall be a different color, if available. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.

Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

**3-3.01. Priming.** Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of primer before application of the primer coat. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating. When using zinc primers the stripe coat shall follow the initial prime coat.

Abraded and otherwise damaged portions of shop-applied coating shall be cleaned and recoated as recommended by the manufacturer of the finish coating. Welded seams and other uncoated surfaces, heads and nuts of field-installed bolts, and surfaces where coating has been damaged by heat shall be given a brush coat of the specified primer. Before the specified spot or touchup coating of metal surfaces, edges, corners, crevices, welds, and bolts in the area of the spot or touchup coating shall be given a brush coat of primer. This patch, spot, or touchup coating shall be completed, and the paint film shall be dry and hard, before additional coating is applied.

**3-3.02. Epoxy.** When used, epoxy shall be applied in accordance with the coating manufacturer's recommendations, including temperature limitations and protection from sunlight until top-coated.

When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

When applying high build epoxy coatings with a roller or brush and where a dry film thickness of at least 4-6 mils per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

**3-3.03. Coal Tar Epoxy.** When used, the application of coal tar epoxy, including time limits for recoating, shall conform to the recommendations of the coating manufacturer.

When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

**3-3.04. Vinyl Ester.** When used, the application of vinyl ester coating system, including time limits for recoating and temperature requirements of the materials, shall conform to the recommendations of the coating manufacturer.

**3-3.05. Film Thickness.** The total coating film thickness including intermediate coats and finish coat, shall be not less than the following:

<u>Type of Coating</u>	<u>Minimum Dry Film Thickness</u>
Medium consistency coal tar	20 mils
Coal tar epoxy (two coats)	20 mils
Epoxy	
Floors (two coats)	10 mils
Surfaces with first coat of epoxy and final coat of aliphatic polyurethane	7 mils (5 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).
Surfaces with first and second coat of epoxy and final coat of aliphatic polyurethane	12 mils (10 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).
Other surfaces (two coats)	10 mils
Immersion service (three coats)	15 mils
Flake-filled epoxy (two coats)	30 mils
Vinyl ester	30 mils
Zinc, epoxy, polyurethane	

<u>Type of Coating</u>	<u>Minimum Dry Film Thickness</u>
Surfaces with first coat of zinc, intermediate coat of epoxy, and final coat of aliphatic polyurethane	10 mils , 3 mils zinc, 5 mils epoxy, plus 2 mils for aliphatic polyurethane.
Heat-resistant (silicone)	3 mils
High heat-resistant (silicone)	3 mils
Other (one coat)	5 mils
Other (two coats)	10 mils

**3-3.06. Weather Conditions.** Coatings shall not be applied, except under shelter, during wet, damp, or foggy weather, or when windblown dust, dirt, debris, or insects will collect on freshly applied coating.

Coatings shall not be applied at temperatures lower than the minimum temperature recommended by the coating manufacturer, or to metal surfaces such as tanks or pipe containing cold water, regardless of the air temperature, when metal conditions are likely to cause condensation. When necessary for proper application, a temporary enclosure shall be erected and kept heated until the coating has fully cured.

Coatings shall not be applied at temperatures higher than the maximum temperature recommended by the coating manufacturer. Where coatings are applied during periods of elevated ambient temperatures, Contractor and the coatings manufacturer shall be jointly responsible to ensure that proper application is performed including adherence to all re-coat window requirements. Precautions shall be taken to reduce the temperature of the surface application, especially for metal, at elevated temperatures above 100°F including shading application area from direct sunlight, applying coating in the evening or at night, and ventilating the area to reduce the humidity and temperature,

Vinyl ester coating materials, when required, shall be maintained during transportation, storage, mixing, and application at the temperature required by the coating manufacturer, 35°F to 90°F.

**3-4. REPAIRING FACTORY FINISHED SURFACES.** Factory finished surfaces damaged prior to acceptance by Owner shall be spot primed and recoated with materials equivalent to the original coatings. If, in the opinion of Engineer, spot repair of the damaged area is not satisfactory, the entire surface or item shall be recoated.

**3-5. PROTECTION OF SURFACES.** Throughout the work Contractor shall use drop cloths, masking tape, and other suitable measures to protect adjacent surfaces. Contractor shall be responsible for correcting and repairing any damage resulting from its or its subcontractors' operations. Coatings spilled or

spattered on adjacent surfaces which are not being coated at the time shall be immediately removed. Exposed concrete or masonry not specified to be coated which is damaged by coatings shall be either removed and rebuilt or, where authorized by Owner, coated with two coats of masonry coating.

**3-6. FIELD QUALITY CONTROL.** The following inspection and testing shall be performed: surface profile, visual inspection, and wet and dry film thickness testing. All inspection and testing shall be witnessed by Engineer.

**3-6.01. Surface Profile Testing.** The surface profile for ferrous metal surfaces shall be measured for compliance with the specified minimum profile. The surface profile for concrete shall comply with SSPC 13/NACE 6 Table 1 for severe service.

**3-6.02. Visual Inspection.** The surface of the protective coatings shall be visually inspected.

**3.6.03. Film Thickness.** Coating film thickness shall be verified by measuring the film thickness of each coat as it is applied and the dry film thickness of the entire system. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of  $\pm 0.5$  mil . Dry film thickness shall be measured in accordance with SSPC-PA 2.

**3-6.04. Spark Testing.** Not required.

**3-6.05. Adhesion Testing.** Not required

**3-7. FIELD PRIMING SCHEDULE.** In general, steel and cast iron surfaces of equipment are specified to be shop primed. Any such surfaces which have not been shop primed shall be field primed. Damaged or failed shop coatings which have been determined unsuitable by Engineer shall be removed and the surfaces shall be field coated, including prime coat (if any). Galvanized, aluminum, stainless steel, and insulated surfaces shall be field primed. Primers used for field priming, unless otherwise required for repair of shop primers, shall be:

<u>Surface To Be Primed</u>	<u>Material</u>
Equipment, surfaces to be coated with	
Aliphatic polyurethane	Universal primer.
Epoxy	Same as finish coats.
Coal tar coating	Same as finish coats.
Vinyl ester	Same as finish coats.
Steel and cast iron, surfaces to be coated with	

<u>Surface To Be Primed</u>	<u>Material</u>
Epoxy	Same as finish coats or inorganic zinc.
Coal tar coating	Same as finish coats.
Aluminum	Epoxy.
Galvanized	Epoxy.
Copper	Epoxy.
Stainless steel	Epoxy.
Plastic surfaces, including PVC and FRP	Same as finish coats.
Insulated piping	As recommended by manufacturer of finish coats.
Concrete, surfaces to be coated with epoxy	
For damp-proofing	Epoxy.
For all other surfaces	Epoxy concrete filler and surfacer.
Concrete block exposed in exterior locations	Epoxy concrete block filler.
Concrete block to be coated with epoxy	Epoxy concrete block filler.

Unless otherwise recommended by the coating manufacturer or specified herein, priming will not be required on concrete, or concrete block, nor on metal surfaces specified to be coated with coal tar epoxy, and heat-resistant coatings. Concrete surfaces to be coated with epoxy shall be filled with epoxy concrete filler and surfacer so that a continuous film is obtained, except where concrete is damp-proofed with epoxy.

**3-8. FINISH COATING SYSTEMS.** The following schedule lists coatings systems and coating surface designations. See Article 1-3 for a definition of the surface designations.

No.	Finish Coating Systems	Coating Surface Designation						
		A	C	E	F	G	H	P
1.	Epoxy – One coat	x			x	x		
2.	Epoxy – Two coats	x	x	x	x	x		x
3.	Epoxy / NSF – Two coats		x	x				
4.	Epoxy – Three coats	x	x	x				
5.	Epoxy / NSF – Three coats	x	x	x				

No.	Finish Coating Systems	Coating Surface Designation						
		A	C	E	F	G	H	P
6.	Epoxy – First coat Aliphatic polyurethane – Finish coat	x	x	x	x	x		x
7.	Epoxy – First and second coat Aliphatic polyurethane – Finish coat	x	x	x	x	x		
8.	Universal primer – First coat Aliphatic polyurethane – Finish coat	x		x				
9.	Medium consistency coal tar – Two coats	x	x	x				
10.	Coal tar epoxy – Two coats	x	x	x				
11.	Vinyl ester – Two coats	x	x	x				
12.	Heat resistant – Two coats						x	
13.	High heat resistant – Two coats						x	
14.	Zinc primer – First coat Epoxy – Intermediate coat Aliphatic polyurethane – Final coat	x		x				
15.	Flake-filled epoxy	x		x				

**3-8.01. Surfaces Not To Be Coated.** Unless otherwise specified, the following surfaces shall be left uncoated:

Exposed aluminum, except ductwork.

Polished or finished stainless steel. Unfinished stainless steel, except flashings and counter flashings, shall be coated.

Nickel or chromium.

Galvanized surfaces, except piping, conduit, ductwork, and other items specifically noted.

Rubber and plastics, except as specified.

Exterior concrete.

Surfaces specified to be factory finished.

**3-8.02. Shop Finishing.** Items to be shop finished include the following. Shop finishing shall be in accordance with the coating manufacturer's recommendations.

- a. Valves
- b. Pumps
- c. Other surfaces where blast cleaning cannot be or is not recommended to be performed in the field.
- d. Other items as otherwise specified.

**3-8.03. Field Coating.** Items to be field coated include the following. Field coating shall be in accordance with the field priming schedule, the coating schedule, and the manufacturer's recommendations.

- a. Valves, piping, and appurtenances.
- b. Pumps
- c. Surfaces not indicated to be shop finished and surfaces where blast cleaning can be performed in the field.
- d. Other items as otherwise specified.

**3-9. METAL SURFACES COATING SCHEDULE.**

<u>Surface To Be Coated</u>	<u>Finish Coating System</u>
Non-galvanized and galvanized structural and miscellaneous steel exposed to view or to the elements in exterior locations.	A6
Non-galvanized and galvanized structural and miscellaneous steel exposed to view inside buildings.	A2
Steel handrails, steel floor plates, doors, door frames.	A8
Unless otherwise specified, pumps, motors, speed reducers, and other machines and equipment exposed to view.	E8
Actuator surfaces for sluice gates, slide gates, control weirs, unless factory finished.	Outdoor – E7 Indoor – E6
Heating and air conditioning units, convector covers, electrical equipment cabinets, and similar items and equipment (unless factory finished) exposed to view.	E8
Surfaces of cranes and hoists exposed to view indoors.	E2
Surfaces of cranes and hoists exposed to the elements outdoors.	E6

<u>Surface To Be Coated</u>	<u>Finish Coating System</u>
Cast Iron and steel piping inside buildings, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.	A2
Cast Iron and steel piping above grade exposed to the elements and to view outdoors, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.	A6
Copper pipe and tubing, including fittings and valves.	F1
Copper pipe and tubing, including fittings and valves exposed to view in exterior locations.	F6
All metal surfaces, unless otherwise specified, which will be submerged or buried, all or in part, including valves, and scum baffles, and cast iron slide gates, but excluding piping laid in the ground.	E4
Cast iron and steel piping in manholes, wetwells, grit basin, aeration basin, and similar locations, including valves fittings, flanges, bolts, supports, and accessories.	A4
Supports and miscellaneous metal for equipment handling corrosive chemicals.	Outdoor – A6 Indoor – A2
Aluminum in contact with concrete.	F1
Engine exhaust piping.	H12
Aluminum and galvanized ductwork and conduit indoors.	F1 or G1
Aluminum and galvanized ductwork and conduit exposed to elements outdoors.	F6 or G6
Aluminum materials exposed to the elements outdoors.	F6

### 3-10. CONCRETE AND MASONRY SURFACES COATING SCHEDULE.

<u>Surface To Be Coated</u>	<u>Finish Coating System</u>
All concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view.	Indoor –C2 Outdoor –C7
Where indicated on the Drawings, walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment.	C2
All walls in contact with liquid where the opposite face forms a part of an interior room or dry pit.	C4
All walls in contact with treated or potable water where the opposite face is above grade or which form is a part of an interior room or a dry pit.	C5

### 3-11. MISCELLANEOUS SURFACES COATING SCHEDULE.

Plastic Surfaces, including PVC and FRP.	Outdoor – P6 Indoor – P2
Piping Insulation	Outdoor – P6 Indoor – P2

**3-12. PIPING IDENTIFICATION SCHEDULE.** Exposed piping and piping in accessible chases shall be identified with lettering or tags designating the service of each piping system, marked with flow directional arrows, and color coded.

Piping scheduled to be color coded shall be completely coated with the indicated colors, except surfaces specified to remain uncoated shall include sufficiently long segments of the specified color to accommodate the lettering and arrows. All other piping shall be coated to match adjacent surfaces, unless otherwise directed by Engineer.

**3-12.01. Location.** Lettering and flow direction arrows shall be provided on pipe near the equipment served, adjacent to valves, on both sides of wall and floor penetrations, at each branch or tee, and at least every 50 feet in straight runs of pipe. If, in the opinion of Engineer, this requirement will result in an excessive number of labels or arrows, the number required shall be reduced as directed.

**3-12.02. Metal Tags.** Where the outside diameter of pipe or pipe covering is 5/8 inch or smaller, aluminum or stainless steel tags shall be provided instead of lettering. Tags shall be stamped as specified and shall be fastened to the pipe with suitable chains. Pipe identified with tags shall be color coded as specified.

**3-12.03. Lettering.** Lettering shall be painted or stenciled on piping or shall be applied as snap-on markers. Snap-on markers shall be plastic sleeves, Brady "Bradysnap-On B-915", Seton "Setmark", or equal. Letter size shall be as follows:

<u>Outside Diameter of Pipe or Covering</u>	<u>Minimum Height of Letters</u>
5/8 inch and smaller	Metal tags -1/4 inch
3/4 to 4 inches	3/4 inch
5 inches and larger	2 inches

**3-12.04. Color Coding and Lettering.** All piping for the following services shall be color coded. Bands shall be 6 inches wide spaced along the pipe at 5 foot intervals. For services not listed, the color coding and lettering shall be as directed by the Engineer.

<b>Piping Identification</b>		
<b>Service</b>	<b>Color of Pipe</b>	<b>Color of Letters</b>
Condensate	Light gray with brown bands	Black
Drain	Dark gray	White
Fuel Oil	Black	White
Gasoline	Black with red bands	White
Odor Control – Indoors	Dark green with light brown bands	White
Odor Control – Outdoors	White	Black
Oil – Hydraulic	Black with white bands	White
Plumbing Vents	Dark gray	White
Potable Water (hot or cold)	Dark blue	White <sup>1</sup>
Sewage	Dark gray	Black

Notes:

1. Lettering shall be on a light green background.

Electrical conduit shall be coated to match adjacent ceiling or wall surfaces as directed by Engineer. Vent lines shall be coated to match surfaces they adjoin.

In addition, special coating of the following items will be required:

<u>Item</u>	<u>Color</u>
Valve handwheels and levers	Red
Hoist hooks and blocks	Yellow and black stripes

Numerals at least 2 inches high shall be painted on or adjacent to all accessible valves, pumps, flowmeters, and other items of equipment which are identified on the Drawings or in the Specifications by number.

**END OF SECTION**

<b>SURFACE DESCRIPTION</b>	<b>SYSTEM NO. -</b>

<b>SURFACE PREPARATION DESCRIPTION</b>
<input type="checkbox"/> Solvent SSPC-SP1 <input type="checkbox"/> Ferrous Metal Nonimmersion SSPC-SP6 <input type="checkbox"/> Ferrous Metal Immersion <ul style="list-style-type: none"> <li><input type="checkbox"/> SSPC-SP10</li> <li><input type="checkbox"/> SSPC-SP-5</li> </ul> <input type="checkbox"/> Other

<b>COATING</b>	<b>DFT mils</b>	<b>MANUFACTURER AND PRODUCT</b>
<b>First Coat (Primer)</b>		
<b>Second Coat</b>		
<b>Third Coat</b>		
<b>Total System</b>		Not less than minimum thickness specified.

Notes: (Attached if needed.)
------------------------------

Project:		
Coatings Manufacturer:		Initials _____
Painting Applicator:		Initials _____
<b>BLACK &amp; VEATCH</b>	<b>COATING SYSTEM DATA SHEET</b>	<b>Fig 1-09940</b>

<b>SHOP PRIMED SURFACE DESCRIPTION</b>	<b>SYSTEM NO. -</b>	<b>-F</b>

<b>SURFACE PREPARATION DESCRIPTION</b>
<input type="checkbox"/> Solvent SSPC-SP1 <input type="checkbox"/> Other:

<b>COATING</b>	<b>DFT mils</b>	<b>MANUFACTURER AND PRODUCT</b>
<b>Shop (Primer)</b>		(Identify Product/Type)
<b>Touchup</b>		
<b>Intermediate Coat</b>		
<b>Finish Coat</b>		
<b>Total System</b>		Not less than minimum thickness specified.

Notes: (Attached if needed.)

Project:		
Coatings Manufacturer:		Initials _____
Painting Applicator:		Initials _____
<b>BLACK &amp; VEATCH</b>	<b>COATING SYSTEM DATA SHEET</b>	<b>Fig 2-09940</b>



## SECTION 09970 SURFACE PROTECTION SPRAY SYSTEM

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to install and test the coating system complete and ready for operation for the structures listed in the specifications and as shown on the Drawings.
- B. The work includes coating of all surfaces as shown and specified on the Drawings. This includes, but is not limited to stairs, walls, floors, concrete divider, concrete slabs, manholes wet wells, and all other work obviously required to be coated unless otherwise specified herein or on the Drawings. The omission of minor items in the Schedule of Work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the Specification as stated herein.

#### 1.02 RELATED WORK

- A. Bypass pumping is the responsibility of the General Contractor.
- B. Concrete surface cleaning in each lift station is the responsibility of the General contractor.
- C. Removal and offsite disposal of rubble is the responsibility of the General Contractor.

#### 1.03 SUBMITTALS

- A. Submit to the County shop drawings and schedules of all surfacing systems and appurtenances required. Submit design data and specification data sheets listing all parameters used in the surfacing system design and thickness calculations based on applicable provisions of ASTM.
- B. Submit to the County the name of the surfacing supplier, a list of materials to be furnished, and the qualification (per 1.05 A) of the application contractor.

#### 1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)  
  
ASTM D-638  
ASTM D-790
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.05 QUALIFICATIONS

- A. The Contractor performing the surfacing work shall be fully qualified, experienced a minimum of seven years and equipped to complete this work expeditiously and in a satisfactory manner. The Contractor shall submit the following information to the County for review and approval before any surfacing work is performed.
  - 1. The number of years of experience in performing this type of specialized work must

be seven years minimum.

2. Name of the surfacing manufacturer and supplier for this work and previous work listed below. The Contractor shall be an approved installer as certified and licensed by the surfacing manufacturer and equipment supplier.
  3. A list of clients that the Contractor has performed this type of work.
    - a. The list shall contain names and telephone numbers of persons who can be called to verify previous satisfactory performance.
    - b. Installation dates and a description of the actual work performed.
    - c. The surfacing manufacturer shall provide an installation list of his product used for similar sewer rehabilitation projects. The list shall provide the same information as required in paragraphs 3.a and 3.b above.
- B. The County reserves the right to approve or disapprove the Contractor, based on the submitted qualifications.

## **1.06 GUARANTEE**

All surfacing shall be guaranteed by the Contractor for a period of five years from the date of acceptance. During this period, all defects discovered in the surfacing, as determined by the County, shall be repaired or replaced in a satisfactory manner at no cost to the County, this shall include, but is not limited to, all work and costs associated with the shut down of any pump stations and all bypass operations needed for the proper repairs to be made.

## **1.07 QUALITY ASSURANCE**

- A. All surfacing products shall be from a single manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in ASTM Standards D-638 and D-790 as applicable.
- B. The Contractor shall employ specialty workers who have proven ability to perform the Work included herein. This will consist of a minimum of two years or two project experiences installing this product. This is a requirement for each and every employee.

## **1.08 DELIVERY, STORAGE AND HANDLING**

- A. Care shall be taken in shipping, handling and placing to avoid damaging. Any material damaged in shipment shall be replaced as directed by the County.
- B. Any material showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. The material sprayed onto the surface shall be a urethane resin system formulated for the application within a sanitary sewer environment. The urethane will exhibit suitable corrosion

resistance to corrosive gases and fluids found within domestic sanitary sewage. Unless dictated by varying effluent, the spray system shall be a urethane and exhibit the cured physical strengths specified herein.

- B. When cured, the surface coating shall form a continuous, tight-fitting, hard, impermeable surfacing data which is suitable for sewer system service and chemically resistant to any chemicals or vapors normally found in domestic sewage.
- C. The surface shall be an integral part of the structure being rehabilitated after being placed and cured. The surface shall cover the complete interior of the existing structure. The surface shall provide a continuous watertight seal or barrier.
  - 1. The surface shall effectively seal the interior surfaces of the structure and prevent any penetration or leakage of groundwater infiltration.
  - 2. Provide water resistance data on surface based on ASTM Standards.
  - 3. The surface shall be compatible with the thermal conditions of existing sewer lift stations and manholes. Surface temperature will range from 30 to 80 degrees F. Provide test data on thermal compatibility based on ASTM Standards.

**2.02 MATERIALS**

- A. Approved materials include
  - 1. Aquatapoxy A-6 and Raven 405 epoxy by Raven Lining Systems
  - 2. Green Monster
  - 3. Sauereisen 210 system (210T & 210GL - Manatee County Light Brown Formula)
  - 4. SpectraShield system
  - 5. Spraywall Urethane by Sprayroq

- B. Polyurethane spray application shall comply with the following specifications:

The cured urethane system shall conform to the minimum physical standards, as listed below. The long-term data is for a 50-year design life of the process.

<u>Cured Urethane</u>	<u>Standard</u>	<u>Long-Term Data</u>
Tensile Stress	ASTM D-638	5,000 psi
Flexural Stress	ASTM D-790	10,000 psi
Flexural Modulus	ASTM D-790	550,000 psi

- C. Epoxy spray application shall be 100% VOC free / 100% solids.

**PART 3 EXECUTION**

**3.01 SURFACE PREPARATION**

- A. The contractor shall clean each structure and shall dispose of any resulting material.
- B. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be

removed.

- C. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.
- D. Surface preparation method(s) should be based upon the conditions of the substrate, service environment and the requirements of the protective coating to be applied.
- E. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. Generally, this can be achieved with a high pressure water cleaning using equipment capable of 5,000 psi at 4 gpm. Other methods such as abrasive blasting, shotblasting, grinding, scarifying or acid etching may also be used. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface that is not excessively damaged.
- F. A concrete structure suitably prepared for coating shall have all loose, soft, discolored or otherwise deteriorated material removed from the manhole and the surface profile of the manhole shall be in accordance with ICRI Guidelines No. 03732. Expose aggregate and obtain a uniform surface texture resembling an ICRI - CPS (Concrete Surface Profile) #4-6. The County may use one or more of the following observations/tests to determine whether the manhole substrate has been properly cleaned and prepared:
  - a. Visual appearance of the manhole - The prepared substrate shall have the appearance of sound concrete, free from discolored, white, chalky and cracked areas.
  - b. Aural observations - When struck with a metal hammer or similar metal tool, the prepared substrate shall exhibit the characteristic sound of solid, competent concrete (or brick). Care should be taken not to fracture sound concrete.
  - c. Mechanical abrasion tests - The substrate should be competent enough such that it cannot be scraped off with the claw of a hammer or similar metal tool.
  - d. pH testing - The County may use wetted litmus paper applied to the surface of the substrate to ensure that the pH of the substrate is 7 or higher.
  - e. Phenolphthalein testing - The County may apply a few drops of phenolphthalein to the surface of the concrete, which if the concrete is competent should yield a purple color.
- G. The County is not obligated to use all of the above tests, but may do so at the County's sole discretion. Often visual, mechanical and/or aural observations and tests alone will be adequate, but the pH and/or phenolphthalein tests may be used if there is still some uncertainty.
- H. If after cleaning, a new or existing manhole does not meet these requirements, the County shall have authority to require additional cleaning effort and/or increased blasting pressure as required to adequately prepare the manhole. If necessary, the County may also require acid etching of the concrete surface to create the desired texture. For existing manholes, the County may also require mechanical removal of deteriorated concrete or other substrate materials.
- I. A mild chlorine solution may be used to neutralize the surface to diminish microbiological bacteria growth prior to final rinse and coating system if approved by the Manufacturer's Representative.
- J. The time between structure cleaning and preparation activities and application of the first

coating layer shall be within the coating manufacturer's recommendation.

- K. All infiltration shall be stopped by using a material which is compatible with and is suitable for topcoating with the specified protective coating.
- L. The area between the manhole and the manhole ring and any other area that might exhibit movement or cracking due to expansion and contraction, shall be grouted with a flexible grout or gel before surface coating spray application.
- M. All surfaces should be inspected by the Inspector during and after preparation and before the repair material is applied.
- N. No separate payment shall be made for any preparatory work required prior to application of the surface coating.

### **3.02 INSTALLATION**

- A. The Contractor shall notify the Project Manager at least 48 hours in advance, giving the date, start time and estimated completion time for the work being conducted.
- B. The Contractor shall provide bypass pumping of sewage flows (as required) where and when the rehabilitation work is being performed. No flows will be permitted in the structure until the spray coating has properly cured to the manufactures specifications.
- C. The installation of the surface coating shall be in complete accordance with the applicable provisions of ASTM and the manufacturer's specifications. A representative of the manufacturer shall be present during the actual installation.
  - 1. Prior to placing the surface coating, the manufacturer's representative must approve the surface preparation work and installation conditions including temperatures.
  - 2. All surfaces shall be sufficiently smooth and even, to ensure good flow handling characteristics when complete.
  - 3. All surfaces shall have the surface coating applied to the required thickness by spray application.
- D. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.
- E. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.
- F. The protective coating material must be spray applied by a Certified Applicator of the protective coating manufacturer.
- G. Polyurethane spray application shall be applied such that all surfaces shall be coated in accordance with the manufactures recommended thickness but not be less than 125 mils.
- H. Epoxy spray application shall be applied such that all surfaces shall be coated in accordance with the following:

1. Specified surfaces shall be coated by spray application of a moisture tolerant, solvent-free, 100% solids, epoxy protective coating as further described herein. Spray application shall be to a minimum wet film thickness in accordance with the following table or manufacturer's recommendation, whichever is greater:

Concrete, New/Smooth	80-100 mils for immersion, 60-80 mils for atmospheric, splash and spill exposure
Concrete, Rough	100-125+ mils
Masonry/Brick	125-150+ mils
Steel	16-80 mils for immersion, 16-40 mils for atmospheric, splash and spill exposure; also profile dependent
Fiberglass Systems	40-60 mils tack coat, 9 oz/yd <sup>2</sup> fabric, 40-60 mils top coat. Varies with circumstances

2. Airless spray application equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating. Air assisted spray application equipment may be acceptable, especially for thinner coats (<10 mils), only if the air source is filtered to completely remove all oil and water.
3. If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than the recoat window for the specified products. Additional surface preparation procedures will be required if this recoat window is exceeded.

**3.03 FIELD TESTING AND ACCEPTANCE**

- A. Field acceptance of surface coatings shall be based on the County's evaluation of the proper surfacing of the structure and the appropriate installation and curing test data along with review of the structure inspections.
- B. The surface coatings shall provide a continuous monolithic surfacing with uniform thickness throughout the structure interior. If the thickness of the coating surface is not uniform or is less than specified, it shall be repaired or replaced at no additional cost to the County.
  1. The County will measure the surface cured thickness from a specimen retrieved by the Contractor. The Contractor shall retrieve the specimen by physically cutting through the surfacing (by drilling or coring). There will be up to three thickness measurement locations in each structure. A suitable non-destructive type of thickness measurement may also be used.
  2. All the surface coating thickness measurement locations shall be repaired by the Contractor in accordance with the manufacturer's recommendations. These repairs shall be included in the five year surface coating guarantee.

- C. All pipe connections shall be open, clear, and watertight.
- D. There shall be no cracks, voids, pinholes, uncured spots, dry spots, lifts, delaminations or other type defects.
- E. If any defective surface coating is discovered after it has been installed, it shall be repaired or replaced in a satisfactory manner within 72 hours and at no additional cost to the County. This requirement shall apply for the entire five year guarantee period.

**END OF SECTION**

**DIVISION 10      SPECIALTIES**

**SECTION 10520    FIRE EXTINGUISHERS**

**PART 1      GENERAL**

**1.01      SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required and install fire extinguishers and the requisite wall mounting brackets at the locations shown on the Contract Drawings.

**PART 2      PRODUCTS**

**2.01      MATERIALS**

- A. Fire extinguishers shall be 10 pound capacity, dry chemical type, rated for A, B and C Class fires **where scheduled below**. Extinguishers shall be red enamel painted steel cylinders with indicating gauge and shall be as manufactured by Larsen's Manufacturing Company, Fyr-Fyter Company, or County Fire Equipment Company.
- B. Fire extinguishers shall be 10 pound capacity, carbon dioxide type, rated for B and C Class fires **where scheduled below**. Extinguishers shall be red enamel painted steel cylinders with indicating gauge and shall be as manufactured by Larsen's Manufacturing Company, Fyr-Fyter Company, or County Fire Equipment Company.
- C. Brackets for wall mounting, as manufactured by extinguisher manufacturer, shall be furnished for all fire extinguishers.
- D. Fire extinguishers shall be provided in accordance with the following schedule and as indicated on the architectural Life Safety Plan Drawings:

<b>Master Lift Station 39-A</b>		
<b>Room/Location</b>	<b>Quantity</b>	<b>Type</b>
<b>Motor Room 101 (near egress doors)</b>	<b>2</b>	<b>ABC</b>
<b>Pump Room (lower level near egress stair)</b>	<b>1</b>	<b>ABC</b>
<b>Prefab Electrical Building</b>	<b>2</b>	<b>BC</b>

**PART 3      EXECUTION**

**3.01      INSTALLATION**

- A. Fire extinguishers and brackets shall be wall mounted.
- B. Mount brackets 4 feet 6 inches above finish floor with expansion bolts or toggle bolts into concrete blocks.

**END OF SECTION**

## SECTION 11150 SUBMERSIBLE PUMPS

### **PART 1 - GENERAL**

**1-1. SCOPE.** This section covers furnishing pedestal-mounted, single-stage, submersible, non-clog, end suction centrifugal pumping units and controls as indicated herein or on the Drawings.

Pump application.	Raw sewage
Number of pumps.	3
Pump tag numbers.	PCL-101/102/103
Pump location.	Dry-pit

Each pumping unit shall be complete with a close-coupled, submersible electric motor, adjustable frequency drive and all other appurtenances specified, or otherwise required for proper operation.

Each pumping unit, including motor and all integral controls, shall be rated and labelled for use in a Class 1, Division 2, Group D area as defined by the National Electric Code.

**1-2. GENERAL.** Equipment furnished under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer. Hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards.

**1-2.01. General Equipment Stipulations.** The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

**1-2.02. Seismic Design Requirements.** Seismic design requirement for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

**1-2.03. Tagging.** Each item of equipment and each part shipped separately shall be tagged and identified with indelible markings for the intended service. Tag numbers shall be clearly marked on all shipping labels and on the outside of all containers.

**1-2.04. Power Supply.** Unless otherwise indicated, power supply to the equipment shall be 480 volts, 60 Hz, 3 phase.

**1-2.05. Identification.** Pumps shall be identified in accordance with the Equipment and Valve Identification section.

**1-3. SUBMITTALS.**

**1-3.01. Drawings and Data.** Complete fabrication and assembly drawings, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Construction Schedule & Project Restraints section. The data and specifications for each unit shall include, but shall not be limited to, the following:

Pumps

- Name of manufacturer.
- Type and model.
- Tag number.
- Pump designation.
- Pump location.
- Rotative speed.
- Size of suction nozzle.
- Size of discharge nozzle.
- Net weight of pump and motor only.
- Net weight with pedestal, when specified.
- Complete performance curves showing capacity versus head, NPSH required, pump efficiency, wire-to-water efficiency, and pump input power.
- Data on shop painting.

Motors

- Name of manufacturer.
- Type and model.
- Type of bearings and method of lubrication.
- Rated size of motor, hp, and service factor.
- Insulation class and temperature rise.
- Full load rotative speed.
- Efficiency at full load and rated pump condition.
- Full load current.
- Locked rotor current.

Adjustable Frequency Drives

As specified in the Adjustable Frequency Drives section.

Moisture Detection System

- Name of manufacturer.
- Type and model.

Enclosure rating and layout if an enclosure is specified.  
Electrical schematics and wiring diagram.  
Published descriptive data on each item of equipment and all accessories, indicating all specific characteristics and options.

**Control Components**

Type and manufacturer.  
Model.  
Enclosure rating.  
Published descriptive data on all components, indicating all specific characteristics and options.  
Where liquid level sensors are provided, provide mounting details.

**Seismic Design Requirements**

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

**1-3.02. Operation and Maintenance Data and Manuals.** Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

**1-4. QUALITY ASSURANCE.**

**1-4.01. Balance.** All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the unfiltered vibration velocity, as measured at any point on the machine including top of motor, shall not exceed the maximum velocity as indicated in Figure 11.6.9.4 of the governing standard.

At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

**1-5. SPARE PARTS.** Spare parts shall be provided as follows:

<u>Spare Parts</u>	<u>Quantity</u>
Mechanical seals	1
Casing wearing plates (semi-open impeller only)	1
Sets of motor bearings	1

Spare parts shall be suitably packaged with labels indicating the contents of each package. Spare parts shall be delivered to Owner as directed.

## **PART 2 - PRODUCTS**

**2-1. SERVICE CONDITIONS.** The pump specified herein will be used to pump raw sewage from the collection system into a forcemain to be delivered to a wastewater treatment plant.

The equipment provided under this section shall be suitable for the following service conditions:

Seismic design requirements.	See Meteorological and Seismic Design Criteria section
Maximum ambient air temperature (dry pit).	104 °F
Maximum liquid temperature.	80 °F
Maximum solids concentration, by weight.	0.1 %
Pumps start and stop against a closed valve.	No
Site elevation.	See Meteorological and Seismic Design Criteria section

All equipment furnished shall be designed to meet all specified conditions and to operate satisfactorily at the elevation indicated.

**2-2. PERFORMANCE AND DESIGN REQUIREMENTS.** Pumping units shall be designed for the performance and design requirements as follows:

Pump tag numbers.	PCL-101/102/103
Rated head.	221 ft
Capacity at rated head.	1800 gpm
Operating head range for full speed continuous operation.	115 to 230 ft
Minimum shutoff head.	250 ft
Maximum nominal pump speed.	1800 rpm

Pump tag numbers.	PCL-101/102/103
Minimum head at reduced speed.	60 ft
Capacity at minimum head at reduced speed.	1000 gpm
Approximate minimum pump speed.	990 rpm
Maximum power required at pump input shaft at any point from minimum operating head to shutoff head.	240 bhp
Evaluated head	160 ft
Efficiency at evaluated head, wire to water.	69 %
Adjustable Frequency Drive losses included in the efficiency calculation	No
Pump designed for reverse rotation at rated head.	No
Minimum NSPHA at rated head.	31 ft
Maximum vibration velocity.	HIS
Minimum pump suction nozzle size (pedestal mounted).	10 in
Minimum pump discharge nozzle/elbow size.	8 in
Minimum test sphere diameter.	3 in

All specified conditions shall be at rated speed unless otherwise indicated.

The minimum hydrostatic test pressure shall be 1.5 times shutoff head plus max suction pressure.

Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergences. The

design running clearance between the impeller inlet and the casing wearing ring (if provided) shall be not less than 0.01 inch [250 µm] or 1 mil per inch [25 µm per 25 mm] of casing wearing ring diameter, whichever is greater.

### **2-3. MATERIALS.**

Stator Housing, Oil Chamber Housing, and Impeller Casing	Cast iron, ASTM A48.
Casing Wearing Ring	Martensitic stainless steel, Brinell 300+.
Impeller (if semi-open)	Hardened cast iron, ASTM A48, Brinell Hardness of 650+.
Bottom Wearing Plate	Hardened cast iron, ASTM A48 with spiral grooves, Brinell Hardness of 650+.
Shaft	Alloy steel, hard chrome plated; or martensitic stainless steel, AISI Type 416 or 420.
Mechanical Seals	2 tandem single type, oil lubricated with silicon or tungsten carbide seal rings at all points, except the upper rotating seal, which shall be carbon.
Pedestal Base	Cast iron or fabricated steel.
Epoxy Coating Primer & Finish Coat	Carboline "Carboguard 891" or Tnemec "Series N140 Pota-Pox Plus".

### **2-4. PUMP CONSTRUCTION.**

**2-4.01. Impeller Casing.** The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The discharge nozzle shall be flanged, with dimensions and drilling conforming to ANSI B16.1, Class 125.

**2-4.02. Impeller.** The impeller shall be semi-open one-piece casting with not more than two nonclog passages. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft by means of a key and self-locking bolt or nut.

**2-4.03. Wearing Rings.**

An axially adjustable wearing plate shall be provided in the casing. Axially adjustable wearing plate shall be arranged to permit adjustment of the axial running clearance between the impeller and plate. The wearing plate shall have an outward spiralling groove designed to force stringy solids outward and away from the impeller.

**2-4.04. Oil Chamber Housing.** The oil chamber shall contain a drain plug and a vent plug.

**2-4.05. Mechanical Seals.** Each pump shall be provided with two mechanical rotating shaft seals arranged in tandem and running in an oil chamber. Each interface shall be held in contact by an independent spring system designed to withstand maximum suction submergence. The seals shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement.

Shaft seals lacking positively driven rotating members or conventional double mechanical seals which utilize a common single or double spring acting between the upper and lower units and requiring a pressure differential to offset external pressure and effect sealing, will not be acceptable. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pumps are run unsubmerged for extended periods while pumping under load.

**2-4.06. Sealing of Mating Surfaces.** All mating surfaces of major components shall be machined and fitted with O-rings where watertight sealing is needed. Sealing shall be accomplished by O-ring contact on four surfaces and O-ring compression in two planes, without reliance on a specific fastener torque or tension to obtain a watertight joint. The use of elliptical O-rings, gaskets, or seals requiring a specific fastener torque value to obtain and maintain compression and watertightness will not be acceptable. The use of secondary sealing compounds, gasket cement, grease, or other devices to obtain watertight joints will not be acceptable.

**2-4.07. Guiderail Mounted Base.** Not used.

**2-4.08. Pedestal Mounted Base.** Unless otherwise indicated or specified, all equipment will be installed on concrete bases at least 6 inches high. Each pedestal mounted pump shall be mounted on a pedestal base extending from the impeller casing to below the bottom of the suction elbow inlet flange. All seams and contact surfaces between steel shapes and plates of fabricated steel pedestals shall be continuously welded and ground smooth. Each pedestal shall be suitable for grouting and bolting to the floor of the drywell.

**2-4.08.01. Suction Elbow.** Each pedestal-mounted pump shall be provided with a flanged suction elbow complete with a cleanout handhole with contoured interior surfaces. The elbow may be integral with the pedestal base. The diameter and drilling of the inlet flange shall conform to ANSI B16.1, Class 125.

**2-4.09. Skid Mounted Base.** Not used.

**2-4.10. Access Hatch Cover.** Not used.

**2-4.11. Shop Painting.** All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the casing and the discharge elbow, shall be shop cleaned in accordance with the coating manufacturer's recommendations. The exterior of the pump shall be painted with the epoxy coating system specified. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least 1 quart of the finish coat material shall be furnished with each pump for field touch-up.

All iron and steel parts inside the pump, including the surfaces of cast iron impellers, shall be painted with a suitable rust protective coating to protect the impeller during shipment, storage, and installation.

The shop painting of other surfaces shall be in accordance with the shop painting requirements in the General Equipment Stipulations.

For potable water applications, all coatings shall be NSF approved.

**2-5. ELECTRIC MOTORS.** Each pump shall be driven by an air-filled, totally submersible electric motor provided by the pump manufacturer. Motor nameplate rating shall exceed the maximum power required by the pump in the operating head range. Each motor shall be rated for the power supply provided to the pump, and shall have a service factor of 1.15. The stator housing shall be an air-filled, watertight casing. A cooling jacket shall encase the motor housing for each pump where needed to maintain adequate cooling. The cooling jacket shall require no external source of cooling water. Motor insulation shall be moisture resistant, Class H, 155°C. Each motor shall be NEMA Design B for continuous duty at 40°C ambient temperature, and designed for at least 10 starts per hour.

The motor bearings shall be antifriction, permanently lubricated type. The lower bearing shall be fixed to carry the pump thrust and the upper bearing free to move axially. The bearings shall have a calculated ABMA L<sub>10</sub> Life Rating of 40,000 hours when operating at maximum operating head. Maximum shaft runout at the mechanical seals shall not exceed 2 mils at any point in the operating head range.

Each motor installed in a drypit shall be capable of continuous operation in air under pump full load conditions, without exceeding the temperature rise limits for the motor insulation system.

Each pump shall be equipped with one or more multiconductor cable assemblies for power and control. Each multiconductor assembly containing power cables shall be provided with a separate grounding conductor. Each cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged use. Cable sizing shall conform to NEC requirements.

All cables for drywell mounted pumps shall be of sufficient length to terminate in a junction box as indicated on the Drawings, with 10 feet of slack which will be coiled at the motor.

The cable entry water seal shall include a strain relief and a grommet type seal designed so that a specific fastener torque is not required to ensure a watertight, submersible seal. The cable entry junction box and motor shall be separated by a stator lead sealing gland or a terminal board. The junction box shall isolate the motor interior from moisture gaining access through the top of the stator housing.

Motors shall be specifically selected for service with an adjustable frequency type speed controller and shall be derated to compensate for harmonic heating effects and reduced self-cooling capability at low-speed operation so that the motor does not exceed Class B temperature rise when operating in the installed condition at load with power received from the adjustable frequency drive. All motors driven by adjustable frequency drives shall be supplied with full phase insulation on the end turns and shall meet the requirements of NEMA MG 1, Part 31. In addition to the requirements of NEMA MG 1, Part 31, motors shall be designed to be continually pulsed at the motor terminals with a voltage of 1600 volts ac.

**2-5.01. Adjustable Frequency Drives.** Adjustable frequency drives shall be provided and shall be coordinated with the requirements of the pumping unit. The pump manufacturer shall be responsible for furnishing the adjustable frequency drive, for matching the motor and the drive, and for coordinating the collection of data and the design to limit harmonics to the levels specified.

Adjustable frequency drives shall be design as specified in the Adjustable Frequency Drives section.

## **2-6. CONTROLS.**

**2-6.01. Liquid Level Sensors.** Not used.

**2-6.02. Pump Controls.** Each motor shall be protected by one motor temperature switch embedded in each phase winding. Each switch shall be designed to operate at 140°C (± 5°C). Each switch shall be normally closed automatic reset type rated 5 amps at 120 volts ac. The switches shall be wired in series with end leads wired to terminals within the motor housing.

Each motor housing shall be provided with a moisture detection system complete with all sensors, control power transformers, intrinsically safe control modules, and relays. The moisture detection system shall be rated for a 120 volt ac supply. The moisture detection system shall provide two normally open dry output contacts rated 5 amps at 120 volts ac. The contacts shall close when moisture is detected in the motor housing. All moisture detections system components shall be furnished by the pump supplier and shall be shipped loose for installation into the motor controller enclosure

### **2-7. SHOP TESTS.**

Each pump shall be tested at the factory for capacity, power requirements, and efficiency at specified rated head, shutoff head, operating head extremes, and at as many other points as necessary for accurate performance curve plotting. All tests and test reports shall be made in conformity with the requirements and recommendations of the Hydraulic Institute Standards. Acceptance testing shall be per Table 11.6.5.4 Grade 1U, with no minus tolerance or margin allowed.

Five certified copies of a report covering each test shall be prepared by the pump manufacturer and delivered to Engineer not less than 10 days prior to the shipment of the equipment from the factory. The report shall include data and test information as stipulated in the Hydraulic Institute Standards, copies of the test log originals, test reading to curve conversion equations, and certified performance curves. The curves shall include head, bhp [brake kW], pump efficiency, and shop test NPSH available, plotted against capacity. The curves shall be easily read and plotted to scales consistent with performance requirements. All test points shall be clearly shown.

**2-8. MANUFACTURERS.** Submersible pump shall be manufactured by Flygt or Hydromatic.

## **PART 3 - EXECUTION**

**3-1. INSTALLATION.** Each pumping unit shall be installed in accordance with the Hydraulic Institute Standards, the Equipment Installation section, and as specified herein.

The equipment base for dry pit type pumping units shall be grouted after initial fitting and alignment, but before final bolting of connecting piping. Special care

shall be taken to maintain alignment of pumping unit components. No stresses shall be transmitted to the pump flanges. After final alignment and bolting, connections to pumping equipment shall be tested for applied piping stresses by loosening the flange bolts. If any movement or opening of the joints is observed, piping shall be adjusted to proper fit.

Control cables shall be supported to prevent tension and damage. Mounting of cable supports in wetwells shall be coordinated by the pump supplier. Liquid level sensors shall operate freely and shall be adjusted to the levels indicated in the respective pump schedules, or in the electrical schematics or P&ID's. Each system of sensors shall be installed complete with all required mounting brackets, weights, galvanized steel mounting pipes and accessories, control panel transformers, auxiliary relays, cables, and junction boxes.

### **3-2. FIELD QUALITY CONTROL.**

**3-2.01. Installation Check.** An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Section 01650, Startup Requirements, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the contract price.

**3-2.02. Installation Supervision.** Installation supervision by the manufacturer is required. Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures. Installation supervisor shall provide a written letter report certifying that the pumps were properly installed and are ready for startup.

**3-2.02. Field Vibration Tests.** Not Used.

### **End of Section**

## Section 11910

### ENGINE-GENERATOR

#### PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of one diesel fueled engine-driven electric generator units designated GEN-401. The engine-generator shall be located outside in a skin tight, non-walk-in type weatherproof, level 1, sound attenuated enclosure. The engine-generator design shall be Caterpillar C18 or equal.

The engine-generator Supplier shall be fully responsible to furnish a complete and coordinated package system including the engine-generator, enclosure, microprocessor-based generator controls, exhaust silencers, batteries and chargers, sub-base fuel storage tank, digital governor, digital voltage regulator and all accessories as required for a complete operating system.

1-2. GENERAL. Equipment furnished under this section shall be assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Coordination. All equipment specified in this section shall be furnished through a single engine-generator manufacturer who shall be responsible for the design, manufacture, coordination, and delivery of the entire system. The Contractor shall be responsible for unloading, storing, and installing the equipment.

The engine-generator unit shall be a standard product of the manufacturer and shall be a packaged type unit, fully shop assembled, wired and tested, requiring no field assembly of critical moving parts.

Supplier shall verify that each component of the system is compatible with all other parts of the system; that all piping, materials, and motor sizes are

appropriate; and that all devices necessary for properly functioning system have been provided.

Supplier shall, at its own expense, arrange for and obtain all necessary permits, inspections, and approval by the proper authorities in local jurisdiction of such work.

Supplier shall properly coordinate the work between the suppliers of the equipment to be used with or connected to the engine-generator, including the switchgear modifications to ensure that all requirements are met.

Supplier shall provide field services specified to assist in commissioning, testing and placing the unit in operation in full conformity with equipment manufacturer's specifications.

1-2.04. Governing Standards. Except where modified or supplemented by these specifications, all equipment and materials shall be designed and constructed in accordance with the latest applicable requirements of the standard specifications and codes of ANSI, ASTM, EEI, EGSA, HEI, IBC, IEEE, IFC, ISO, NEMA, NFPA, SAE, STI, UL and other such regularly published and accepted standards as well as state and local codes.

The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1-2.05. Equipment Identification. All equipment, valves, devices, panels, and control equipment denoted by a symbol and an identifying number shall be provided with equipment identification tag or nameplate. Equipment identification shall be as indicated in the Equipment and Valve Identification section.

1-2.06. Manufacturer's Nameplates. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable.

1-2.07. Power Supply. Site power supply provided to the engine-generator enclosure for auxiliary loads shall be a single 480 volt, 60 Hz service. The manufacture shall furnish a step-down transformer and panelboard, as required, to power all loads within the enclosure.

The engine (starting and controls) will operate from batteries specified herein. When needed, a control transformer shall be provided within the panel-board for control supply.

### 1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete assembly and installation drawings, together with detailed specifications and data covering materials, drive unit, parts, devices and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals Procedures section. The data and specifications for the unit shall include, but shall not be limited to, the following:

Manufacturer, model, and type:

Engine.

Alternator.

Enclosure.

Battery charger and battery.

Fuel oil cooler (if required by engine design).

Silencer.

Emission control equipment.

Sub-base fuel storage tank.

Engine output horsepower and efficiency curves at rated capacity.

Fuel consumption at rated capacity.

Ratings at specified conditions:

Engine (net horsepower).

Engine (maximum performance horsepower bare engine).

Generator kW at specified power factor.

Volts.

Amperes.

Overall dimensions and weight:

Length.

Width.

Height.

Net weight.

Wiring diagrams and schematics, including the engine control panel.

Alternator insulation class and temperature ratings.

Alternator winding pitch.

Confirmation or test results showing compliance with specified motor starting and voltage dip requirements as well as unloading the specified loads.

Control panel layout, identifying location of all instrumentation being supplied.

Engine drawing to include location of all piping connections.

Operation instructions.

Letter from the engine-generator manufacturer confirming that the unit will provide the specified minimum kW rating at the specified design conditions and time duration including ambient temperature rise from all equipment located inside the enclosure.

Confirmation that the battery charger is sized to recharge the batteries for the specified condition and time period.

Confirmation that the starting batteries provide the specified number of start attempts for the specified time period.

Maximum output short circuit kVA available.

Letter from the engine-generator manufacturer confirming that the enclosure is suitable for the specified wind velocity and is designed as specified for rain penetration when the unit is operating.

Manufacturer and type of engine cooling antifreeze being supplied.

Exhaust gas emission data, maximum values at loads of 1/2, 3/4, and full when operating on 100 percent diesel fuel:

Carbon Monoxide (CO), lb/hr

Nitrogen Oxides (NO<sub>x</sub>), lb/hr

Particulate Matter (PM), lb/hr

Temperature, F

Flow, acfm

Equipment skid drawing including material list.

Confirmation that the exhaust through the exhaust silencer and emissions control equipment does not exceed the specified maximum pressure loss at the specified power outage capacity of the unit.

Letter from the engine-generator manufacturer confirming that the unit is in full compliance with federal EPA, State, and Local air emission requirements.

Confirmation that the engine-generator unit, including the enclosure, louvered openings, and exhaust system will limit the noise to not exceed the specified decibel reading at the specified distance from any point from the enclosure when operating at the specified capacity.

Name, address, and phone number of manufacturer's repair facility.

Color chart showing available options for the enclosure color. The color of the enclosure shall be as directed by Owner during shop drawing review.

Drawings showing engine-generator inside the enclosure that shows location of all enclosure mounted and engine-generator mounted equipment. Drawings to indicate maintenance access clearances for electrical and mechanical equipment. Drawing to show location of all enclosures bracing and location of doors, sub-base tank fill access door, power panel door, silencer, and removable panels.

Identification of all field connections for electrical, control, or other service and associated connection requirements to be performed by the Installation Contractor.

Detailed procedures and instrument calibration reports for all items associated with the shop and field-testing activities.

Provide recommendation for mounting the engine-generator for the specified seismic parameters.

Stairs and platform drawings.

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section

Letter from the manufacturer confirming site visit and indicating a item to be replaced such that nameplate capacity will be obtained from all the engine-generators.

Anchor Bolts

Generator Protection Relay recommended settings.

Detailed installation instructions for Installation Contractor.

Refer to Attachment A for a list of technical information that should be provided with the submittal.

1-3.02. Operation, Maintenance, and Repair Manual. Operation, Maintenance and Repair Manuals, including names and telephone numbers of emergency contact persons, shall be submitted in accordance with the Submittals Procedures section. The manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements Section.

1-4.01 Spare Parts. The following spare parts and accessories shall be furnished in substantial wooden boxes with identifying labels and delivered to Owner as directed:

<u>Spare Parts</u>	<u>Quantity (for each unit)</u>
Air filters.	2 sets
Oil filters.	4 sets
Fuel filters.	12 sets

V-belts.	1 set
Crankcase filter media.	1 set

If any of the above spare parts are used during the installation process, they shall be replaced by the manufacturer at no cost to the Owner.

All spare parts shall be provided in waterproof packages suitable for export service, labeled with its description and part numbers. Each item or set of parts expected to be installed at one time shall be in an individual package. The spare parts shall be stored as directed by the owner.

1-4.02. Keys. Three sets of identical keys for locks on the enclosure and all cabinets shall be provided for the engine-generator.

## PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. The engine-generator unit shall be designed to operate under the following service conditions:

Seismic wind and snow design requirements including importance factor	See Meteorological and Seismic Design Criteria section
Ambient air temperature range.	19 to 115 °F
Site elevation.	25 ft

The engine-generator unit will be used as a power unit for selected electrical loads of the plant when the utility supplied power fails for minimum of 24 continuous hours and maximum of 50 hours per year.

The engine-generator shall automatically start and connect to the plant's electrical control system when initiated from automatic transfer switch as indicated on the drawings.

Fuel for the engine-generator will be furnished from a sub-base fuel storage tank associated with the engine-generator as specified herein.

The engine-generator Supplier shall provide the correct amount and grade of crankcase oil, coolant, and other fluids (except fuel) necessary for initial startup, testing and operation.

2-1-01. Engine Mounting. The engine-generator shall be attached to an associated skid suitable for mounting on top of the sub-base fuel storage tank anchored to a reinforced concrete base. The skid shall be constructed of heavy-duty steel, designed and built to resist deflection and to maintain alignment during lifting and

operation during any range of operation. Mounting holes in the structural skid shall be suitably sized to accommodate thermal expansion of the unit.

Unless otherwise recommended by the manufacturer, the engine-generator sub-base fuel storage tank package shall be attached to the reinforced concrete base using suitable number of hold down lugs and anchor bolts. The use of clamping devices to secure the sub-base tank will not be acceptable. Anchor bolts may be pre-cast in the reinforced concrete base or holes drilled into the concrete base at the required location and the anchor bolts secured with epoxy resin. Unless otherwise recommended by the manufacturer, the nuts for the anchor bolts shall be hand tighten.

2-1-02. Anchor Bolts. All field assembly bolts, anchor bolts, nuts, and washers shall be stainless steel as specified in the Anchorage in Concrete and Masonry section. All anchor bolts, nuts, and washers required for installation shall be provided by the Supplier.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. The engine-generator units shall be designed for the operating conditions and requirements as follows:

Tag numbers	GEN-401
Generator	
Minimum power rating capacity with accessories, for the generator voltage output and service conditions specified herein.	550 kW
Output frequency.	60 Hz
Output voltage.	480 V
Output power factor.	0.8
Output phase and configuration.	3 wire, solidly-grounded wye
Maximum Voltage Dip	See Performance Table
Engine Fuel Supply.	No. 2 Ultra-low Sulfur diesel
Maximum speed.	1,800 rpm
Minimum piston displacement.	1,953 in <sup>3</sup>
Black start required.	Yes
Factory Emission Certification when operating at full load.	Tier 2
Maximum outside length of the engine-generator package including air intake plenums and radiator discharge plenums but	34.0 ft

not including access platforms.

Maximum outside width of the engine-generator package including air intake plenums but not including access platforms. 10.5 ft

Maximum overall height of the complete package including sub-base tank, engine-generator, and exhaust system. 15.0 ft

Maximum package wet weight including engine-generator, enclosure, ancillary equipment and fuel. 50 tons

Engine-generators submitted with ratings in excess of current published data will not be acceptable.

The entire engine-generator package system shall be electrically grounded with provisions to connect to a grounding system installed by others. Connection locations shall be indicated in the shop drawing submittals.

Engine performance, cooling, and all accessories to account for ambient air temperatures increase from heat rejected from all equipment located inside the enclosure.

Engine-generator unit furnished shall be of a design that can be accommodated in the space as indicated on the drawings. Maximum outside dimensions of the Engine-generator enclosure including any air intake or discharge plenums shall be as specified.

Any special fittings or piping required for connection to fuel piping shall be furnished and installed.

The engine-generator shall meet the required Environmental Protection Agency New Source Performance Standard emission regulations, the California Air Resources Board, and any other local requirement. The unit shall be certified at the factory prior to shipping.

The engine-generator supplier shall coordinate with the local air quality management authority to ensure the equipment meets all current local air emissions requirements. The engine-generator supplier shall guarantee the equipment supplied meets all local air emissions requirements in place at the time of startup. Field testing of actual emissions will be required per Section 3-3 to verify compliance with the emissions requirements.

2-2.01. Performance Tables. The engine-generator shall satisfactorily start the following loads in the listed order, while meeting the specified voltage and frequency dip:

	<u>Load Description</u>	<u>Load</u>	<u>Maximum Voltage Dip (%)</u>	<u>Maximum Frequency Dip (%)</u>	<u>Comments</u>
<u>Step 1</u>					
1.1	Misc. Bldg. Loads	30 kVA	20	20	
1.2	Motor	0.75 HP	20	20	Across the line
1.3	Motor	0.75 HP	20	20	Across the line
1.4	Motor	0.75 HP	20	20	Across the line
1.5	Motor	0.75 HP	20	20	Across the line
1.6	Motor	0.75 HP	20	20	Across the line
<u>Step 2</u>					
2.1	Motor	250 hp	10	5	VFD 110% Current Limit, 18 Pulse, 3ph
2.2	Motor	2 hp	30	30	Across the line
2.3	Motor	2 hp	30	30	Across the line
2.4	Motor	1 hp	30	30	Across the line
<u>Step 3</u>					
3.1	Motor	250 hp	10	5	VFD 110% Current Limit, 18 Pulse, 3ph
3.2	Motor	1.5 hp	30	30	Across the line
3.3	Motor	1.5 hp	30	30	Across the line
3.4	Motor	5 hp	30	30	Across the line
3.5	Motor	5 hp	30	30	Across the line

2-2-01.02. Unloading Requirements. The engine-generator shall satisfactorily unload the loads indicated above in any order one at a time while not exceeding overspeed, frequency deviation, and voltage deviation.

2-3. ACCEPTABLE MANUFACTURERS. The engine-generator shall be a current production. The engine-generator shall be manufactured by Caterpillar or Cummins or Koehler without exception.

The complete engine-generator package shall be assembled by the engine-generator manufacturer or their representative.

The manufacturer of the engine-generator unit shall have a full-time factory trained technical staff and an equipped twenty-four (24) hour service facility having all personnel and all equipment required to maintain, repair, or overhaul the engine-generator unit and associated equipment.

#### 2-4. ENGINE-GENERATOR UNIT.

2-4.01. Engine. The engine shall be a reciprocating 4-stroke cycle compression ignition type and shall be equipped with the following:

Electronic governor for isochronous regulation of engine speed from no load to full load alternator output.

Dry type air cleaner with replaceable elements.

2-4.02. Alternator. The engine-generator alternator shall be a 4 pole, revolving field design with temperature compensated solid state voltage regulator, brushless rotating rectifier exciter system, and drip-proof construction with amortisseur windings. The alternator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semi-flexible driving flange to ensure permanent alignment.

Frequency regulation shall be isochronous  $\pm 0.15$  Hz from no load to rated load. Voltage regulation shall be within  $\pm 2$  percent of rated voltage, steady state, from no load to full load. The momentary voltage drop shall not exceed the specified percent without starter coils dropping out or stalling the engine at any time when applying or starting the specified loads. Recovery to stable operation shall occur within two seconds.

The alternator shall have Class F insulation as defined by NEMA MG1-1.65 and temperature rise shall be within NEMA MG1-22.40 definition at rated condition.

The alternator conduit box shall be sized to accommodate the separate phase leads, neutral leads, current transformers, voltage surge arrestors and capacitors, and connections as indicated on the electrical one-lines.

The winding pitch shall be 2/3 pitch.

An alternator winding heater shall be furnished as an integral part of the engine-generator unit. Alternator winding heater shall be rated 120 volts, single phase. The alternator winding heater control system shall include an interlock with the engine-generator unit so that the heaters are de-energized at all times that the generator field is energized. The Supplier shall provide all internal alternator winding heater wiring and fused branch circuit protection.

2-4.02.01. Surge Protection. The engine-generator shall be provided with a voltage surge protection system installed in the generator terminal box or in a

separate enclosure near the generator terminal box that is located inside the enclosure.

The surge protection system shall include a surge capacitor and surge arrester. All cable required to connect the surge protection system to the generator terminals shall be furnished and installed under this section.

2-4.03. Fuel System. The engine-generator unit shall be furnished with a complete fuel system including engine-driven fuel pump, double wall sub-base fuel storage tank, engine supply and return lines, fuel maintenance system if required, and all accessories required for proper operation. All items shall be suitable for the specified fuel and located inside the enclosure and serviceable from inside the enclosure. The engine driven fuel pump shall transfer the fuel from the sub-base fuel storage tank to the engine-generator.

The complete fuel system and all fuel piping shall be suitable for the specified fuel and shall meet all NFPA, state, and local requirements.

Stainless steel flexible connectors shall be provided for the diesel fuel supply and return lines and at a minimum shall be located at each connection to the engine, upstream of the combination fuel filter/separator, and in the fuel return line to the sub-base fuel tank. The stainless steel flexible connectors shall be U.S. Hose "Model 401M" or equal.

A combination fuel filter/separator shall be located on the fuel supply line inside the enclosure between the sub-base fuel storage tank and the engine driven fuel pump, upstream from the flexible connectors. The combination fuel filter/separator shall be a manifold unit with shutoff valves and shall permit servicing the filter/separator without engine shutdown. This shall permit valving off of the filter/separator and bypassing the fuel to the other filter/separator. Filter/separator shall be manufactured by Racor or equal.

Fuel oil coolers shall be provided if the engine fuel system absorbs heat from the unit injectors and surrounding jacket water. The fuel cooler shall be a radiator mounted, air cooled unit that uses the air flow from the radiator for cooling. To prevent overheating of the fuel in the sub-base fuel storage tank, the fuel oil cooler shall be adequately sized to cool the return fuel from the engine to the required fuel inlet temperature.

The fuel storage tank shall be a rectangular sub-base type, double wall Fireguard type with solid dry type insulation between the two steel walls, shall be located below the engine-generator and shall be constructed to permit access to the electrical stub-up area. The primary tank and the secondary tank shall meet all EPA, state, and local requirements, be vented, and shall normally be used to store diesel fuel at atmospheric pressure. The primary internal steel tank and the secondary outer steel tank shall both be of welded construction throughout and each shall be UL 142 listed and labeled.

The sub-base fuel storage tank shall be Fireguard type, with two-hour fire rating and impact ballistic protection. The tank shall be UL 2085 listed, and shall meet requirements of the Uniform Fire Code 7907, and NFPA 30/30A. The tank shall be manufactured to and labeled in accordance with STI standards; no exposed concrete, spalling or cracking with a 20-year minimum warranty.

The fuel storage tank shall have a minimum usable capacity to provide for storage for 24 hours of continuous operation of the engine-generator when operating at 100 percent capacity but shall not be less than 2,500 gallons.

The secondary tank shall be closed top, encircle the tank, prevent the containment area from being contaminated, and sized to contain minimum 110 percent of the tank's capacity. All connections required for field-testing the secondary tank shall be furnished.

The fuel storage tank shall be provided with the following:

- Secondary containment tank.

- Float switch in secondary tank to indicate tank leak

- Vent cap.

- Primary tank emergency vent.

- Secondary tank emergency vent.

- Level gauge that is capable of measuring fuel level without engine running and is viewable from the manual fill connection.

- Fill spill containment box and pump out with cap.

- Automatic shutoff valve, dry type quick fill coupling and check valve on the fill line.

- Cap for pump out connection.

All connections for the sub-base fuel storage tank shall be located inside the enclosure and on top of the tank. The fuel storage tank shall be provided with the following connections:

- Engine fuel supply.

- Engine fuel return.

- Manual fill.

- Minimum 2-inch tank pump out with cap. Pump out line to extend to within 2 inches of the bottom of the tank.

- Primary tank vent.

- Secondary tank vent

Level gauge with transmitter for remote level indication on the engine control panel.

Primary tank emergency vent.

Secondary tank emergency vent.

Low level switch.

Leak detection.

High level float with externally mounted alarm horn and silencer button located near the fill connection.

High-high level switch (if required for automatic shutoff of the fuel fill).

Secondary tank testing with cap.

Minimum 3-inch connection with suitable screwed cap or blind flange for tank access.

Two 2-inch spare connections with caps.

The fuel storage tank shall have instrumentation suitable for the geometric configuration of the tank that includes, but is not limited to the following:

Level indication readout on the engine control panel with contact for transmission of a remote 4-20 mA signal for remote level indication. Power, if required, shall be pre-wired and fed from the engine-generator local control panel.

Level switch with electrically isolated dry contacts for remote leak detection of the primary tank shall be provided with feedback to the engine control panel.

Low level switch with electrically isolated dry contacts for remote low level annunciation on the engine control panel. The Low Fuel alarm shall be set to annunciate when 25 percent or less of the tank's capacity is remaining in the tank above the engine supply connection.

High level switch for annunciating audible alarm at 90 percent capacity in the fuel storage tank. Audible alarm horn and silence button shall be located near the fill connection.

High-High level switch with electrically isolated contacts to shut off an electrically operated valve if used in the fill line at 95 percent capacity in the fuel storage tank.

One common, isolated, dry contact to close for any fuel system alarm. A comprehensive fuel tank overfill protection system shall be provided as described herein. All devices and components shall be pre-wired from the system control panel with feedback to the Generator Control Panel as indicated.

Set at 90 percent tank capacity, the High Fuel alarm shall provide an audible alarm near the connection to alert the fill operator to prevent overfill of the tank.

A silence button shall be provided to silence the alarm horn, automatically resetting when the fuel level has dropped below the high level condition.

The fuel storage tank fill line shall include a suitable means for automatic shutoff of the fill line when 95 percent of the tank capacity has been reached. If electric operated valve is used, it shall be AC powered and be interlocked with the High-High level switch. The fill system including piping, fittings, and the automatic shut off valve shall be suitable for a pumped flow from a fill truck.

Tank fill connection, pump out connection, and level gauge shall be accessible from ground level, through a lockable access door in the enclosure. A fill spill containment box shall be provided for containment of spillage during tank fill or tank pump out.

The fill system including piping, fittings and the automatic shutoff valve, shall be suitable for a pump flow from a fill truck. The fill connection shall include a dry type quick disconnect coupling sized to accommodate the local fuel distributor.

A ground stud for the fuel truck shall also be supplied.

A suitably sized vent connection and vent cover shall be provided for the storage primary tank vent and for the secondary tank vent. Each vent cover shall be installed outside the enclosure. The cover shall have an aluminum body, screen over the outlet, and shall prevent rain from entering the vent line.

Suitable sized emergency vent connections for the primary and secondary tank and emergency vents shall be provided for the fuel storage tank. The emergency relief vent shall be installed outside the enclosure and shall be designed as required to relieve excessive internal pressure caused by fire exposure.

Each vent line and each emergency relief vent line shall be routed up on the inside of the enclosure and shall terminate just above the enclosure.

All electrical components that are furnished as part of the fuel system shall be wired by the engine-generator Supplier to either the fuel system controls and/or the local engine-generator control panel. The fuel system controls shall be powered from the power panel specified in this section. Power supply wiring to all components of the fuel system shall be provided and installed by the engine-generator Supplier.

2-4.04. Exhaust System. The engine-generator unit shall be furnished with a complete exhaust system including an all SS exhaust silencer or if required an all SS diesel particulate filter/silencer, all exhaust piping, stainless steel bellows expansion joints, and accessories required for a complete operating system. The entire exhaust and emission control system shall be designed and sized by the

engine manufacturer to comply with all emission requirements. Emission control equipment shall be provided by the engine-generator manufacturer.

If required, the exhaust particulate filter/silencer shall be provided as required to meet all Federal, State, and Local emission requirements.

All exhaust piping shall be Schedule 10S, AISI Type 304L stainless steel with butt-welded fittings.

The silencer shall be all welded AISI Type 304L stainless steel construction. The exhaust silencer shall be furnished with suitable stainless steel bracket supports for horizontal mounting inside the enclosure. The silencer shall be sized so that the back pressure at rated capacity of the engine does not exceed half the manufacturer's maximum allowable back pressure. The exhaust from the engine shall enter either the bottom or side. Silencers shall be Maxim "M51", Nelson "300" or equal.

The silencer shall be provided in order to meet the overall engine-generator unit noise emissions requirements specified in Section 2-4.14.

The exhaust silencer if located inside the enclosure and all exhaust piping inside the enclosure shall be thermally and acoustically insulated with a removable insulation.

The exhaust shall discharge vertically at the silencer outlet. A rain cap shall be provided to prevent rain from entering the exhaust pipe. The rain cap shall open from exhaust pressure from the engine and shall close when exhaust flow stops. The cap shall be stainless steel counter-balancing with vertical discharge.

Exhaust emission test ports shall be provided in the exhaust piping after the silencer. Ports shall be threaded and shall be provided with stainless steel threaded plugs or caps.

2-4.04.01. Exhaust Particulate Filter and Silencer. If required to meet local emissions requirements, the exhaust particulate filter/silencer shall reduce the diesel engine exhaust emissions or shall be provided in order to meet the overall engine-generator unit noise requirements specified in Paragraph 2-4.14. The particulate filter/silencer shall be a continuously regenerated diesel particulate filter without requiring manual intervention. Regeneration shall occur during normal engine operation once an exhaust temperature of 750 F is reached.

The particulate filter/silencer housing shall be constructed of all welded AISI type 304L stainless steel with suitable stainless steel bracket supports for mounting on top of the enclosure. The particulate filter/silencer shall be designed to contain multiple filter elements and shall be provided with an access door to the filters. The doors shall be easily removed without the assistance of lifting

equipment and be located for easy access without removing of the particulate filter/silencer. The door shall be provided with gaskets to prevent exhaust gas from leaking to the atmosphere. Connection to the engine exhaust system shall be via standard ANSI 150# pattern flanges.

2-4.05. Starting System and Control Power. The engine-generator unit shall be furnished with a complete electric motor start system including starting motors, battery pack with rack, cables, and battery charger.

The batteries shall be of the high rate, nickel-cadmium type and have a 24 volt output. The batteries shall be electrically sized for the specified design conditions or electrically sized for the engine furnished using electric strip heaters to maintain minimum cell voltages of 0.65 volt per cell during initial starting, and 0.85 volt per cell throughout the cranking time for five consecutive starting attempts of 10 seconds each. Battery voltages shall be maintained under the conditions specified herein.

The battery charger shall be suitable for the nickel-cadmium battery pack. The charger shall have a DC output suitable to supply power for all continuous loads and to recharge the batteries from a fully discharged state to normal operating voltage within 8 hours. The battery charger shall be provided with a NEMA 2 corrosion resistant enclosure. The battery charger shall be provided with the following: on/off switch, DC ammeter, DC voltmeter, AC input and DC output circuit breakers or fuses, floating voltage equalization, equalizing timer, and relays with form c contacts for remote annunciation of loss of AC power, low battery voltage, and high battery voltage.

The batteries, battery rack, and battery charger shall be located inside the engine-generator enclosure. The battery rack frame shall be constructed of corrosion resistant material.

The engine-generator shall automatically supply power to the remote bus that powers the battery charger when it is operating and when utility power is not available.

If electric strip type heaters are used due to the design conditions, they shall be thermostatically controlled and be sized to maintain the batteries at 50°F with a winter ambient temperature inside the enclosure as specified here in. The strip heaters shall be powered from the panel board specified here in and shall be wired by the engine-generator supplier.

2-4.06. Cooling System. The engine-generator unit shall be cooled with unit-mounted radiator cooling system complete with radiator, expansion tank, water pump, belt-driven fan, fan guard, thermostatic temperature control, high-water temperature cutout, electric jacket water heater and all accessories required for proper operation. The radiator shall be sized with sufficient capacity for cooling

of the engine and all other accessories required for proper operation including the ambient air temperate rise inside the enclosure. The fan shall draw air over the engine and discharge through the radiator.

The cooling system shall be filled with a permanent antifreeze mixture of the ethylene glycol type with rust inhibitor suitable for the service conditions specified herein.

The electric jacket water heater shall be furnished to maintain jacket water at 90°F with a winter ambient temperature as specified herein. The jacket water heater shall be thermostatically controlled.

The jacket water heater shall be powered from the panelboard supplied in this section and shall be wired by the engine-generator Supplier.

2-4.07. Enclosure. The engine-generator unit, including control panel, battery rack, battery charger, transformer, panelboard, sub-base fuel storage tank, and other ancillary equipment, shall be housed in a weatherproof, sound attenuated, enclosure of the non-walking type. The enclosure shall be shop mounted on its engine-generator skid or field erected by the Supplier.

The enclosure shall be designed to permit routine maintenance of engine-generator and ancillary equipment. Proper clearance must be maintained in front of all electrical equipment per the National Electric Code (NEC) and the Basic Building Code (BOCA).

The enclosure shall be designed to withstand the specified conditions as defined in the Meteorological and Seismic Design Criteria Section.

The enclosure shall be as manufactured by Pritchard-Brown or equal.

2-4.07.01. Enclosure Fabrication. The enclosure shall consist of two side walls, two end walls, and roof. The roof shall be braced as necessary to support the exhaust system. All bracing and reinforcing members shall be integral to the enclosure.

The enclosure shall be constructed of either steel or aluminum. Steel enclosure shall be constructed with a support frame of not less than 14 gage steel and roof panels of 16 gage.

Aluminum enclosure shall be formed sheet aluminum construction, made of modular panels and louvers. Posts, rails, channels, and roof bows shall be 6061-T6 extruded aluminum. The panels shall be 0.040-inch thick minimum.

The enclosure shall be rain proof type as defined by UL2200 and shall prevent the wetting of live parts when the unit is operating. If required to meet the rain

penetration requirements, "rain resistant" louvers, vertical air turning plenums or a combination of the two shall be provided. Roof shall be cambered to prevent rain water accumulation.

The enclosure walls shall be reinforced to support the plenums. Plenums shall utilize bracing as required to prevent vibration and damage from the specified wind velocity. The total assembly of generator set, enclosure, and sub-base fuel tank shall be designed to be lifted into place using spreader bars.

A minimum of four separate doors, two per side, shall be provided and located for easy maintenance access to the engine-generator, controls, and accessories. If required, access door shall be provided in front of the auxiliary power terminal box, control panel, and panel board to permit access and working space from outside the enclosure when the door is open.

Doors shall be lockable with stainless steel hardware, include retainers to hold the door open during service and the maximum width of each individual door shall not exceed three feet.

Access service platforms along each long side of the enclosure and shall be as tall as the sub-base tank.

Access platforms and stairs shall be of stainless steel and aluminum construction. The access platforms shall be four (4) feet wide and shall be located on each side of the enclosure with individual stairs to each platform. Suitable brackets shall be welded to the enclosure at the factory for field-bolting the access platforms or stairs onto the brackets on the enclosure. Stairs and handrails shall not prevent the enclosure doors from opening fully.

The access platforms shall provide access to all doors including enclosure doors and fuel fill door.

The service platforms or stairs shall be OSHA compliant and shall be provided by the engine-generator manufacturer.

The entire enclosure, except for the louvered openings, shall be provided with noise suppression insulation.

The enclosure shall be provided to meet the overall engine-generator unit noise emission requirements as specified in Section 2-4.14. Field sound level tests shall be performed on the unit as specified in Section 3-3.02.

Roof penetrations for the installation of the silencer system, all sub-base tank venting shall be gasketed to prevent the entrance of rain.

Suitable OSHA approved access service platform shall be provided to access the interior of the enclosure. Access platform shall be of all aluminum construction.

The access platform shall be located on each side of the enclosure with individual stairs to each platform. Suitable brackets shall be welded to the enclosure at the factory for field-bolting the access platform onto the brackets of the enclosure. Stairs and handrails shall not prevent the enclosure doors from opening fully.

The sub-base fuel storage tank fill connection location shall be accessible from either ground level, an access platform, or stairs through a lockable access door located on the northwest side of the enclosure as indicated on the drawings.

Engine oil and coolant drains shall be piped to the side of the skid, with lockable shutoff valves and caps. All enclosure penetrations shall be gasketed or sealed to prevent the entry of rodents.

Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

The enclosure shall be cleaned and painted as specified herein.

All enclosure doors shall be equipped with intrusion switches wired together to provide remote indication of when a door is open. Switches shall be rated for 120VAC, 5 amps.

2-4.07.02. Enclosure Ventilation. The enclosure shall be provided with intake and exhaust louvers with dampers to open on engine start. Louvers and dampers shall be sized for the cooling air requirements. Louvers shall be AC powered closed and spring open on unit start. The louvers shall be screened from the inside to prevent the entry of birds. The louvers shall be pre-wired, requiring only connection to the panel board specified in this Section.

The enclosure shall be provided with vertical air turning plenums for cooling air intake. The air inlet turning plenum shall be located on the end of the enclosure opposite the radiator discharge plenum.

The enclosure shall be provided with vertical air turning plenums for radiator discharge air. The radiator discharge plenum shall direct the air and mechanical noise upwards away from the unit, and shall be supplied with a bottom sump area, with a 1-inch drain and shutoff valve to remove any moisture.

2-4.07.03. Electrical. The enclosure shall be completely pre-wired, requiring only a 480V external connections to the enclosure to power all enclosure loads. A step-down transformer and panel board shall be provided as required and located within the generator enclosure. All circuits shall be routed in electrical metallic tubing with galvanized boxes and hardware.

The enclosure shall be provided with a minimum of four, two per side, 120 volt, 20 amp, duplex grounded receptacles.

Interior AC/DC operated maintenance lights, controlled with a 1 hour wind-up timer switch shall be provided.

2-4.08. Crankcase Vent Blow-By Absorber. Suitable crankcase breather system shall be provided by the engine-generator manufacturer to remove oil mist from the crankcase emission prior to induction in to the air intake system. The system provided shall meet the applicable level emission requirements.

2-4.09. Engine-Generator Local Control Panel. The engine-generator unit shall have a control panel mounted inside the enclosure with panel mounted controls accessible when the enclosure doors are open. The panel shall be provided with vibration isolators to prevent damage to the instruments from engine-generator vibration.

Adequate clearance shall be provided between the panel and the engine to allow engine maintenance without moving the control panel.

The control panel shall be automatic and safety type and shall, at a minimum, include all items required by NFPA 110, Level 1. In addition, the control panel shall be provided with the following instrumentation and controls:

Tachometer.

Non-resettable hour meter.

AC voltmeter, AC ammeter, voltmeter/ammeter selector switch with "off" position.

Two normally open dry contacts which close when the engine is running and open with it is stopped.

Dry contact that closes for remote common alarm.

Dry contact that closes when the control selector switch is in "Auto" mode.

Three-position selector switch with "RUN-OFF-AUTO"

Indicating lights with common alarm for the following:

Sub-base tank low fuel level.

Sub-base tank leak detection.

Sub-base tank continuous reading level.

Dry contact for common fuel alarm.

Contacts for a remote two position maintain contact emergency shutdown switch.

The control panel shall be provided with a three-position selector switch with the following positions: "RUN-OFF-AUTO". In the "RUN" position, the engine starting sequence shall be initiated providing local control for maintenance, in the "AUTO" position, the engine-generator will be remotely started and stopped by a run contact from the Automatic Transfer Controller System.

2-4.10. Emergency Shutdown Control Station. A remotely located emergency shutdown control station shall be furnished under this section and connected to the engine-generator control panel. The control station when activated shall shutdown the engine generator regardless of the position of the "RUN-OFF-AUTO" selector switch. Control wiring between the control station and the engine-generator control panel shall be furnished by the installing Contractor.

2-4.11. Auxiliary Power Panelboard. The engine-generator unit shall have a 480-120/208 or 120/240 volt, dry-type, step-down transformer, sized by the manufacture, and 120/208 or 120/240 volt panelboard with main and branch circuit breakers rated as required. The panelboard enclosure shall have a Door-In-Door hinged trim cover. The panel board and transformer shall be mounted inside the enclosure and isolated from generator vibration.

The panelboard shall be provided with a main circuit breaker and branch circuit breakers that will power the required loads inside the enclosure as specified herein. A minimum of 4 spaces for future breakers shall be provided. The panel board shall be pre-wired to all engine-generator accessories.

The panel board shall supply power to the services including but not limited to the following:

- Engine-generator starting system battery charger.
- Enclosure lights and receptacles.
- Fuel System
- Enclosure intake and exhaust louvers/dampers.
- Engine jacket water heater.
- Alternator winding heater.
- Battery pad heater for starting batteries (if required).
- Local control panel.

The panelboard shall have an integral surge protection device rated for high exposure.

2-4.12. Generator Component Overcurrent and Differential Protection.

A generator line circuit breaker rated for the generator output voltage, having the trip rating indicated on the drawings, shall be provided on the output terminals. The line circuit breaker shall be pre-wired to the generator output terminals and shall be provided within the generator enclosure.

Overcurrent protection devices shall be provided as needed by the system design to protect generator rotor and excitation system components.

2-4.13. Limiting Dimensions. The engine-generator unit furnished shall be of a design that can be accommodated in the space available as specified herein and as shown on the Drawings.

2-4.14. Noise Emissions. The engine-generator unit, including the enclosure, louvered openings, and exhaust system, shall be designed to limit the noise emissions to not exceed the A-weighted sound pressure level of 75 dB (A) at 23 feet from any point of the engine-generator unit and shall meet all local noise requirement, whichever is more stringent, when operating at the specified capacity when operating alone, and when measured in accordance with industry standards such as but not limited to ANSI S12.18, ASME PTC 36, and ISO 8528-10.

2-5. SHOP PAINTING.

2-5.01. Engine-Generator. All steel and iron surfaces shall be protected by suitable coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, engine, alternator, enclosure, piping, and valves shall be shop primed and finish painted prior to shipment to the site.

Stainless steel, nonferrous, and nonmetallic surfaces shall not be painted.

2-5.02. Enclosure. The enclosure shall be thoroughly cleaned after assembly, etched, and shop painted, both interior and exterior surfaces. The enclosure shall be painted according to the manufacturer's standard practices with the interior receiving at least one coat of ANSI gray and the exterior paint thickness shall be 3 mils minimum. Paint colors shall be selected by the Owner.

2-6. SHOP TESTS. The manufacturer shall shop test the engine-generator with its local control panel, unit mounted radiator, and emissions control system to demonstrate that the equipment conforms to the specified requirements for load

capacity using a load bank at the specified frequency, voltage, phase and power factor.

All items included on the unit mounted local control panel shall be assembled, wired, and tested in the manufacturer's shop.

At a minimum the tests shall consist of repeated starts and stops, operation under a load bank at specified capacity frequency, voltage, phase, and power factor for a minimum of four continuous hour, and tests to demonstrate that each safety shutdown device is working properly.

Upon completion of all testing, Supplier shall submit certified copies of the shop test results prior to shipping the unit.

Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner. Supplier is responsible to provide two weeks' notice for testing.

2-7. OPERATION INSTRUCTION. Step-by-step instructions shall be furnished by the engine manufacturer. The instructions shall include, but not be limited to, the following procedures or information:

Startup of the unit.

Normal shutdown of the unit.

Emergency shutdown of the unit.

Normal operation of the unit, typical temperatures, pressures, speed, etc., for gauges and instruments which are displayed on the panel.

The operation instructions shall be submitted for review in accordance with the Submittals Procedures section. When the review is complete, the instruction sheets shall be printed on heavy paper or cardboard stock and laminated with clear plastic. Two copies of the laminated instructions shall be furnished. One copy shall be located or displayed at the control panel for the unit. The reserve copy shall be delivered to Owner. The instructions specified here are in addition to the operation and maintenance manuals required by the Submittals Procedures section.

2-8. AIR EMISSION PERMIT. Supplier shall be responsible for preparing and submitting air emission permits applications on behalf of the Owner to the local air quality authority for the unit being supplied base on the maximum number of operation hours and the guaranteed emissions.

The permit shall include provisions for the Owner to contact the local air quality authority to operate the unit in the event the permit hours may be exceeded due to unforeseen emergency conditions.

## PART 3 - EXECUTION

3-1. INSTALLATION. The engine-generator shall be installed by the Installation Contractor per the written instructions of the manufacturer as included in the shop drawing submittals. Additional requirements of the System Supplier are as specified herein.

The exposed finish shall be inspected after completing system installation, including pipe connections, fittings, valves, and specialties. Burrs, dirt, and construction debris shall be removed and any damaged finishes, including chips, scratches, and abrasions shall be repaired.

### 3-2. FIELD QUALITY CONTROL.

3-2.01. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the contract price.

3-3. FIELD TESTING. Manufacturer's field services shall be provided for field testing. All costs for these services shall be included in the contract price.

3-3.01. Performance Test. The unit shall be mechanically checked for proper operation. The alarm and safety shutdown shall be checked by artificially simulating an alarm condition. Defective equipment and controls disclosed by the tests shall be replaced or corrected, and the packages placed in satisfactory operating condition.

The engine-generator set shall be tested to demonstrate that the equipment conforms to specified requirements for capacity and starting duty and guaranteed air emissions.

The complete system (engine, generator, exhaust system, starting system, fuel system and sub-base fuel storage tank, and control panel) shall be field tested together by the manufacturer as a complete system to assure compatibility.

The unit test shall consist of repeated starts and stops, operation under a plant loads at the specified power factor rating for the duration of indicated below.

Before each of the following tests, the engine shall be brought to steady state condition as determined by the instrument readings:

- Successfully demonstrate four consecutive start, run and stop sequences of the unit without any alarm conditions.
- Demonstrate that each safety shutdown device is working properly.
- Four continuous hours at specified power rating and power factor within normal operating conditions of the unit without any alarm conditions. This period will also be used for any emissions testing as documented herein.
- Four starts of the specified electrical loads in the order listed without exceeding the maximum voltage drop allowance followed by 30 minutes of continuous operation per start within normal operating conditions of the unit without any alarm conditions.
- Four consecutive, successful transfers to and from utility power.
- Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service and observing proper operation of the system for at least two hours.  
Coordinate timing and obtain approval for start of test with site personnel

Contractor will furnish the fueling, lubricants and load bank for initial tests.

At the option of the Owner, an independent laboratory will be provided by the Owner for the exhaust gas sampling and analysis. Testing will be conducted during the load test when operating on diesel fuel. The laboratory analysis will be used for verification the unit meets the guaranteed emissions.

Any retesting or modifications to the equipment to meet the above requirements and emission guarantees shall be approved by the Engineer. All costs of modifications and retesting, including the independent laboratory for air emission testing, shall be at no cost to the Owner.

In addition to the required emission levels being monitored, the following items shall be measured, recorded at 15-minute intervals, and submitted in a field test report:

Outdoor ambient temperature.

kW output.

Engine speed, rpm.

Engine jacket water temperature.

Engine oil pressure.

Start time.

Completion time.

Test reports shall verify that the specified tests have been performed and shall state results. Test results shall be submitted as required in the Submittals Procedures section.

3-3.02. Field Sound Level Test. The installed equipment shall be tested for noise during the four-hour test. The measured engine-generator sound levels shall not exceed whichever sound level is more stringent between the sound level specified herein or the maximum local sound level allowed when the unit is operating. Compliance with the noise emission requirement shall be determined in accordance with industry standards including ASME PTC-36. Compliance shall be based on not exceeding the allowable sound pressure level including background sound corrections per Section 4-2.6 of ASME PTC-36 and excluding any correction for measurement uncertainties.

Any retesting or modifications to the equipment exhaust silencer or enclosure to meet the above requirements shall be approved by Engineer. All costs of modifications and retesting shall be at no cost to Owner.

Test reports shall verify that the specified tests have been performed in accordance with the referenced standards and shall state results. Test results shall be submitted as required in the Submittals Procedures section.

3-4. TRAINING. The manufacturer shall conduct on-site training to instruct Owner on operation and maintenance of each unit. The training shall be arranged and coordinated with Owner through the System Supplier. All costs for these services shall be included in the Contract Price.

The training program shall consist of two sessions with a minimum duration of 4hrs each session for a class size up to ten persons selected by Owner.

For each training session, approximately half the time should be spent in a classroom environment and the other half in a hands-on environment.

A detailed outline of the material to be covered during each training session and training materials are to be submitted to the Engineer at least one month before the start of training for review, comment, and approval. The equipment representative shall provide an adequate number of printed trainee materials for all persons being trained.

3-5. WARRANTY. The System Supplier shall guarantee that the all components of the system including the engine-generator, emissions control system, enclosure, control system, and all equipment specified herein and all ancillary

equipment, shall perform to the conditions specified herein or in the respective equipment section.

The guarantee period shall be five years after the date of Substantial Completion by the Installation Contractor. If within the guarantee period, any system component is found to be defective, the System Supplier shall promptly, without cost to the Owner, satisfactorily correct or repair such defective work. No deductibles should be allowed for travel time, service hours, repair cost, etc.

3-6. INITIAL TANK FILL. Upon satisfactory completion of all work, the Contractor shall fill the sub-base tank with the specified fuel.

End of Section

11910- Attachment A - Manufacturers Technical Fill-in Form

	<b>Parameter/Requirement</b>	<b>Supplier</b>
1	Manufacturer and model:	
1a	Engine	
1b	Alternator	
1c	Enclosure	
1d	Fuel Storage Tank (Type)	
1e	Silencer or Particulate Filter/Silencer	
2	Fuel consumption at rated capacity, gpm	
3	Ratings at specified conditions:	
3a	Engine (net horsepower)	
3b	Minimum power rating capacity with accessories, for the generator voltage output and service conditions specified herein.	
3c	Output voltage.	
3d	Output power factor.	
3e	Output phase and configuration.	
3f	Maximum engine speed, rpm	
3g	Engine minimum piston displacement, cu in	
3h	Factory emission certification when operating at full load	
4	Package:	
4a	Maximum outside length dimensions of the engine-generator package including air intake plenums and radiator discharge plenums but not including access platforms, in	
4b	Maximum outside width dimensions of the engine-generator package including air intake plenums but not including access platforms or stairs, in	
4c	Maximum overall height dimensions of the complete package including sub-base tank, engine-generator, and exhaust system, in	
4d	Is sub-base fuel storage tank a Fireguard type?	

	<b>Parameter/Requirement</b>	<b>Supplier</b>
4e	Sub-base fuel storage tank capacity, gal	
4f	Sub-base fuel storage tank dimensions (LxWxH), in	
4g	Maximum package wet weight including engine-generator, enclosure, ancillary equipment and fuel, lbs	
4h	Maximum enclosure rated wind velocity, mph	
5	Confirmation from the engine-generator manufacturer that the unit will provide the specified minimum kW rating at the specified design conditions and time duration including ambient temperature rise from all equipment located inside the enclosure.	
6	Confirmation NiCAD batteries are being supplied.	
7	Confirmation from the engine-generator manufacture confirming that the unit is in full compliance with federal EPA, State, and Local air emission requirements.	
8	Confirmation that the engine-generator unit, including the enclosure, louvered openings, and exhaust system will limit the noise to not exceed the specified decibel reading at the specified distance from any point from the enclosure when operating at the specified capacity and meet local noise requirements.	
9	Confirm compliance with the Meteorological and Seismic Design Criteria section.	
10	Spare Parts Being Provided (Quantity)	
10a	Air filter sets	
10b	Oil filter sets	
10c	Fuel filter sets	
10d	V-belts sets	
10e	Crankcase filter media sets	
10f	Additional Spare Parts	

## SECTION 13130 PRECAST CONCRETE BUILDING

### PART 1 - GENERAL

1-1. SCOPE. The precast concrete building shall be provided and erected as specified herein and as shown on the Drawings. The building shall be provided complete with fasteners, anchors, doors and frames, door hardware, fluid-applied roof coating, and all gasketing necessary for a weathertight enclosure.

Building HVAC equipment and electrical equipment (including lighting and outlets), painting are specified in other sections.

1-2. GENERAL. The Lift Station Electrical Building shall be erected on a slab-on-grade base as indicated on the Drawings. The building shall be suitable for housing of equipment shown on the Drawings and as indicated elsewhere in these documents. The buildings shall be designed, fabricated, erected, and equipped in accordance with all applicable codes, laws and regulations, and as specified herein. Wall openings for HVAC, electrical equipment, and architectural components shall be provided as necessary. Contractor shall confirm wall opening sizes and locations based on furnished equipment and coordinate these requirements with the building manufacturer prior to submitting shop drawings.

To ensure proper coordination, all building appurtenances shall be obtained and provided by the building manufacturer.

#### Design Requirements:

Building size shall be as specified herein and as shown on the Drawings. The building size shall be confirmed prior to manufacture based on the size of the electrical equipment to be provided. The overall building footprint shall be finalized prior to pouring the associated concrete floor slab.

Building shall be completely waterproof.

Building shall conform to the requirements of the 2020 Florida Building Code.

#### Building Dimensions:

10'-4" x 28'-4" minimum interior clear.

12'-0" minimum interior clear height.

Low slope tapered gable roof, minimum 1/4:12 slope with 4" minimum overhang on all four sides with integral drip edge.

A professional structural engineer, licensed to practice in the State of Florida, shall perform the structural design of the precast concrete building. The design shall include stamped drawings and calculations to confirm compliance with the requirements of these specifications and to obtain all required local approvals and permits.

1-3. SUBMITTALS. Complete shop drawings and product data shall be submitted in accordance with the Construction Schedule & Project Restraints section. Submittals shall include wall and roof design calculations stamped by a Florida structural PE, data on concrete mix design, and details on the method of attachment between slab/walls and walls/roof. Submittal shall include standard exterior finish options for selection by owner.

1-4. QUALITY ASSURANCE. Building provided shall be end product of one manufacturer.

Manufacturer Qualifications: Building shall be manufactured and erected by firm with minimum of 5 yrs experience in structures of size and character specified.

## PART 2 - PRODUCTS

2-1. PRECAST BUILDING. The building shall be a precast, reinforced concrete structure that is pre-assembled in the factory or field assembled. The building shall be manufactured with a mechanism for assembly under tension and shall be provided with joints to be caulked with a urethane sealant compound to maintain a permanent seal under severe weather conditions. All joints shall be finished and caulked, and concrete on the interior shall be smoothed to remove any projections.

Concrete shall be 5000 PSI minimum 28-day compressive strength, air-entrained. All inserts shall be bolted directly to form before casting panels. No floating-in of connection inserts shall be allowed.

Building shall be as manufactured by Easi-Set Industries, CXT Concrete Buildings; or approved equal.

2-1.01. Structural Design Criteria. The building shall be designed to meet the loading requirements of the 2020 Florida Building Code and ACI 318 "Building

Code Requirements for Reinforced Concrete". The minimum design loads shall be as follows:

- Roof Live Load: 20 psf (unreduced)
- Roof Dead Load – Actual, 50 psf minimum
- Wind Load (SEI/ASCE 7-10):
- Nominal Design Wind Speed,  $V_{ult}$ : 122 mph
- Ultimate Design Wind Speed,  $V_{asd}$ : 156 mph
- Exposure C
- Risk Category III

Walls shall be designed to support air conditioning equipment as specified or as shown on the Drawings.

2-1.02. Building Dimensions. The buildings dimensions shall be verified by the Contractor during construction with vendors of internal equipment provided and shall have minimum interior dimensions as specified herein.

2-1.03. Post-tensioning Strands. Roof shall be post-tensioned in field after keyway is filled and cured to required PSI strength. Post-tensioning cables shall be 41K polystrand CP50, 1/2 inch, 270 KSI, 7-wire strand, enclosed within a greased plastic sheath (ASTM A416).

2-1.04. Finish. The exterior walls shall have a skip trowel finish (similar appearance to stucco). Exterior color shall match adjacent Lift Station and shall be approved by the Owner. Interior walls shall have smooth finish and shall be field painted.

2-1.05. Roof. Roof panel shall have a minimum 1/4" per foot slope from peak to edge. The roof shall extend 4 inches beyond the wall panels and shall include a continuous drip edge.

2-1.06. Fluid Applied Roof Coating. The concrete roof shall receive a fluid applied deck after the building is fully erected on site. The fluid applied deck coating shall be Neogard "Elasta-Gard C Aliphatic" system or approved equal.

2-2. MISCELLANEOUS MATERIALS. The building shall be provided with flush aluminum doors and frames, door hardware, warning signage, and fire extinguisher as follows.

2-2.01. Doors. One double door and one single personnel door shall be provided conforming to the following requirements:

Double Door Size	Pair of 3'-0" x 7'-0" doors with 1'-4" removable
------------------	--

	transom, 2-inch frame @ jambs/head (rough opening of 6'-4" x 8'-8").
Single Door Size	3'-0" x 7'-0", 2-inch frame @ jambs/head (rough opening 3'-4" x 7'-2").
Flush Aluminum Door Construction	As specified in Section 08410 Flush Aluminum Doors and Frames.
Door Hardware	As specified in Section 08700 Finish Hardware.

2-2.03. Signage. A "DANGER, HIGH VOLTAGE, KEEP OUT" sign shall be provided at each personnel door.

2-2.04. Fire Extinguisher. One portable Class C fire extinguisher shall be provided and installed on the interior wall adjacent to the double door. The fire extinguisher shall have a 10-pound capacity and shall be surface mounted. The fire extinguisher shall be mounted 42-inches above the finish floor and shall include wall lettering to identify the location.

2-2.05. ELECTRICAL POWER & LIGHTING: Engineer, design, and furnish electrical system compatible with applicable electrical details on drawing and NFPA 70, the National Electrical Code. Except as noted on drawing electrical system shall also comply with the following:

- a. General interior LED lighting: minimum of 50 fc at the workplane, 30" above finished floor.
- b. Emergency LED interior lighting: self-contained unit with battery back-up for 1 ½ hours of service when fully charged.
- c. Outdoor lighting and receptacles installed on the outside walls of the building as shown on the Drawings.
- d. Provide 15 amp duplex convenience receptacles around room perimeter.

### PART 3 - EXECUTION

3-1. COORDINATION. Prior to delivery of the building, the base and floor shall be prepared by the Contractor as indicated on the Drawings. All conduits shall be installed and extended to a minimum of 12 inches above the finish floor elevation.

Contractor shall coordinate construction of slab, delivery of building, and erection of building with manufacturer.

3-2. SHOP INSPECTION. The owner may, at their option, visit the shop to observe/inspect building casting and fabrications. The Contractor shall notify the owner a minimum of two weeks in advance of casting. The building manufacturer shall provide convenient access to the location of the work and shall cooperate to facilitate inspections.

Any inspections at the site of fabrication required by regulatory agencies for permitting shall be included at the cost of the Contractor.

3-3. INSTALLATION. Building shall be set level. Panels shall be fastened together with 1/4 inch thick (minimum) 304 stainless steel brackets to meet loading requirements. Panel fasteners shall be 1/2 inch diameter (minimum), 304 stainless steel. Wall panels shall be connected to floor slab with stainless steel adhesive anchors with quantity, diameter and embedment depth to meet loading criteria.

3-3.01. Panel Joints. All joints between panels shall be caulked on the exterior and interior surface of the joints in accordance with the Joint Sealants section.

3-3.02. Roof Joints. Grout in keyways shall be polymer concrete placed after coating keyway with methyl methacrylate resin and isocyanate resin. Top of keyway to be coated with primer followed by one coat of polymeric joint sealant, followed by a fiberglass resin fabric and a second coat of polymeric joint sealant.

End of Section

## SECTION 13350A WET WELL CLEANING

### PART 1 GENERAL

#### 1.01 SCOPE

##### A. Description

The Contractor shall provide the necessary labor and equipment for the removal of waste generated from Sanitary Sewage Lift Station Wet Wells. Cleaning of the sewer wet wells will be conducted at the direction of the County.

##### B. Work Included

The successful bidder will provide services for the “total elimination” of the waste within the wet well. Cleaning shall include stopping the flow into the station, the physical removal of all floating material, grease/oil, organic compounds, bottom sediment, grit, and materials that have collected on the walls, floor, and all other extraneous materials within said wet wells, are cleaned from the lift station structure and all items within. Vacuum Trucks with the ability to remove the sludge, dirt, grease, etc. from the interior walls and bottom of the wet well.

#### 1.02 EQUIPMENT

- A. All cleaning machines must be capable of efficient, reliable operation. A high-pressure water washing or wet abrasive sand blasting, use 3500-psi water pressure, minimum. Remove dirt, oil, loose concrete, any previously applied coatings (except liners) or other deleterious materials.

#### 1.03 CLEANING

- A. Continue the cleaning procedures using pressure washing and/or mechanical methods until a uniform and sound profile is obtained. All contractors shall be expected to have and make available extension equipment on an as needed basis in order to properly clean deeper basins. Actual operation of equipment may need to be witnessed/verified by the inspector upon and prior to awarding a purchase order for this requirement.
- B. The Removal and Disposal of all material from the Wet Wells is the responsibility of the Contractor. The cost for this shall be included in the bid price. No dumping or stock piling of these materials will be allowed at any of the lift stations.
- C. The Contractor is fully responsible for compliance with all Federal, State, and local laws, including but not limited to the OSHA Confined Space Entry regulations.
- D. Existing liner, control floats and/or pressure transmitters located in each wet well must be protected from damage by the Contractor during his/her operations. Any damage done to the liner, floats and/or pressure transmitters must be immediately

repaired by the Contractor at his/her expense.

- E. Some of the wet wells are configured to allow for direct vertical access; some will require flexible suction lines and/or bends. The Contractor must remove and replace grating in the wet wells to allow for complete and total access to all areas of the wet wells for the removal of grease, grit, and other material. No additional compensation will be allowed for special piping, rigging, etc. required to complete the work.
- F. See plans for the approximate dimensions of each wet well.
- G. Each lift pump station is considered to be a locked, secure facility. Access will need to be arranged through the Wastewater Superintendent accordingly.
- H. The Contractor, at his/her sole risk, may store his/her equipment at the lift stations during the project. Insurance for said equipment will be the responsibility of the contractor/equipment owner.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 13500 INSTRUMENTATION AND CONTROL SYSTEM

### PART 1 – GENERAL

1-1. SCOPE. This section covers the furnishing and installation of the instrumentation and control system modifications to OWNER's existing 39A Master Lift Station (MLS):

Principal components of the instrumentation for the MLS are shown on plans or specified under associated sections of Division 13. The MLS utilizes an existing Dataflow Systems (DFS) RTU for monitoring and control of the MLS pumps, monitoring MLS instrumentation, and communicating via an existing radio system to the SCADA master. The existing DFS RTU shall be abandoned. A new RTU shall be provided and shall be based upon the Southeast Master Liftstation 677. Existing wiring shall be investigated and verified to field devices and connected to replacement pump drives and MLS instrumentation including standby engine-generator and Automatic Transfer Switch as shown on plans. The Contractor shall allocate sufficient time to accomplish these tasks. The quality standards and acceptable suppliers of field instruments, control system components, control panels, and construction standards for assembly and wiring of the control panels associated with the DFS controls and SCADA monitoring of the MLS shall comply with the requirements of 13500 and associated sections listed under 13500-1-1.02.

Modifications to OWNER's new RTU and existing SCADA system at the central site shall be by OWNER or OWNER's designated supplier.

1-1.01. Associated Sections. This section also includes the equipment and services specified in the following sections.

Section 13563	PRESSURE AND LEVEL INSTRUMENTS
Section 13540	MAS RADIO EQUIPMENT
Section 13570	PANELS, CONSOLES AND APPURTENANCES

1-2. GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the

requirements specified herein shall take precedence.

1-2.02. Drawings. The Drawings indicate general locations and arrangements of equipment and may include installation details and block and one-line diagrams showing connections and interfaces with other equipment.

1-2.03. Codes, Permits and Agency Approvals. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Where mandated by codes, panels, assemblies, materials, and equipment shall be listed by Underwriters' Laboratories. Contractor shall, as part of their work, arrange for and obtain all necessary permits, inspections, and approvals by the authorities having local jurisdiction of such work. This shall include any third-party inspections and testing of panels and equipment.

1-2.04. Supplier's Qualifications. Equipment and software furnished under this section and under other related sections listed in the Scope paragraph above shall be designed, coordinated, and supplied by a single manufacturer or supplier, hereinafter referred to as the System Supplier. The System Supplier shall be regularly engaged in the business of supplying computer-based monitoring, control, and data acquisition systems. The Contractor shall utilize the services of the System Supplier to coordinate the control system modifications related to the new RTU panel. The System Supplier shall check-out and calibrate instruments, and to perform all testing, training, and startup activities specified to be provided. The Owner or Owner's supplier is responsible for any modifications to the central site.

The System Supplier shall have the following minimum qualifications:

- The supplier shall maintain a design office staffed with qualified technical design personnel.
- The supplier shall maintain competent and experienced service personnel to service the hardware and software furnished for this project.
- The supplier shall have as a minimum 5 years of experience in the design, coordination and supply of computer-based monitoring, control, and data acquisition systems.

1-2.05. Coordination. Systems supplied under this section shall be designed and coordinated by the System Supplier for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications, under other contracts, and, where applicable, with related existing equipment. A meeting shall be held prior to commencement of the work to ensure that coordination between the System Supplier, Contractor and Owner to discuss all of the aspects of the work. All equipment shall be designed and installed in full conformity with the Drawings, specifications, engineering data, instructions, and

recommendations of the manufacturer, and the manufacturer of the related equipment.

1-2.06. Related Equipment and Materials. Related equipment and materials may include, but will not be limited to, instrumentation, motor controllers, valve actuators, chemical feeders, analytical measuring devices, conduit, cable, and piping as described in other sections or furnished under other contracts.

1-2.07. Device Tag Numbering System. All new devices shall be provided with permanent identification tags. The tag numbers shall agree with System Supplier's equipment drawings and shall be as close as practical to the tag numbers used on the Drawings and device schedules. All new field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered or tape labels will not be acceptable.

1-3. GENERAL REQUIREMENTS. The drawings and specifications indicate the extent and general arrangement of the systems. If any departures from the Drawings or Specifications are deemed necessary by System Supplier, details of such departures and the reasons shall be submitted to Engineer for review with or before the first stage submittal. No departures shall be made without prior written acceptance.

The specifications describe the minimum requirements for hardware and any software. Where System Supplier's standard configuration includes additional items of equipment or software features not specifically described herein, such equipment or features shall be furnished as a part of the system and shall be warranted as specified herein.

1-3.01. Governing Standards. Equipment furnished under this section shall be designed, constructed, and tested in accordance with IEEE 519, ANSI C37.90, FCC Part 15 - Class A, and NEMA ICS-1-109.60.

1-3.02. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values. The System Supplier shall review the Drawings and make any modifications requisite for proper installation subject to acceptance by Engineer. At least three feet of clear access space shall be provided in front of all instrumentation and control system components.

1-3.03. Workmanship and Materials. System Supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except for testing.

1-3.04. Corrosive Fluids. All parts which are exposed to corrosive conditions shall be made from corrosion resistant materials. System Supplier shall submit certification that the instrument manufacturer approves the selection of materials of primary elements that are in contact with the specified process fluid to be inert to the effects of the process fluid.

1-3.05. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation devices shall be furnished as needed for proper performance of the equipment.

1-3.06. Programming Devices. A programming or system-configuring device shall be provided for systems that contain any equipment that requires such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete, newly purchased for this project, and shall be in like-new condition when turned over to Owner at completion of startup.

1-4. SUBMITTALS. Complete dimensional, assembly, and installation drawings, wiring and schematic diagrams; and details, specifications, and data covering the materials used and the parts, devices and accessories forming a part of the system furnished, shall be submitted in accordance with the submittals section.

1-5. PREPARATION FOR SHIPMENT. All electronic equipment and instruments shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements, shall be kept dry at all times, and shall not be exposed to adverse ambient conditions.

Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted surfaces that are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

Each shipment shall include an appropriate shipping list that indicates the contents of the package, including the specific instrument tags. The shipping list shall be accessible without exposing the instruments to the atmosphere. The shipping list shall also contain any cautionary notes regarding storage of the instruments, including requirements to protect the instrument from static discharge,

desensitizing chemicals (solvents, paints, etc.), or ambient atmospheric conditions.

Individual instruments shall be appropriately tagged or labeled to positively identify the device. All identification shall be visible without the need to unpack the instrument from its protective packaging.

Instrument shipment and storage requirements shall be coordinated with Engineer or Owner prior to shipment. System Supplier shall provide adequate storage and be ready to accept the shipment before shipping any equipment to the site. Additional shipping and storage requirements shall be as detailed in the individual instrument specifications.

Components which are shipped loose due to transportation limitations shall be assembled and disassembled by the manufacturer prior to shipment to assure that all components fit together and are adequately supported.

1-6. DELIVERY, STORAGE, AND SHIPPING. Shipping shall be in accordance with the Special Project Procedures section. Handling and storage shall be in accordance with the Storage and Protection section.

1-7. SPARE PARTS. Not Used.

## PART 2 - PRODUCTS

2-1. GENERAL REQUIREMENTS. All equipment furnished under each section referenced in SCOPE is a part of this section and shall be selected by System Supplier for its superior quality and intended performance. Equipment and materials used shall be subject to review.

2-1.01. Standard Products. The systems furnished shall be standard products. Where two or more units of the same type of equipment are supplied, they shall be the products of the same manufacturer; however, all components of the systems furnished hereunder need not be the products of one manufacturer unless specified herein.

To the extent possible, instruments used for similar types of functions and services shall be of the same brand and model line. Similar components of different instruments shall be the products of the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. The design of the systems furnished hereunder shall utilize concepts, techniques and features that

provide maximum reliability and ease of maintenance and repair. The systems shall include board-level devices such as light emitting diodes or other indicators to facilitate quick diagnosis and repair. Diagnostic software shall be furnished to facilitate system-level troubleshooting.

2-2.01. Factory Assembly. Equipment shall be shipped completely factory assembled, except where its physical size, arrangement, configuration, or shipping and handling limitations make the shipment of completely assembled units impracticable.

2-3. POWER SUPPLY AND INSTRUMENT SIGNAL. Power supply to all control system equipment will be 120 volts, 60 Hz, single phase. System Supplier shall be responsible for distribution of power among enclosures, consoles, peripherals, and other components of the system from the power supply source indicated on the Drawings. Power distribution hardware shall include cables and branch circuit overcurrent protection installed in accordance with the electrical section.

Facility power is 480VAC 3 phase AC. Unless otherwise indicated, power supply to the instrumentation will be unregulated 120 volts AC and 480 VAC 3 phase for operation of 3 phase motors. Unless otherwise indicated, all transmitted electronic analog instrument signals shall be 4-20 mA dc and shall be linear with the measured variable.

2-3.01. Facility Distribution System. Equipment not indicated to be powered from an uninterruptible power source shall be suitable for being supplied from the facility distribution system and shall be capable of withstanding voltage variations of  $\pm 10$  percent and harmonics up to the limits of IEEE 519 without affecting operation. System Supplier shall provide voltage conditioning or filtering equipment if necessary to meet the requirements specified.

2-3.02. Power Supplies. Power supplies for voltages other than those listed above shall be an integral part of the equipment furnished. Internal power supplies shall be regulated, current limiting, and self-protected.

2-3.03. Surge Withstand. All equipment shall meet all surge withstand capability tests as defined in ANSI C37.90 without damage to the equipment.

2-4. SERVICE CONDITIONS AND ENVIRONMENTAL REQUIREMENTS. The equipment provided for the instrumentation and control system shall be suitable for the service conditions specified in the attached equipment sections.

All equipment shall be designed and selected to operate without degradation in performance throughout the environmental extremes specified. Equipment shall be designed to prevent the generation of electromagnetic and radio frequency

interference and shall be in compliance with FCC Rules and Regulations, Part 15, for Class A computing devices.

2-4.01. Ambient Temperature and Elevation. All equipment located outdoors shall be suitable for operation in an ambient temperature range -20°C to 60°C and a relative humidity of 5 to 100 percent. Heaters and air conditioning/cooling equipment and sun shields shall be provided where essential to maintain equipment within its manufacturer-recommended operating ranges.

All equipment and instruments shall be designed to operate at the site elevation of 86      ft.

2-4.02. Deleterious Effects. All system equipment will be installed in areas without anti-static floor construction and without any provisions for control of particulates or corrosive gases. System Supplier shall furnish any additional air cleaning equipment, anti-static chair pads, or other protective measures necessary for proper operation of the system.

All input/output hardware shall meet or exceed, without false operation, all requirements of NEMA ICS-1-109.60, Electrical Noise Tests.

2-4.03. Noise Level. Not Applicable.

2-4.04. Lightning Protection. In addition to other environmental protection specified herein, the entire system shall be provided with lightning protection. Lightning protection measures shall include the following.

2-4.04.01. Grounding. All major components of the system shall have a low resistance ground connection. Grounding system provisions indicated on the Drawings shall be modified as recommended by System Supplier.

2-4.04.02. Surge Suppressors. Surge and lightning suppressors shall be non-faulting, non-interrupting, and shall protect against line-to-line and line-to-ground surges. Devices shall be solid-state metal oxide varistor (MOV) or silicon junction type, with a response time of less than 50 nanoseconds. Surge protective devices shall be applied for the following:

- a. All 120 VAC power connections to PLCs, instruments, and control equipment. Surge arresters shall be Transtector “ACP-100-HW Series”, Power Integrity Corporation “ZTA Series”, Phoenix Contact “Mains PlugTrab”, or MCG Surge Protection “400 Series”.

2-5. SOFTWARE DOCUMENTATION. System Supplier shall furnish complete documentation on all software required for instrumentation configuration. Software documentation shall consist of the following principal items.

- a. One backup set of any integrated circuit or solid-state memory-based plug-in firmware used.
- b. Three sets of printed as-built reference documentation for any special software provided specifically for this contract.

2-6. SOFTWARE LICENSE. Not Applicable.

2-7. INSTALLATION TEST EQUIPMENT. All necessary testing equipment for calibration and checking of system components shall be provided by System Supplier. System Supplier shall also furnish calibration and maintenance records for all testing and calibration equipment used on the site if requested by Engineer.

2-8. PROGRAMMING DEVICES. The System Supplier shall provide any required special programming devices and cables for configuration of field instruments. The Owner shall utilize their own programming devices for configuration of the new DFS RTU.

2-9. PROGRAMMING SOFTWARE. The System Supplier shall utilize their own programming software for configuration of field instrumentation.

### PART 3 – EXECUTION

3-1. INSTALLATION REQUIREMENTS. The installation of equipment furnished hereunder shall be by the Contractor or their assigned subcontractors.

3-1.01. Field Wiring. Field wiring materials and installation shall be in accordance with the electrical section.

3-1.02. Salvage of Existing Equipment. Not used.

3-2. SYSTEM SOFTWARE CONFIGURATION. System software required for startup and any modifications to the DFS RTU shall be by OWNER or OWNER's designated supplier.

3-3. SYSTEMS CHECK. The System Supplier shall provide the services of a trained and experienced field supervisor to assist the installation contractor during installation, and to calibrate, test, and advise others of the procedures for installation, adjustment, and operation.

3-3.01. Field Manager. Not used.

3-3.02. Field Inspection at Delivery. The field supervisor shall inspect major equipment items within five working days of delivery, to assure that the equipment was not damaged during shipment and shall supervise or assist with unpacking, initial placement, and initial wiring of the system.

3-3.03. Field Calibration of Instruments. After each instrument has been installed, a technical representative of System Supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final settings. The adjustments of calibrated instruments shall be sealed or marked, insofar as possible, to discourage tampering. Instrument calibration shall be done before checkout of the system operation. A typical instrument calibration report is attached to the end of this section.

3-3.04. Training for Installation Personnel. Not Used.

3-3.05. Field Inspection Prior to Start Up. After installation and wiring connections are complete, the field supervisor, with additional System Supplier's personnel, and in coordination with the Owner at the central site, shall verify at the central site that each external connection to the system is correctly wired and field process components and devices are functioning as intended.

3-3.05.01. Analog Signals. Analog input signals shall be simulated at the transmitting source, and verified to be received at the proper register address in the control system. Analog outputs shall be generated at the control system, and verified to be received with the correct polarity, at the respective receiving device.

3-3.05.02. Discrete Signals. Discrete input and output signals shall be simulated and verified that they are received at the respective receiving device, and at the proper voltage.

3-3.05.03. Devices by Other Suppliers. If interrelated devices furnished by other suppliers, under other contracts, or by Owner, such as valve actuators, motor controls, chemical feeders, and instruments, do not perform properly at the time of system checkout, the field supervisor shall use suitable test equipment to introduce simulated signals to and/or measure signals from these devices to locate the sources of trouble or malfunction.

3-3.05.04. System Check Out Report. The System Supplier shall submit a written report on the results of such tests to Engineer. Additional documentation shall be furnished as requested by Engineer to establish responsibility for corrective measures. System Supplier shall verify, in writing, to Engineer or Owner that System Supplier has successfully completed the external connection check before beginning system startup or field acceptance testing.

3-3.06. Start Up Assistance. After the field supervisor has completed the system check and submitted his report, System Supplier shall supply factory-trained personnel to provide on-site start up assistance. During the startup period, these personnel shall thoroughly check all equipment, correct any deficiencies, and verify the proper operation of all components.

3-4. TESTING. The system shall be acceptance tested on site.

System Supplier shall perform start-up and on site testing in accordance with requirements outlined below.

3-4.01. Factory Acceptance Testing. Not Used.

3-4.02. Site Acceptance Testing. After installation and checkout by System Supplier's personnel, the system shall be subjected to an acceptance test.

Site acceptance testing shall be scheduled after receipt of the System Check Out Report.

3-5. TRAINING. Not Required.

End of Section

INSTRUMENT NAME & SERVICE:		
BRAND & MODEL NO.:		
TAG OR LOOP NO.:		
INPUT/OUTPUT RANGE:		
INPUT	ACTUAL OUTPUT	DESIRED OUTPUT
PROPORTIONAL BAND:		
RESET:		
POSITION OF SWITCHES, JUMPERS, ETC.		
COMMENTS:		
DATE OF CALIBRATION: CALIBRATED BY:		
<b>Black &amp; Veatch</b>	INSTRUMENT CALIBRATION REPORT	Figure 1-13500

Manatee County, FL  
Master Lift Station 39A Improvements

13500  
1

100% Submittal  
September, 2022

ISSUED FOR BID

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**INSTRUMENT DEVICE SCHEDULE**

**Item No.** This is an arbitrary sequential number which is for reference only.  
**System.** Contains the system code assigned to each instrument/device. System code abbreviations are found on legend sheet I-002  
**Type.** This is the ISA (or similar) alpha tag representing the function of the instrument.  
**Loop Number.** This is the numeric (or alphanumeric) loop designation for the instrument.  
**Service Description.** This is the description of the instrument service (i.e. Filter No. 1 Loss-of-Head).  
**Device Type and Size.** This is the instrument device type and should match the description as listed in the specification. A size is given if applicable (e.g., flow meters)  
**Output Type.** This generally will be '4-20 mA' or 'Dry Contact'. It could also be a serial output for smart devices (such as HART or FIELD-BUS) but only if the serial output is the primary I/O  
**Output Range.** This is the calibrated range for analog devices or the trip point(s) for discrete devices.  
**Power Type.** This will typically be '2-wire' for devices which are loop powered from the PLC enclosure, or '4-wire' for devices which are powered from external power  
**P&ID DWG.** This is the drawing number of the P&ID where the device is shown.  
**Spec.** The provider for the specification section listed is responsible for supplying the device.  
**Remarks.** This column may include a cross reference to another specification section where applicable or to a note which provides additional information.

Item No.	System	Type	Loop Number	Service Description	Device Type	Size	Output_Type	Output_Range	Power_Type	P&ID DWG	Specification	Remarks
1	MLS	HS	101	WET WELL PUMP NO.1 LOCK-OUT SWITCH	2 POSITION PUSH-PULL SWITCH	N/A	DRY CONTACT	N/A	N/A	I-04	16050	
2	MLS	HS	102	WET WELL PUMP NO.2 LOCK-OUT SWITCH	2 POSITION PUSH-PULL SWITCH	N/A	DRY CONTACT	N/A	N/A	I-04	16050	
3	MLS	HS	103	WET WELL PUMP NO.3 LOCK-OUT SWITCH	2 POSITION PUSH-PULL SWITCH	N/A	DRY CONTACT	N/A	N/A	I-04	16050	
4	MLS	LIT	100	WET WELL 1 LEVEL	BUBBLER TRANSMITTER	TBC	4-20 mA	TBC	4-WIRE	I-04		EXISTING
5	MLS	LSH	100	WET WELL 1 LEVEL HIGH	FLOAT LEVEL SWITCH	TBC	DRY CONTACT	TBC	N/A	I-04		EXISTING
6	MLS	LSL	100	WET WELL 1 LEVEL LOW	FLOAT LEVEL SWITCH	TBC	DRY CONTACT	TBC	N/A	I-04		EXISTING
7	MLS	LSH	101	WET WELL 2 LEVEL HIGH	FLOAT LEVEL SWITCH	TBC	DRY CONTACT	TBC	N/A	I-04		EXISTING
8	MLS	LSL	101	WET WELL 2 LEVEL LOW	FLOAT LEVEL SWITCH	TBC	DRY CONTACT	TBC	N/A	I-04		EXISTING
9	MLS	FE	100	WET WELL PUMP STATION DISCHARGE HEADER FLOW	ELECTROMAGETIC FLOWMETER FLOW ELEMENT	TBC	N/A	TBC	N/A	I-04		EXISTING
10	MLS	FIT	100	WET WELL PUMP STATION DISCHARGE HEADER FLOW	ELECTROMAGETIC FLOWMETER FLOW TRANSMITTER	N/A	4-20 mA	TBC	4-WIRE	I-04		EXISTING
11	MLS	LSH	102	WET WELL PUMP STATION SUMP LEVEL HIGH	FLOAT LEVEL SWITCH	TBC	DRY CONTACT	TBC	N/A	I-04		EXISTING
12	MLS	PIT	100	WET WELL PUMP STATION PRESSURE	PRESSURE TRANSMITTER	N/A	4-20 mA	TBC	2-WIRE	I-04		EXISTING
13	MLS	PIT	100	WET WELL PUMP STATION PRESSURE	PRESSURE GAUGE	N/A	N/A	0-100 PSI	N/A	I-04	13563	
14	MLS	HS	401	ENGINE GENERATOR EMERGENCY SHUTDOWN SWITCH	2 POSITION PUSH-PULL SWITCH	N/A	DRY CONTACT	TBD	N/A	I-05	16050	
15	EG	LE	401	ENGINE GENERATOR DAY TANK LEVEL	LEVEL SENSOR	TBC	N/A	TBC	N/A	I-05	11911	
16	EG	LIT	401	ENGINE GENERATOR DAY TANK LEVEL	LEVEL TRANSMITTER	TBC	4-20 mA	TBC	4-WIRE	I-05	11911	

## SECTION 13350A WET WELL CLEANING

### PART 1 GENERAL

#### 1.01 SCOPE

##### A. Description

The Contractor shall provide the necessary labor and equipment for the removal of waste generated from Sanitary Sewage Lift Station Wet Wells. Cleaning of the sewer wet wells will be conducted at the direction of the County.

##### B. Work Included

The successful bidder will provide services for the “total elimination” of the waste within the wet well. Cleaning shall include stopping the flow into the station, the physical removal of all floating material, grease/oil, organic compounds, bottom sediment, grit, and materials that have collected on the walls, floor, and all other extraneous materials within said wet wells, are cleaned from the lift station structure and all items within. Vacuum Trucks with the ability to remove the sludge, dirt, grease, etc. from the interior walls and bottom of the wet well.

#### 1.02 EQUIPMENT

- A. All cleaning machines must be capable of efficient, reliable operation. A high-pressure water washing or wet abrasive sand blasting, use 3500-psi water pressure, minimum. Remove dirt, oil, loose concrete, any previously applied coatings (except liners) or other deleterious materials.

#### 1.03 CLEANING

- A. Continue the cleaning procedures using pressure washing and/or mechanical methods until a uniform and sound profile is obtained. All contractors shall be expected to have and make available extension equipment on an as needed basis in order to properly clean deeper basins. Actual operation of equipment may need to be witnessed/verified by the inspector upon and prior to awarding a purchase order for this requirement.
- B. The Removal and Disposal of all material from the Wet Wells is the responsibility of the Contractor. The cost for this shall be included in the bid price. No dumping or stock piling of these materials will be allowed at any of the lift stations.
- C. The Contractor is fully responsible for compliance with all Federal, State, and local laws, including but not limited to the OSHA Confined Space Entry regulations.
- D. Existing liner, control floats and/or pressure transmitters located in each wet well must be protected from damage by the Contractor during his/her operations. Any damage done to the liner, floats and/or pressure transmitters must be immediately

repaired by the Contractor at his/her expense.

- E. Some of the wet wells are configured to allow for direct vertical access; some will require flexible suction lines and/or bends. The Contractor must remove and replace grating in the wet wells to allow for complete and total access to all areas of the wet wells for the removal of grease, grit, and other material. No additional compensation will be allowed for special piping, rigging, etc. required to complete the work.
- F. See plans for the approximate dimensions of each wet well.
- G. Each lift pump station is considered to be a locked, secure facility. Access will need to be arranged through the Wastewater Superintendent accordingly.
- H. The Contractor, at his/her sole risk, may store his/her equipment at the lift stations during the project. Insurance for said equipment will be the responsibility of the contractor/equipment owner.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 13540 MULTIPLE ADDRESS RADIO EQUIPMENT

### PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of radio communication equipment for the Instrumentation and Control System. Radio equipment shall operate in conjunction with field devices such as Owner's existing DataFlow Systems (DFS) HyperTac central equipment and new RTU etc., as described elsewhere in these Specifications. The new radio equipment shall be provided as part of the new RTU and shall be connected to existing tower mounted antenna via replacement coaxial RF cabling.

1-1.02. Control System. The Instrumentation and Control System section shall apply to all equipment furnished under this section.

1-2. GENERAL. Equipment furnished and under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-2.02. Drawings. Supplementing this section, the Drawings show the cable and mounting details. All hardware, including power supplies, special cables, and other appurtenant equipment, shall be provided to meet the functional requirements described herein and indicated on the Drawings.

1-2.03. Accessories. System Supplier shall provide all necessary cabling, and hardware for a complete operational radio system.

1-3. SUBMITTALS. Submittals shall be as specified in the Instrumentation and Control System section.

1-4. DELIVERY, STORAGE, AND SHIPPING. Delivery, storage and shipping shall be as specified in the Instrumentation and Control System section.

### PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. Radios and accessories shall be suitable for installation in enclosures and for environmental conditions as follows.

2-2. SPREAD SPECTRUM RADIO – Serial Communications. Not used.

2-3. SPREAD SPECTRUM RADIO – Ethernet Communications. Not used.

2-4. MAS RADIO. The existing radio network will be utilized. The new radio is part of the TCU pump controller provided by Section 15500.

2-5. SURGE SUPPRESSION. System Supplier shall provide an in-line surge suppressor on antenna cables at each radio site to protect the radio equipment from damage by lightning. Surge suppressors shall be Polyphaser Series IS-B50LN-C2 or equal.

Two lengths of super-flexible Heliac cable shall be supplied for each surge suppressor; one for the connection between surge suppressor and radio antenna port, and one for the connection between the coaxial transmission cable (1/2 inch and larger) and the antenna. The cable shall be terminated with standard N type connectors. The cable shall be Andrew Super-flexible Heliac 1/4 inch Type FSS1-50A.

2-6. ANTENNA CABLE. All cabling between antennas and radio transceivers shall utilize a splice-free foam dielectric coaxial cable cut to length. Foam dielectric coaxial cable shall consist of an inner conductor surrounded by a foam dielectric, a corrugated outer conductor surrounding the dielectric, and a polyethylene jacket. The installation shall use self-flaring connectors specifically designed for use with the cable. The antenna cable shall be grounded as indicated in the Drawings.

All foam dielectric coaxial cable for all antenna locations shall be Andrew 1/2 inch Heliac, "Type LDF4-50A."

2-7. ANTENNAS.

2-7.03. Wooden Poles. Not used

2-7.04. Radio Towers. The existing radio tower shall be reused.

2-7.05. Radio Masts. Not used.

2-7.06. Grounding Conductors. All ground conductors shall be soft drawn copper cable or bar, not smaller than 12 AWG, bare or green insulated in accordance with the National Electrical Code.

2-7.07. Ground Rods. Ground rods not described elsewhere shall be 5/8 inch diameter by 8 feet long, with a copper jacket bonded to a steel core.

## PART 3 - EXECUTION

3-1. GENERAL INSTALLATION REQUIREMENTS. General installation requirements are described in Section 13500.

3-1.01. Radio Equipment. The new radio equipment supplied with the new RTU equipment shall be connected to existing antenna via replacement RF cabling.

3-1.02. Surge Suppressor Installation. New RF cabling shall be terminated to the new DFS RTU RF surge suppressor

3-1.03. Installation of Grounding Materials. Electrical system grounding and equipment grounding shall be in compliance with the National Electrical Code.

End of Section

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INPUT/OUTPUT LIST

**Item No.** This is an arbitrary sequential number which is for reference only.

**IO Type:** This is the type of I/O signal, as follows:

- AI = Analog Input
- AO = Analog Output
- DI = Discrete Input
- DO = Discrete Output
- PI = Pulse Input (totalizer or accumulator type input)

**Type.** This describes the type of signal as defined by ISA or similar.

**Loop Number.** This is the loop number as shown on the P&ID drawing.

**Service Description.** This is the description or the function (i.e. Filter No. 1 Loss-of-Head).

**Field Device.** This is the tag number of equipment identifier associated with the I/O point.

**Controller ID.** This is a sequential number for a given type within a specific controller (PLC or DCU).

**Analog Data (Signal Type).** This will typically be 4-20mA, but could also be 1-5Vdc, serial, HART, FIELDBUS, or similar to indicate the signal type of the associated input or output.

**Analog Data (Signal Range).** This will be the scaled value of the input in engineering units.

**Analog Data (Power Type).** This will typically be '2-wire' for devices which are loop powered from the PLC enclosure, or '4-wire' for devices which are powered from external power supplies, unless noted otherwise.

**Discrete Data (Signal Type).** This will be 24VDC or 120VAC, ETHERNET, or similar to indicate the signal type of the associated input or output.

**Discrete Data (Closed State).** This will indicate the state of the input or output when it is considered to be closed or energized (normal, alarm, running, failed, etc.).

**Discrete Data (Power Source).** This will indicate the location of the power source for the wetting voltage on the contacts, as follows:

- Field = External field power source. (May require interposing relays or isolated I/O module type.)
- Local = Power originates from within the PLC or I/O enclosure.

**Discrete Data (Interp Relay).** This will be either 'Yes' or 'No' to indicate whether the input or output requires an interposing relay. Relays are typically required to isolate external voltage sources. See specifications for additional details.

**DWG Name.** This column indicates associated Process & Instrumentation Diagram.

**Remarks.** This column may include a cross reference to another specification section where applicable, or to a note which provides additional information

Item No.	IO Type	Type	Loop Number	Service Description	Field Device	Controller ID	Analog Signal Type	Analog Signal Range	Analog Power Type	Digital Signal Type	Digital Close State	Digital Power Source	Digital Interp Relay	DWG Name	Remarks
1	DI	YIR	MLS-YIR-100	COMMUNITOR RUNNING	COMMUNITOR	DFS RTU 362	N/A	N/A	N/A	24VDC	RUNNING	PLC	NO	I-04	
2	DI	YA	MLS-YA-100	COMMUNITOR FAIL	COMMUNITOR	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
3	DO	UCR	MLS-UCR-101	WET WELL PUMP NO.1- RUN COMMAND	AFD-101	DFS RTU 362	N/A	N/A	N/A	24VDC	RUN CMD	FIELD	YES	I-04	
4	AO	SC	MLS-SC-101	WET WELL PUMP NO.1- SPEED COMMAND	AFD-101	DFS RTU 362	4-20 mA	0-100%	4 WIRE	N/A	N/A	N/A	N/A	I-04	
5	AI	SI	MLS-SI-101	WET WELL PUMP NO.1- SPEED FEEDBACK	AFD-101	DFS RTU 362	4-20 mA	0-100%	4 WIRE	N/A	N/A	N/A	N/A	I-04	
6	DI	YA	MLS-YA-101	WET WELL PUMP NO.1- AFD FAULT	AFD-101	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
7	DI	YI	MLS-YI-101	WET WELL PUMP NO.1- IN AUTO	AFD-101	DFS RTU 362	N/A	N/A	N/A	24VDC	IN AUTO	PLC	NO	I-04	
8	DI	YIR	MLS-YIR-101	WET WELL PUMP NO.1- RUNNING STATUS	AFD-101	DFS RTU 362	N/A	N/A	N/A	24VDC	RUNNING	PLC	NO	I-04	
9	DO	UCR	MLS-UCR-102	WET WELL PUMP NO.2- RUN COMMAND	AFD-102	DFS RTU 362	N/A	N/A	N/A	24VDC	RUN CMD	FIELD	YES	I-04	
10	AO	SC	MLS-SC-102	WET WELL PUMP NO.2- SPEED COMMAND	AFD-102	DFS RTU 362	4-20 mA	0-100%	4 WIRE	N/A	N/A	N/A	N/A	I-04	
11	AI	SI	MLS-SI-102	WET WELL PUMP NO.2- SPEED FEEDBACK	AFD-102	DFS RTU 362	4-20 mA	0-100%	4 WIRE	N/A	N/A	N/A	N/A	I-04	
12	DI	YA	MLS-YA-102	WET WELL PUMP NO.2- AFD FAULT	AFD-102	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
13	DI	YI	MLS-YI-102	WET WELL PUMP NO.2- IN AUTO	AFD-102	DFS RTU 362	N/A	N/A	N/A	24VDC	IN AUTO	PLC	NO	I-04	
14	DI	YIR	MLS-YIR-102	WET WELL PUMP NO.2- RUNNING STATUS	AFD-102	DFS RTU 362	N/A	N/A	N/A	24VDC	RUNNING	PLC	NO	I-04	
15	DO	UCR	MLS-UCR-103	WET WELL PUMP NO.3- RUN COMMAND	AFD-103	DFS RTU 362	N/A	N/A	N/A	24VDC	RUN CMD	FIELD	YES	I-04	
16	AO	SC	MLS-SC-103	WET WELL PUMP NO.3- SPEED COMMAND	AFD-103	DFS RTU 362	4-20 mA	0-100%	4 WIRE	N/A	N/A	N/A	N/A	I-04	
17	AI	SI	MLS-SI-103	WET WELL PUMP NO.3- SPEED FEEDBACK	AFD-103	DFS RTU 362	4-20 mA	0-100%	4 WIRE	N/A	N/A	N/A	N/A	I-04	
18	DI	YA	MLS-YA-103	WET WELL PUMP NO.3- AFD FAULT	AFD-103	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
19	DI	YI	MLS-YI-103	WET WELL PUMP NO.3- IN AUTO	AFD-103	DFS RTU 362	N/A	N/A	N/A	24VDC	IN AUTO	PLC	NO	I-04	
20	DI	YIR	MLS-YIR-103	WET WELL PUMP NO.3- RUNNING STATUS	AFD-103	DFS RTU 362	N/A	N/A	N/A	24VDC	RUNNING	PLC	NO	I-04	
21	AI	LI	MLS-LI-100	WET WELL 1 LEVEL	LIT-100	DFS RTU 362	4-20 mA	TBD	2-WIRE	N/A	N/A	N/A	N/A	I-04	
22	DI	LAH	MLS-LAH-100	WET WELL 1 HIGH LEVEL ALARM	LSH-100	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
23	DI	LAL	MLS-LAL-100	WET WELL 1 LOW LEVEL ALARM	LSL-100	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
24	DI	LAH	MLS-LAH-101	WET WELL 2 HIGH LEVEL ALARM	LSH-101	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
25	DI	LAL	MLS-LAL-101	WET WELL 2 LOW LEVEL ALARM	LSL-101	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
26	DI	LAH	MLS-LAH-102	SUMP HIGH LEVEL ALARM	LSH-102	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-04	
27	AI	FI	MLS-FI-100	WET WELL PUMP DISCHARGE FLOW	FIT-100	DFS RTU 362	4-20 mA	EXISTING	4-WIRE	N/A	N/A	N/A	N/A	I-04	
28	AI	PI	MLS-PI-100	WET WELL PUMP DISCHARGE PRESSURE	PIT-100	DFS RTU 362	4-20 mA	EXISTING	2-WIRE	N/A	N/A	N/A	N/A	I-04	
29	DI	YI	MLS-YI-100	ODOR CONTROL	--	DFS RTU 362	N/A	N/A	N/A	24VDC	ODOR	PLC	NO	I-04	
30	DI	YI	EG-YI-401A	AUTOMATIC TRANSFER SWITCH EMERGENCY CONNECTION	ATS-401	DFS RTU 362	N/A	N/A	N/A	24VDC	EMERGENCY CONNECTION.	PLC	NO	I-05	
31	DI	YI	EG-YI-401B	AUTOMATIC TRANSFER SWITCH NORMAL CONNECTION	ATS-401	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL CONNECTION.	PLC	NO	I-05	
32	DI	YI	EG-YI-401C	AUTOMATIC TRANSFER SWITCH EMERGENCY POWER AVAILABLE	ATS-401	DFS RTU 362	N/A	N/A	N/A	24VDC	EMERGENCY POWER	PLC	NO	I-05	
33	DI	YI	EG-YI-401D	AUTOMATIC TRANSFER SWITCH NORMAL POWER AVAILABLE	ATS-401	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL POWER	PLC	NO	I-05	
34	AI	LI	EG-LI-401	ENGINE GENERATOR FUEL LEVEL	LCP-101	DFS RTU 362	4-20 mA	PER SUPPLIER	4-WIRE	N/A	N/A	N/A	N/A	I-05	
35	DI	YIR	EG-YIR-403	ENGINE GENERATOR RUNNING	LCP-101	DFS RTU 362	N/A	N/A	N/A	24VDC	RUNNING	PLC	NO	I-05	
36	DI	UA	EG-UA-404	ENGINE GENERATOR FAIL	LCP-101	DFS RTU 362	N/A	N/A	N/A	24VDC	NORMAL	PLC	NO	I-05	
37	DI	YI	RG-YI-101	RAIN GAUGE	RG-101	DFS RTU 362	N/A	N/A	N/A	24VDC	RAIN GAUGE	PLC	NO	I-05	Pulse Input

## SECTION 13563 PRESSURE AND LEVEL INSTRUMENTS

### PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of pressure and level instruments and accessories required for the Instrumentation and Control System as specified herein or as indicated on the Drawings.

Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule.

When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the Drawings or the Instrument Device Schedule.

1-2. DESIGN CRITERIA. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by Contractor.

Primary elements shall derive any required power from the transmitter, unless otherwise indicated.

The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the Drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the Drawings or in the Instrument Device Schedule.

Where possible, each instrument shall be factory calibrated to the calibration ranges indicated in the Drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. Calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the Drawings and/or Instrument Device Schedule.

1-3. SUBMITTALS. Submittals shall be made as specified in the Instrumentation and Control System section.

1-4. SHIPMENT, PROTECTION, AND STORAGE. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of the Instrumentation and Control System section. Identification of

packaging shall be as described in the Instrumentation and Control System section.

## PART 2 - PRODUCTS

2-1. GENERAL. The following paragraphs provide minimum device stipulations. The Drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

2-1.01. Interconnecting Cable. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of three meters or as indicated in the Drawings or Instrument Device Schedule.

2-1.02. Programming Device. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section.) The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2-1.03. Configuration Software/Serial Interface. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under Microsoft's Windows 7 or higher operating systems. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

## 2-2. PRESSURE AND LEVEL INSTRUMENTATION.

2-2.01. Pressure and Pressure Sensing Level Transmitters. Not used.

2-2.02. Premium Accuracy Pressure and Pressure Sensing Level Transmitters. Not Used.

2-2.03. Differential Pressure Transmitters. Not used.

2-2.04. Premium Accuracy Differential Pressure Transmitters. Not used.

- 2-2.05. Flange-Mounted Pressure Sensing Level Transmitters. Not used.
- 2-2.06. Ultrasonic Level Transmitters. Not used.
- 2-2.07. Admittance Probe Level Transmitters. Not used.
- 2-2.08. Submersible Pressure Sensing Level Transmitters. Not used.
- 2-2.09. Bubbler System Components. Not used.
- 2-2.10. Fixed-Mount Float Type Level Switches. Not used.
- 2-2.11. Weighted Float Type Level Switches. Not used.
- 2-2.12. Adjustable Deadband Float Type Level Switches. Not used.
- 2-2.13. Electrode/Conductance Relay Level Switches. Not used.
- 2-2.14. Flange-Mounted Displacement Float Type Level Switches. Not used.
- 2-2.15. Flood Level Switches. Not used.
- 2-2.16. Ultrasonic Level Switches. Not used.
- 2-2.17. Pressure Switches. Not used.

2-2.18. Field-Mount Pressure Gauges. Pressure gauges shall be of the indicating dial type, with C-type phosphor bronze Bourdon tube; stainless steel rotary geared movement; phenolic or polypropylene open front turret case; adjustable pointer; stainless steel, phenolic, or polypropylene ring; and acrylic plastic or shatterproof glass window.

Gauge dial shall be 4-1/2 inch size, with white background and black markings. The units of measurement shall be indicated on the dial face. Subdivisions of the scale shall conform to the requirements of the governing standard. Pointer travel shall be not less than 200 degrees or more than 270 degrees of arc.

All stem-mounted gauges shall be provided with 1/2 inch NPT connections. Where indicated in the Drawings or on the Instrument Device Schedule, stem mounted gauges shall have an adjustable viewing angle to allow the gauge to be positioned for optimum viewing.

All pressure gauges shall measure in psi and all vacuum gauges in inches [mm] water. All gauges shall have a suitable range to give mid-scale readings under normal conditions. Gauge accuracy shall be 0.5 percent of scale range.

Gauge valve materials shall be compatible with the measured process. Where the process is not defined, gauge valves shall have AISI Type 316 stainless steel wetted parts and Teflon seals. Multi-port gauge valves shall have all unused ports plugged. Gauge valve construction shall be as detailed under 2-2.19.

A diaphragm seal shall be provided for the respective gauge where shown on plans.

Gauges shall be installed at the locations indicated on the Drawings, with installation conforming to the installation details. All gauges and diaphragm seals shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All connections shall be free from leaks. Lines shall be purged of trapped air at gauge locations prior to installation of the gauge or seal.

Each gauge shall be provided with all required mounting hardware to securely mount the unit according to the mounting requirements indicated in the Drawings or the Instrument Device Schedule.

Unless otherwise indicated, mounting and installation hardware shall be Type 316L stainless steel.

2-2.19 Instrument Shutoff Valves Each gauge shall be provided with an isolation ball valve.

2-2.20 Annular Pressure Seals. Not used.

2-2.21. Radar Level Transmitters. Not Used.

### PART 3 - EXECUTION

3-1. FIELD SERVICES. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.

Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

End of Section

## SECTION 13570

### PANELS, CONSOLES, AND APPURTENANCES

#### PART 1 - GENERAL

1-1. SCOPE. The Panels, Consoles and Appurtenances section covers the furnishing of panels and appurtenances as indicated on the Drawings. The RTU panel provided shall be by Dataflow and shall be modeled on the Southeast Master Liftstation 677.

1-1.01. Control System. The Instrumentation and Control System section shall apply to all equipment furnished under the Panels, Consoles and Appurtenances section.

1-2. GENERAL. Equipment (furnished and installed) under this section shall be fabricated and assembled in full conformity with the Drawings and specifications, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-2.02. Drawings. General dimensions and arrangements are indicated on the Drawings. System Supplier shall be responsible for coordinating the enclosure size and arrangements to accommodate the equipment provided.

1-3. SUBMITTALS. Submittals shall be made as specified in the Instrumentation and Control System section.

1-4. DELIVERY, STORAGE, AND SHIPPING. Delivery, storage and shipping shall be as per The Instrumentation and Control System section.

#### PART 2 - PRODUCTS

2-1. PANEL DESIGN AND FABRICATION FEATURES. All panels furnished shall conform to the stipulations of NEMA ICS-6-1993 (R2001, R2006). Unless indicated otherwise on the Drawings, the following paragraphs describe general fabrication specifications for the PLC cabinets, instrument panels, consoles, enclosures, and subpanels.

2-1.01. Piping. Not used.

2-1.02. Power Entrance. The power entrance to each panel shall be provided with a surge protection device. Refer to the Instrumentation and Controls section for surge suppression requirements.

2-1.03. Power Wiring. Power distribution wiring on the line side of panel fuses shall be minimum 12 AWG.

2-1.04. Nameplates. Nameplates shall be provided on the face of the panel and shall be made of laminated phenolic material having engraved letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel.

2-1.05. Painting. Interior and exterior surfaces of all carbon-steel panels shall be thoroughly cleaned and painted with rust inhibitive (universal) primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils

2-2. FREESTANDING VERTICAL PANELS. The following paragraphs specify the freestanding vertical panels:

2-2.01. Construction. Panel construction shall be an indoor, dusttight, completely enclosed cubicle formed from steel structural members and steel plates. The base shall be formed of steel channels, with flanges extending upwards. The base shall be provided with 1/2 inch diameter holes at 12 inch centers so that the base can be bolted to the concrete equipment base. Welds, seams, and edges on all exposed surfaces shall be ground smooth. Suitable lifting facilities shall be provided for handling and shipment.

2-2.02. Structure. Panel structure shall be suitably braced and of sufficient strength to support all equipment mounted on or within, to withstand handling and shipment, to remain in proper alignment, and to be rigid and freestanding. Top, sides, and back shall be fabricated from USS 10 gage or heavier carbon steel sheets, with stationary back suitable for back to wall installation, or designed for rear access with hinged back doors. Doors shall not be greater than 24 inches wide or spaced not greater than 36 inches center to center.

2-2.03. Panel Front. The front shall be a hinged door, or doors, with mounted instruments and control devices, fabricated from USS 10 gage carbon steel sheet and suitably braced and supported to maintain alignment. Panels with hinged fronts shall be of sufficient width to permit door opening without interference with rear projection of flush mounted instruments.

2-2.04. Doors. Doors shall be essentially full height, having turned back edges and additional bracing to ensure rigidity and prevent sagging. Doors shall be

mounted with strong, continuous, piano type hinges. Positive latches, acting from a common door handle, shall hold doors securely compressed at top, side, and bottom against rubber gaskets.

2-2.05. Mounted Instruments. Not used.

2-2.06. Conduit Entrance. Not used.

2-2.07. Size and Arrangement. Panel shall be sized to accommodate the dimensions and general instrument arrangement as shown in the photo and in the notes on the Drawings.

2-2.08. Interior Lighting. Illumination of panel interiors shall be provided by ceiling mounted lamp fixtures spaced at approximately 2'-6" and near the door. Fixtures shall be nominal 40-watt LED type, with a common "On-Off" switch near each end door.

Floor stands shall be provided to support cabinets not fastened to a wall or other support. Floor stands shall be full-depth and shall have a minimum height of 12 inches. Floor stand material and finish shall match the cabinet.

All wall-mounted cabinets shall meet the requirements of the panel fabrication paragraph of this section.

### PART 3 - EXECUTION

3-1. GENERAL INSTALLATION REQUIREMENTS. Installation requirements are specified in the Instrumentation and Control System section. In addition, equipment furnished under this section shall conform to the following manufacturing stipulations.

END OF SECTION

SECTION 15020 MISCELLANEOUS PIPING AND ACCESSORIES  
INSTALLATION

PART 1 - GENERAL

1-1. SCOPE. This section covers the installation of piping and accessories as indicated on the Drawings for the following piping sections:

Section Title

Miscellaneous Steel Pipe, Tubing, and Accessories

Miscellaneous Plastic Pipe, Tubing, and Accessories

Miscellaneous Piping and Accessories Installation

Copper Tubing and Accessories

Contractor shall furnish all necessary jointing materials, coatings, and accessories that are specified herein.

Pipe supports and anchors shall be furnished by Contractor, and are covered in the Pipe Hangers and Supports section. Pipe trenching and backfilling are covered in the Trenching, Bedding, and Backfill for Pipe section.

1-2. GENERAL.

1-2.01. Coordination. Materials installed under this section shall be installed in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by Engineer.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Items requiring submittals shall include, but not be limited to, the following:

Materials as specified herein.

1-3.02. Welder Certification. Not Used.

1-3.03. Spool Drawings. Not Used.

1-4. QUALITY ASSURANCE.

1-4.01. Welding and Brazing Qualifications. All welding and brazing procedures and operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of Section IX of the ASME Code. All procedure and operator qualifications shall be submitted to the Engineer for review.

1-4.02. Tolerances. These tolerances apply to in-line items and connections for other lines.

The general dimension, such as face-to-face, face or end-to-end, face- or end-to-center, and center-to-center shall be 1/8 inch.

The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot.

Rotation of flange bolt holes shall not exceed 1/16 inch.

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2-2. MATERIALS.

Threaded Fittings

Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize".
Teflon Thread Sealer	Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon".
Teflon Thread Tape	Hercules "Tape Dope" or John Crane "Thread-Tape".

## Solder or Brazed Fittings

Solder Solid wire, ASTM B32, ANSI/NSF 61 certified, Alloy Grade Sb5, (95-5).

Soldering Flux Paste type, ASTM B813.

Brazing Filler Metal AWS A5.8, BCuP-5; Engelhard "Silvaloy 15", Goldsmith "GB-15", or Handy & Harman "Sil-Fos".

Brazing Flux Paste type, Fed Spec O-F-499, Type B.

## Insulating Fittings

Threaded Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".

Flanged Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

Pipe Insulation See Mechanical Insulation section.

Watertight/Dusttight Pipe Sleeves O-Z Electrical Manufacturing "Thruwall" and "Floor Seals", or Thunderline "Link-Seals"; with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts.

Pipe Sleeve Sealant Polysulfide or urethane, as specified in the Caulking section or as indicated on the Drawings.

## Protective Coatings

Tape Wrap ANSI/AWWA C209, except single ply tape thickness shall not be less than 30 mils; Protecto Wrap "200" or Tapecoat "CT".

Primer As recommended by the tape manufacturer.

## PART 3 - EXECUTION

3-1. INSPECTION. All piping components shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and recleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or owner representative before its use.

### 3-2. PREPARATION.

3-2.01. Field Measurement. Pipe shall be cut to measurements taken at the site, not from the Drawings. All necessary provisions shall be made in laying out piping to allow for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction to avoid transmission of noise resulting from expansion.

### 3-3. INSTALLATION.

3-3.01. General. All instruments and specialty items shall be installed according to the manufacturer's instructions and with sufficient clearance and access for ease of operation and maintenance.

Flat faced wrenches and vises shall be used for copper tubing systems. Pipe wrenches and vises with toothed jaws will damage copper materials and shall not be used. Bends in soft temper tubing shall be shaped with bending tools.

3-3.02. Pipe Sleeves. Piping passing through concrete or masonry shall be installed through sleeves that have been installed before the concrete is placed or when masonry is laid. Pipe sleeves installed through floors with a special finish, such as ceramic or vinyl composition tile, shall be flush with the finished floor surface and shall be provided with nickel or chromium plated floor plates. Unless otherwise indicated on the Drawings, in all other locations where pipes pass through floors, pipe sleeves shall project not less than 1 inch nor more than 2 inches above the floor surface, with the projections uniform within each area. In the case of insulated pipes, the insulation shall extend through pipe sleeves. Where the Drawings indicate future installation of pipe, sleeves fitted with suitable plastic caps or plugs shall be provided.

Holes drilled with a suitable rotary drill will be considered instead of sleeves for piping which passes through interior walls and through floors with a special finish.

Unless otherwise indicated on the Drawings, all pipes passing through walls or slabs which have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies, or with sleeves and modular rubber sealing elements.

3-3.03. Pipe Joints. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements.

3-3.03.01. Threaded. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed after threading and before assembly to remove all burrs. Unless otherwise indicated, threaded joints shall be made up with teflon thread tape, thread sealer, or a suitable joint compound.

3-3.03.02. Compression. Not Used.

3-3.03.03. Flared. Not Used.

3-3.03.04. Soldered and Brazed. Where solder fittings are specified for lines smaller than 2 inches, joints may be soldered or brazed at the option of Contractor. Brazing alloy shall contain no tin.

Surfaces to be joined shall be thoroughly cleaned with flint paper and coated with a thin film of flux. At each joint, tubing shall enter to the full depth of the fitting socket.

Care shall be taken to avoid overheating the metal or flux. Each joint shall be uniformly heated to the extent that filler metal will melt on contact. While the joint is still hot, surplus filler metal and flux shall be removed with a rag or brush.

3-3.03.05. Solvent Welded. Not Used.

3-3.03.06. Epoxy and Adhesive Bonded. Not Used.

3-3.03.07. Heat Fusion Bonded. Not Used.

3-3.03.08. Flanged. Not Used.

3-3.03.09. Welded. Not Used.

3-3.03.10. Grooved Couplings. Not Used.

3-3.03.11. Push-on. Not Used.

3-3.03.12. Rubber-Gasketed. Not Used.

3-3.03.13. Other Pipe Joints. Not Used.

3-3.04. Pipe. Pipe shall be installed as specified, as indicated on the Drawings, or, in the absence of detail piping arrangement, in a manner acceptable to Engineer.

Piping shall be installed without springing or forcing the pipe in a manner which would induce stresses in the pipe, valves, or connecting equipment.

Piping shall be supported in conformance with the Pipe Hangers and Supports section.

Piping shall be connected to equipment by flanges or unions as specified in the various piping sections. Piping connecting to equipment shall be supported by a pipe support and not by the equipment.

A union shall be provided within 2 feet of each threaded-end valve unless there are other connections which will permit easy removal of the valve. Unions shall also be provided in piping adjacent to devices or equipment which may require removal in the future and where required by the Drawings or the Specifications.

In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.

3-3.05. Valves. Isolation valves provided with equipment and instruments shall be located in a manner which will allow ease of access and removal of the items to be isolated. Prior to soldering or brazing valves, teflon and elastomer seats and seals shall be removed to prevent damage.

#### 3-4. PIPING ASSEMBLY.

3-4.01. General. Contractor shall only use labor that has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner

Any deviations from the Specifications or piping locations shown on the Drawings require prior review and approval by Engineer.

3-4.02. Buttwelded Piping. Not Used.

3-5. PROTECTIVE COATING. Not Used.

3-6. PRESSURE AND LEAKAGE TESTING. Not Used.

3-7. CLEANING. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of Engineer.

3-8. ACCEPTANCE. Owner reserves the right to have any section of the piping system which he suspects may be faulty cut out of the system by Contractor for inspection and testing. Should the joint prove to be sound, Owner will reimburse Contractor on a time-and-material basis as specified in the Contract. Should the joint prove to be faulty, the destructive test will continue joint by joint in all directions until sound joints are found. Costs for replacement of faulty work and/or materials shall be the responsibility of Contractor.

End of Section

## SECTION 15050 BASIC MECHANICAL BUILDING SYSTEMS MATERIALS AND METHODS

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers general mechanical building system requirements as referenced from other sections and furnishing and installation of:

Mechanical identification  
Seismic restraints

for the heating, ventilating, and air conditioning systems. Protective coatings for ductwork and equipment without special coatings shall be as specified in the Protective Coatings sections.

**1-2. GENERAL.** Materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the manufacturer unless exceptions are noted by the Engineer.

**1-2.01. Coordination.** Where two or more units of the same class of materials are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

**1-2.02. General Equipment Stipulations.** The General Equipment Stipulations shall apply to all materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

**1-2.03. Governing Standards.** Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable local codes and ordinances, laws, and regulations which pertain to such work. In case of a conflict between these specifications and any state law or local ordinance, the latter shall govern.

**1-2.04. Metal Thickness.** Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

### **1-3. SUBMITTALS.**

**1-3.01. Drawings and Data.** Complete information, detailed specifications, and data covering materials, parts, devices, and accessories forming a part of the materials furnished, shall be submitted in accordance with the Construction Schedule & Project Restraints section.

#### Number Plates

Product data on number plates.

A listing of equipment to receive number plates shall be submitted.

#### Equipment Motors

Name of Manufacturer.

Type and Model.

Horsepower rating and service factor.

Temperature rise and insulation rating.

Full load rotative speed.

Type of bearings and method of lubrication.

Net weight.

Overall dimensions.

Efficiency at full, 3/4, and 1/2 loads.

Full load current and power factor.

Locked rotor current.

#### Adjustable Frequency Drives

Type and model.

Name of manufacturer.

Operating speed range, rpm.

Rated bhp at maximum speed.

Efficiency at maximum speed, percent.

Maximum heat output, BTUH.

Speed at maximum heat output, rpm.

Dimensions and net weight of complete panel.

Catalog and data sheets on all components.

Electrical schematics and wiring diagrams.

### **1-4. QUALITY ASSURANCE.**

**1-4.01. Welding Qualifications.** All welding procedures and welding operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of AWS Standard Qualification Procedures. All procedure and operator qualifications shall be in written form and subject to Engineer's review. Accurate records of operator and procedure qualifications shall be maintained by Contractor and made available to Engineer upon request.

**1-4.02. Manufacturer's Experience.** Unless the equipment manufacturer is specifically named in this section, the manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.

## **PART 2 - PRODUCTS**

**2-1. SERVICE CONDITIONS.** All equipment shall be designed and selected to meet the specified conditions. Where equipment is provided with special coatings, unit capacities shall be corrected to account for any efficiency losses from the selected special coating.

### **2-2. PERFORMANCE AND DESIGN REQUIREMENTS.**

**2-2.01. Dimensional Restrictions.** Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer.

**2-2.02. Elevation.** Equipment shall be designed to operate at the elevation indicated in the Meteorological and Seismic Design Criteria section.

**2-2.03. Equipment Efficiencies.** Unless otherwise indicated in the respective equipment paragraph, the equipment efficiency shall be in accordance with the requirements of the latest edition of ASHRAE Standard 90.1.

**2-2.04. Drive Units.** Drive units shall be designed for 24 hour continuous service.

**2-2.04.01. V-Belt Drives.** Each V-belt drive shall include a sliding base or other suitable belt tension adjustment. V-belt drives shall have a service factor of at least 1.5 at maximum speed based on the nameplate horsepower of the drive motor unless otherwise indicated in the specific equipment paragraph. Multiple belts shall be provided in matched sets and shall be oil resistant, non-static type. External belts and drive assemblies shall be protected by a belt safety guard constructed in accordance with OSHA requirements. The guard shall be provided with a tachometer opening.

Unless otherwise indicated in the specific equipment paragraph, equipment with smaller than 10 horsepower motors shall have adjustable pitch sheaves and equipment with multiple belts or 10 horsepower and larger motors shall have fixed sheaves. Adjustable sheaves shall be selected so that the fan speed at the specified conditions is selected at the mid-position of the sheave range. Fixed sheaves shall be replaced as necessary with sheaves of the proper size during the air system balancing to provide the required speed for the specified airflow.

**2-2.04.02. Electric Motors.** Motor horsepower scheduled on the Drawings are minimum motor horsepower. Larger motors shall be provided if required to meet the specified capacities for the equipment furnished. Motors furnished with equipment shall meet the following requirements.

- a. Premium efficient motors with a minimum efficiency of at least that specified in the Common Motor Requirements for Process Equipment section shall be provided where available as a standard option. All other motors shall meet the minimum efficiency standards required by the 2007 Energy Independence and Security Act.
- b. Designed and applied in accordance with NEMA, ANSI, IEEE, AFBMA, and NEC for the duty service imposed by the driven equipment, such as frequent starting, intermittent overload, high inertia, mounting configuration, or service environment.
- c. Rated for continuous duty at 40°C ambient.
- d. Motors used in applications which exceed the usual service conditions as defined by NEMA, such as higher than 40°C ambient, altitude exceeding 3,300 feet, explosive or corrosive environments, departure from rated voltage and frequency, poor ventilation, frequent starting, or adjustable frequency drive applications, shall be properly selected with respect to their service conditions and shall not exceed specified temperature rise limits in accordance with ANSI/NEMA MG 1 for insulation class, service factor, and motor enclosure type.
- e. To ensure long life, motors shall have nameplate horsepower equal or greater than the maximum load imposed by the driven equipment and shall carry a service factor rating as follows:

<u>Motor Size</u>	<u>Enclosure</u>	<u>Service Factor</u>
Fractional hp	Open	1.15
	Other Than Open	1.0
Integral hp	Open	1.15
	Other Than Open	1.0

Motors used with adjustable frequency drives shall have a 1.15 service factor on sine wave power and a 1.0 service factor on drive power.

- f. Designed for full voltage starting.
- g. Designed to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.

- h. Totally enclosed motors shall have a continuous moisture drain that also excludes insects.
- i. Bearings shall be either oil or grease lubricated.
- j. Motor nameplates shall indicate as a minimum the manufacturer name and model number, motor horsepower, voltage, phase, frequency, speed, full load current, locked rotor current, frame size, service factor, power factor, and efficiency.
- k. Dripproof motors, or totally enclosed motors at Contractor's option, shall be furnished on equipment in indoor, above-grade, clean, and dry locations.
- l. Totally enclosed motors shall be furnished on:
  - (1) Outdoor equipment.
  - (2) Equipment for installation below grade.
  - (3) Equipment operating in chemical feed and chemical handling locations.
  - (4) Equipment operating in wet or dust-laden locations.
- m. Explosionproof motors shall be furnished as specified by applicable codes or as specified in other sections.
- n. A manufacturer's standard motor may be supplied on packaged equipment and fans in which case a redesign of the unit would be required to furnish motors of other than the manufacturer's standard design. However, in all cases, the motor types indicated are preferred and shall be furnished if offered by the manufacturer as a standard option.
- o. Motors used with adjustable frequency drives shall have insulation system meeting the requirements of NEMA MG 1, Part 31.

**2-2.05. Adjustable Frequency Drives.** Adjustable frequency drives shall be provided as indicated on the Drawings and shall be coordinated with the requirements of the associated equipment. The equipment manufacturer shall be responsible for furnishing the adjustable frequency drive, for matching the motor and the drive, and for coordinating the collection of data and the design to limit harmonics to the levels specified.

Adjustable frequency drives shall be as covered in the Adjustable Frequency Drives section.

## **2-3. MANUFACTURE AND FABRICATION.**

**2-3.01. Welding.** All welds shall be continuous (seal type) on submerged or partially submerged components.

**2-3.02. Anchor Bolts and Expansion Anchors.** Anchor bolts, expansion anchors, nuts, and washers shall be as indicated in the Anchorage in Concrete and Masonry section unless otherwise indicated on the Drawings.

**2-3.03. Edge Grinding.** Sharp corners of cut or sheared edges which will be submerged in operation shall be dulled by at least one pass of a power grinder to improve paint adherence.

**2-3.04. Surface Preparation.** All iron and steel surfaces, except motors, shall be shop cleaned by sandblasting or equivalent, in strict conformance with the paint manufacturer's recommendations. All mill scale, rust, and contaminants shall be removed before shop primer is applied.

## **2-4. MATERIALS.**

**2-4.01. Mechanical Identification.** Mechanical identification consisting of equipment number plates, equipment information plates, valve tags, and ductwork identification shall conform to the requirements as indicated herein.

**2-4.01.01. Number Plates.** Hand-lettered or tape labels will not be acceptable.

Number plates for control equipment such as but not limited to thermostats, control stations, and emergency ventilation shutoff switches shall in addition to the specific device identification list the controlled equipment in parenthesis below the device number.

**2-4.01.02. Piping.** Piping identification shall be as specified in the Protective Coatings section. The lettering size, length of color field, colors, and viewing angles of identification devices shall be in accordance with ASME A13.1.

**2-4.01.03. Valves.** Not used.

**2-4.01.04. Ductwork.** Ductwork shall be identified with nameplates as specified herein, or stenciled painting. Ductwork shall be identified with the equipment number and area served, direction of airflow, and service (supply, return, mixed, exhaust, and outside air). The identification shall be located at equipment, at each side of structure or enclosure penetrations, and at each obstruction.

**2-4.02. Seismic Design.** All ductwork and piping associated with the HVAC systems shall be provided with seismic restraints in accordance with Seismic Hazard Level (SHL) of the latest edition of the SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems as specified and in accordance with the applicable building code. The seismic hazard level used to design the restraints shall be level A. Equipment and associated attachments and restraints shall be in accordance with the Meteorological and Seismic Design Criteria section.

## **PART 3 - EXECUTION**

**3-1. INSTALLATION.** Materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by the Engineer.

The installation of identifying devices shall be coordinated with the application of covering materials and painting where devices are applied to surfaces. All surfaces to receive adhesive number plates shall be cleaned before installation of the identification device.

**END OF SECTION**

SECTION 15064 STAINLESS STEEL PIPE AND ALLOY PIPE,  
TUBING, AND ACCESSORIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of stainless-steel pipe and alloy pipe, tubing and accessories through 24" diameter for the services as indicated herein. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

1-2. SUBMITTALS.

1-2.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

- Name of Manufacturer
- Type and model
- Construction materials, thickness, and finishes
- Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

All welding and brazing procedures and operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of Section IX of the ASME Code. All procedure and operator qualifications shall be in written form and submitted to the Engineer for review.

Pipe for liquid chemical service shall comply with ASME B31.3. Pipe for all other services shall comply with ASME B31.1.

1-3. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2-1. MATERIALS. Stainless steel pipe and alloy pipe materials shall be as specified herein.

2-1.01. Material Classification SS-1. Not used.

2-1.02. Material Classification SS-2. Not used.

2-1.03. Material Classification SS-3.

SS-3 – Schedule 10S with Beveled Ends.  Engine exhaust piping.  2-1/2 inch and larger.	Pipe Fittings	ASTM A312, Grade TP304L. Buttwelded, ASTM A403, WP304L. Fittings shall conform to ANSI/ASME B16.9, Schedule 10S with beveled ends.
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2-1.04. Material Classification SS-4. Not used.

2-1.05. Material Classification SS-5. Not used.

2-1.06. Material Classification SS-6. Not used.

2-1.07. Material Classification SS-7. Not used.

2-1.08. Material Classification SS-8. Not used.

2-1.09. Material Classification SS-9. Not used.

2-1.10. Material Classification SS-10. Not used.

2-1.11. Material Classification SS-11. Not used.

2-1.12. Material Classification CRP-1. Not used.

2-1.13. Material Classification HST-1. Not used.

2-1.14. Accessory Materials. Accessory materials for the stainless steel pipe systems shall be as indicated. Flanges shall be flat faced for water service and shall be raised face for air or gas service except when connecting to flat face equipment or valve flanges.

## Flanges

SS-1, SS-2 and SS-3  
Pipe Backing Flanges

Stainless steel plate, AISI Type 304 or 316 to match fittings. Provide stub ends or angle face rings with material and thickness to match fittings. The angle or radius between the angle face ring or stub end and the pipe shall match the angle or radius of the backing flange for proper seating. Flanges shall conform with ANSI/ASME B16.5, Class 150 diameter and drilling; with the following thicknesses:

<u>Nominal Pipe Size inches</u>	<u>Flange Thickness inches</u>
1/2-8	1/2
10-16	5/8
18-20	3/4
24-30	1
36	1-1/4

SS-4 and SS-5 Pipe  
Flanges

ANSI/ASME B16.5, Class 150, AISI Type 304, 304L, 316, or 316L, to match piping.

SS-10 Pipe Flanges

Except where otherwise permitted or required, ANSI/AWWA C207, Class D, slip-on constructed of stainless steel plate or ANSI/ASME B16.5, Class 150, AISI Type 304, 304L, 316, or 316L, to match piping.

SS-11 Pipe Backing  
Flanges

Epoxy coated carbon steel to match fittings. Provide stub ends or angle face rings with material and thickness to match fittings. The angle or radius between the angle face ring or stub end and the pipe shall match the angle or radius of the backing flange for proper seating. Flanges shall conform with ANSI/ASME B16.5, Class 150 diameter and drilling; with the following thicknesses:

Nominal Pipe Size inches	Flange Thickness inches
1/2-8	1/2
10-16	5/8
18-20	3/4
24-30	1
36	1-1/4

Flange Bolts	ASTM A193 Class 2, AISI Type 304, ANSI B18.2.1, heavy hex head, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
Flange Nuts	ASTM A194, AISI Type 304, ANSI/ASME B18.2.2, heavy hex pattern. Washers shall be installed under the nuts.
Flange Gaskets	Flexitalic "Style CG", spiral wound, AISI Type 304 stainless steel, non-asbestos filler, 3/16 inch nominal thickness, with compression ring 1/8 inch thick to match required flange dimensions.
Elbows	Except for elbows in chemical service lines 4 inches and smaller, elbows shall be long radius type for which the laying length is 1.5 times the pipe diameter.
Protective Coatings – High Temperature Buried Service	
Epoxy for buried aeration and process air piping	Shop or field applied high solids epoxy; suitable for protection at continuous pipe wall temperatures up to 300 F. Coating shall be abrasion resistant. The finished coating shall have a minimum total film thickness of 10 mils. The surface shall be prepared in accordance with SSPC-SP7 as a minimum unless otherwise recommended by the coating manufacturer. The coating shall be Carboline "Thermaline 450", PPG Amercoat "Amerlock 400", or equal.

## Insulating Fittings

Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

2-1.14.01. Branch Connections. Branch connections 2-1/2 inches and smaller shall be made with welding fittings. Welded outlets shall be used. Where the exact outlet size desired is in doubt, but is known to be less than 1 inch, a 1 inch outlet shall be provided and reducing bushings used as needed.

Branch connections sized 3 and larger shall be made with pipe nipples or with welding fittings with welded outlets. Pipe nipples and welding fittings shall be welded to the pipe shell and reinforced as needed to meet design and testing requirements. The pressure rating of branch and branch connections shall equal or exceed the pressure rating of the main pipe it is connected to.

Small branch connections shall be so located that they will not interfere with joints, supports, or other details, and shall be provided with caps or plugs to protect the threads during shipping and handling.

2-2. WELDING OF STAINLESS STEEL AND ALLOYS. Filler metal for welding austenitic stainless steel and alloys, P-number 8 base materials shall be in accordance with the following:

Material Type/Grade 304 shall use Type 308 filler metal.

Material Type/Grade 304L shall use Type 308L filler metal.

Material Type/Grade 316, shall use Type 316 filler metal.

Material Type/Grade 316L shall use Type 316L filler metal.

Material Type/Carpenter 20 shall use Carpenter 20 filler metal.

Material Type/Hastelloy C276 shall use Hastelloy C276 filler metal.

The following requirements shall apply when fabricating austenitic stainless steel and alloy components.

Grinding shall be by aluminum oxide, zirconium oxide, or silicon carbide grinding wheels that shall not have been used on carbon or low alloy steels. Hand or power wire brushing shall be by stainless steel brushes that shall not have been used on carbon or low alloy steels for stainless steel pipe. Hand or power wire brushing shall be by Carpenter 20 brushes that shall not have been used on carbon or low alloy steels for Carpenter 20 pipe. Hand or power wire brushing

shall be by Hastelloy C276 brushes that shall not have been used on carbon or low alloy steels for Hastelloy C276 pipe. All tools used in fabrication shall be protected to minimize contact with steel alloys or free iron. Grinding wheels and brushes shall be identified and controlled for their use on these materials only to ensure that contamination of these materials does not occur.

Antispatter compounds, marking fluids, marking pens, tape, temperature indicating crayons, and other tools shall have a total halogen content of less than 200 parts per million.

Heat input control for welding shall be specified in the applicable WPS and shall not exceed 55,000 joules per inch (22,000 joules per cm) as determined by the following formula:

$$\text{Heat Input (J/in.)} = \frac{\text{Voltage} \times \text{Amperage} \times 60}{\text{Travel Speed (in./min.)}}$$

Complete penetration pressure retaining welds shall be made using the Gas Tungsten Arc Welding (GTAW) process for the root and second layer as a minimum.

Austenitic stainless steel instrument tubing shall be welded using only the GTAW process.

Socket welds or butt welds in all austenitic stainless steel instrument tubing lines shall require an inert gas backing (purge) using argon during welding to avoid oxidation.

The application of heat to correct weld distortion and dimensional deviation without prior written approval from the Engineer is prohibited.

Unless otherwise approved in writing, the GTAW process shall require the addition of filler metal.

The maximum preheat and interpass temperature for austenitic stainless steel shall be 350° F (176° C). The minimum preheat temperature shall be 50° F (10° C).

Complete joint penetration welds welded from one side without backing, weld repairs welded from one side without backing, or weld repairs in which the base metal remaining after excavation is less than 0.1875 inch from being through wall, which are fabricated from austenitic stainless steel ASME P-number 8 base metal or unassigned metals with similar chemical compositions, shall have the root side of the weld purged with an argon backing gas prior to welding. Backing gas (purge) shall only be argon. The argon backing gas shall be classified as

welding grade argon or shall meet Specification SFA-5.32, AWS Classification SG-A. The backing gas (purge) shall be maintained until a minimum of two layers of weld metal have been deposited.

2-3. SHOP CLEANING AND PICKLING OF STAINLESS STEEL PIPING AND WELDS. All stainless steel piping shall be thoroughly cleaned and pickled at the mill in accordance with ASTM A380.

Pickling shall produce a modest etch and shall remove all embedded iron and heat tint. After fabrication, pickled surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron. All pickled surfaces damaged during fabrication including welded areas shall either be mechanically cleaned or repickled or passivated in accordance with ASTM A380. Materials that have been contaminated with steel alloys or free iron shall not be used until all contamination is removed. When cleaning to remove steel or iron contamination is required, it shall be performed in accordance with ASTM A380, Code D requirements. Mechanical cleaning is not an acceptable cleaning method for oxygen or ozone piping. Oxygen and ozone piping shall be repickled or passivated as specified herein. All stainless steel surfaces shall be adequately protected during fabrication, shipping, handling, and installation to prevent contamination from iron or carbon steel objects or surfaces. Particulate matter shall be removed from piping and welds. Labels shall be affixed to the piping sections to indicate shop cleaning has been performed. Welds shall be either mechanically cleaned or pickled or passivated on the exterior of the pipe.

For buried piping, at least the exterior of all welds shall be passivated.

2-4. HIGH TEMPERATURE EPOXY COATING. Not used.

2-5. INSULATING FITTINGS. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.

### PART 3 - EXECUTION

3-1. INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

SECTION 15065 MISCELLANEOUS STEEL PIPE, TUBING, AND  
ACCESSORIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of miscellaneous steel pipe, tubing and accessories that for pipe diameters 24 inches [600 mm] and smaller. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

Steel pipe for potable and non-potable water conveyance are covered in the Steel Pipe section.

1-2. GENERAL.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

Name of Manufacturer  
Type and model  
Construction materials, thickness, and finishes  
Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.



2-2. STEEL PIPE. Steel pipe materials and service shall be as specified herein.

2-2.01. Material Classification CS-1. Not used.

2-2.02. Material Classification CS-2. Not used.

2-2.03. Material Classification CS-3. Not used.

2-2.04. Material Classification CS-4. Not used.

CS-4 – Extra Strong Steel with Threaded Fittings.  Fuel oil or diesel fuel piping in interior locations or outdoors above grade (seal weld).  3 inch and smaller.	Pipe	ASTM A53/A106, Type S, extra strong, Grade B; Threaded ends.
	Fittings	Forged steel, threaded. Fittings shall conform to ANSI B16.11, Class 2000 or 3000; Bonney, Crane, Ladish, or Vogt.

2-2.15. Accessory Materials. Accessory materials for the miscellaneous steel pipe and tubing systems shall be as indicated.

Nipples	ASTM A733, seamless, extra strong (Schedule 80); "close" nipples will be permitted only by special authorization in each case.
Unions (Malleable Iron)	Fed Spec WW-U-53I, Class 2; Type B (galvanized) for galvanized pipe or Type A (black) for ungalvanized pipe.
Flanges	
Standard Weight Pipe	ANSI/ASME B16.5, Class 150, flat faced when connected to flat faced flanges; otherwise, raised face.
Extra Strong Pipe	
Other services	ANSI/ASME B16.5, Class 300, raised face.

Flange Bolts and Nuts	ASTM A193, Grade B7 with ASTM A194 Grade 2H nuts. Length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
Flange Gaskets	
For Oil Service	Non-asbestos filler with neoprene or nitrile binder; dimensions to suit flange contact face; 1/16 inch minimum thickness for plain finished surfaces, 3/32 inch minimum thickness for serrated surfaces.
For Other Services	
Flat Faced Flanges	Non-asbestos filler with neoprene or nitrile binder; dimensions to suit flange contact face; 1/16 inch minimum thickness for plain finished surfaces, 3/32 inch minimum thickness for serrated surfaces.
Raised Face Flanges	Continuous stainless steel ribbon wound into a spiral with non-asbestos filler between adjacent coils with a carbon steel gauge ring. Compressed gasket thickness shall be 0.095 inch ±0.005 inch.

2-3. COATINGS. Standard weight steel pipe in buried locations, except hot piping such as aeration air piping, shall have exterior surfaces protected with a shop applied plastic coating. Coatings for hot piping shall be as specified.

Extra strong steel pipe in buried locations shall have exterior surfaces protected with a shop applied plastic coating.

Shop applied coatings shall be as follows:

External Coatings	
Plastic	Liberty Coating Company "Pritec" or Bredero-Shaw "Entec". The products of other manufacturers will not be acceptable.
Tape Wrap	ANSI/AWWA C209, except single ply tape thickness shall not be less than 30 mils; Protecto Wrap "200" or Tapecoat "CT".

PART 3 - EXECUTION

3-1. INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

SECTION 15067 MISCELLANEOUS PLASTIC PIPE, TUBING, AND  
ACCESSORIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of miscellaneous plastic pipe, tubing, and accessories. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, jointing materials and other necessary appurtenances.

1-2. SUBMITTALS.

1-2.01. Drawings and Data. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

Name of Manufacturer  
Type and model  
Construction materials, thickness, and finishes  
Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1-3. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

Pipe, tubing, and fittings shall be stored between 40°F and 90°F [4°C and 32°C].

PART 2 - PRODUCTS

2-1. FRP PIPE. Not used.

2-2. PVC PIPE MATERIALS. PVC pipe materials and services shall be as specified herein.

2-2.01. Material Classification PVC-1. Not used.

2-2.02. Material Classification PVC-2.

PVC-2 – Schedule 80 PVC Pipe with Solvent Welded Joints.	Pipe	ASTM D1785, Cell Classification 12454, bearing NSF seal, Schedule 80.
Sleeves for copper tubing.	Fittings	ASTM D2467, Cell Classification 12454, bearing NSF seal. Flanges or unions shall be provided where needed to facilitate disassembly of equipment or valves. Flanges or unions shall be joined to the pipe by a solvent weld. When acceptable to Engineer, threaded joints may be used instead of solvent welded joints in exposed interior locations for the purpose of facilitating assembly. The use of threaded joints in this system shall be held to a minimum.

2-2.03. Accessory Materials. Accessory materials for the PVC Pipe systems shall be as indicated.

Flanges	Diameter and drilling shall conform to ANSI/ASME B16.5, Class 150. Schedule 80 for DWV systems.
Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch [3 to 10 mm] beyond outer face of the nut.  Stainless steel for DWV and chemical feed systems, galvanized steel for all other systems.
Flat Washers	ANSI B18.22.1, plain. Same material as bolts and nuts.

Flange Gaskets

Full face, 1/8 inch [3 mm] thick, chemical-resistant elastomeric material suitable for the specified service.

PART 3 - EXECUTION

3-1. INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

## SECTION 15070 COPPER TUBING AND ACCESSORIES

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers the furnishing of copper tubing and accessories. Copper tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

### 1-2. SUBMITTALS.

**1-2.01. Drawings and Data.** Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Construction Schedule & Project Restraints section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

Name of Manufacturer  
Type and model  
Construction materials, thickness, and finishes  
Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

**1-3. DELIVERY, STORAGE, AND HANDLING.** Shipping shall be in accordance with the Special Project Procedures section. Handling and storage shall be in accordance with the Storage and Protection section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

### PART 2 - PRODUCTS

**2-1. MATERIALS.** Copper tubing materials and service shall be as specified herein.

**2-1.01. Material Classification CU-1.** Not used.

**2-1.02. Material Classification CU-2.** Not used.

**2-1.03. Material Classification CU-3.** Not used.

**2-1.04. Material Classification CU-4.** Not used.

**2-1.05. Material Classification CU-5.** Not used.

**2-1.06. Material Classification CU-6.** Not used.

**2-1.07. Material Classification CU-7.**

CU-7 – ARC Tubing with Brazed Fittings	Tubing	Hard drawn ACR copper tubing, ASTM B280. Dimensions shall be in accordance with ASTM B280.
Refrigerant piping.	Fittings	Brazed.

**2-1.08. Accessory Materials.** Accessory materials for the copper tubing systems shall be as indicated.

Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
Flange Gaskets	ASTM D1330, Grade I, red rubber, ring type, 1/8 inch thick.
Expansion Joints	Tempflex "Model HB Expansion Compensators" with copper tube ends.
Insulating Fittings	
Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, poly-propylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	EpcO "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

### **PART 3 - EXECUTION**

**3-1. INSTALLATION.** Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

**END OF SECTION**

**DIVISION 15      MECHANICAL**

**SECTION 15094    PIPE HANGERS AND SUPPORTS**

**PART 1            GENERAL**

**1.01            SCOPE OF WORK**

Furnish all labor, materials, equipment and incidentals and install pipe hangers, supports, concrete inserts and anchor bolts including all metallic hanging and supporting devices for supporting exposed piping.

**1.02            QUALIFICATIONS**

- A. Hangers and supports shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions. The minimum working factor of safety for pipe supports shall be five (5) times the ultimate tensile strength of the material.

Note: Lift Stations have their own pipe support hanger and support design and detail, shown in the Utility Standards if not shown on the plans.

- B. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the Contractor shall submit a certification stating that such requirements have been complied with.

**1.03            SUBMITTALS**

- A. Submit to the County for approval, as provided in the Contract Documents, shop drawings of all items to be furnished under this Section.
- B. Submit to the County, for approval, samples of all materials specified herein.
- C. All pipe hangers, supports, hanger rods, clamps, concrete inserts and wall brackets, etc., whether specified or not, shall be submitted (together with load calculations) to the County for approval, if requested.

**PART 2            PRODUCTS**

**2.01            GENERAL**

- A. All pipe and tubing shall be supported as required to prevent significant stresses in the pipe or tubing material, valves, and fittings and to support and secure the pipe in the intended position and alignment. All supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact. All pipe supports shall be approved prior to installation.
- B. All materials used in manufacturing hangers and supports shall be capable of meeting the respective ASTM Standard Specifications with regard to tests and physical and chemical properties, and be in accordance with MSS SP-58.

- C. Hangers and supports shall be spaced in accordance with ANSI B31.1.0 except that the maximum unsupported span shall not exceed 10 feet unless otherwise specified herein.
- D. Unless otherwise specified herein, pipe hangers and supports shall be as manufactured by Grinnell Co., Inc., Carpenter and Patterson, Inc., or equal. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary. Any item comparable in type, style, quality, design and performance will be considered for approval.

**2.02 PIPE HANGERS AND SUPPORTS FOR METAL PIPE**

- A. Suspended single pipes shall be supported by hangers suspended by steel rods from galvanized concrete inserts, beam clamps, or ceiling mounting bolts.

The following sizes are minimum requirements and are subject to the County's approval:

- 1. Hanger rods shall be rolled steel machine threaded with load ratings conforming to ASTM Specifications and the strength of the rod shall be based on root diameter. Hanger rods shall have the following minimum diameters:

<u>Pipe Size, Inches</u>	<u>Min. Rod Diameter, In.</u>
Less than 2-1/2	3/8
2-1/2 through 4	1/2
4	5/8
6	3/4
8-12	7/8
14-18	1
20-30	1-1/4
Above 30	See SPECIAL SUPPORTS Paragraph 2.04

- 2. Where applicable, structural attachments shall be beam clamps. Beam clamps, for rod sizes 1/2-inch through 3/4-inch shall be equal to Grinnell Fig. No. 229, and for rod sizes 7/8-inch through 1-1/4 inches shall be equal to Grinnel Fig. No. 228, or equal.
- 3. Concrete inserts for pipe hangers shall be continuous metal inserts designed to be used in ceilings, walls or floors, spot insets for individual pipe hangers, or ceiling mounting bolts for individual pipe hangers and shall be as manufactured by Unistrut Corp., Wayne, Michigan; Carpenter and Patterson, Inc., Laconia, New Hampshire; Richmond or equal and shall be as follows:
  - a. Continuous concrete inserts shall be used where applicable and/or as shown on the Drawings and shall be used for hanger rod sizes up to and including 3/4-inch diameter. Inserts to be used where supports are parallel to the main slab reinforcement shall be Series P3200 by Unistrut Corp., Fig. 1480 Type 2 by Carpenter and Patterson, Inc. or equal. Inserts to be used where supports are perpendicular to the main slab reinforcement shall be Series P3300 by Unistrut Corp., Fig. 1480 Type I by Carpenter and Patterson, Inc., or equal.
  - b. Spot concrete inserts shall be used where applicable and shall be used for hanger sizes up to and including 7/8-inch diameter. Inserts shall be Fig. 650 by Carpenter and Patterson, Inc. for hanger rod sizes 1/2-inch through and including 3/4-inch and Fig. 266 by Carpenter and Patterson, Inc., for 7/8-inch hanger rods.

- c. Ceiling mounting bolts shall be used where applicable and be for hanger rod sizes 1-inch through and including 1-1/4 inches shall be Fig. 104M as manufactured by Carpenter and Patterson, Inc. or equal.
  - d. All pipe hangers shall be capable of vertical adjustment under load and after erection. Turnbuckles, as required and where applied, shall be equal to Grinnell Fig. No. 230.
4. Wall or column supported pipes shall be supported by welded steel brackets equal to Grinnell Fig. 194, 195 and 199 as required, for pipe sizes up to and including 20-inch diameter. Additional wall bearing plates shall be provided where required.
- a. Where the pipe is located above the bracket, the pipe shall be supported by an anchor chair and U-bolt assembly supported by the bracket for pipes 4-inches and larger or by a U-bolt for pipes smaller than 4-inches. Anchor chairs shall be equal to Carpenter & Patterson Fig. 127. U-bolts shall be equal to Grinnell Fig. 120 and 137.
  - b. Where the pipe is located below the bracket, the pipes shall be supported by pipe hangers suspended by steel rods from the bracket. Hangers and steel rods shall be as specified above.
  - c. Wall or column supported pipes 2-inches and smaller may be supported by hangers equal to Carpenter and Patterson Figures 74, 179 or 237 as required.
5. Floor supported pipes 3-inches and larger in diameter shall be supported by either cast-in-place concrete supports or adjustable pipe saddle supports as directed by the County. In general, concrete supports shall be used when lateral displacement of the pipes is probable (unless lateral support is provided), and adjustable pipe saddle type supports shall be used where lateral displacement of the pipes is not probable.
- a. Each concrete support shall conform to the details shown on the Drawings. Concrete shall be poured after the pipe is in place with temporary supports. Top edges and vertical corners of each concrete support shall have 1-inch bevels. Each pipe shall be secured on each concrete support by a wrought iron or steel anchor strap anchored to the concrete with cast-in-place bolts or with expansion bolts. Where directed by the County, vertical reinforcement bars shall be grouted into drilled holes in the concrete floor to prevent overturning or lateral displacement of the concrete support. Unless otherwise approved by the County, maximum support height shall be five (5) feet.
  - b. Concrete piers used to support base elbows and tees shall be similar to that specified above.  
Piers may be square or rectangular.
  - c. Each adjustable pipe saddle support shall be screwed or welded to the corresponding size 150 lb. companion flanges or slip-on welding flanges respectively. Supporting pipe shall be of Schedule 40 steel pipe construction. Each flange shall be secured to the concrete floor by a minimum of two (2) expansion bolts per flange. Adjustable saddle supports shall be equal to Grinnell Fig. No. 264. Where used under base fittings, a suitable flange shall be substituted for the saddle.
  - d. Floor supported pipes less than 3-inches shall be supported by fabricated steel supports.
6. Vertical piping shall be supported as follows:
- a. Where pipes change from horizontal to vertical, the pipes shall be supported on the horizontal runs within two feet of the change in direction by pipe supports as previously specified herein.
  - b. For vertical runs exceeding 15 feet, pipes shall be supported by approved

- pipe collars, clamps, brackets, or wall rests at all points required to insure a rigid installation.
- c. Where vertical piping passes through a steel floor sleeve, the pipe shall be supported by a friction type pipe clamp which is supported by the pipe sleeve. Pipe clamps shall be equal to Grinnell Fig. 262.
- 7. Anchor bolts shall be equal to Kwik-Bolt as manufactured by Hilti Fastening Systems, Tulsa, Oklahoma or Wej-it manufactured by Wej-it Expansion Products, Inc., Bloomfield, Colorado.
  - 8. All rods, hangers, inserts, brackets, and components shall be furnished with galvanized finish.

## **2.03 PIPE HANGERS AND SUPPORTS FOR PLASTIC PIPE**

- A. Single plastic pipes shall be supported by pipe supports as previously specified herein.
- B. Multiple, suspended, horizontal plastic pipe runs, where possible, and rubber hose shall be supported by ladder type cable trays such as the Electray Ladder by Husky-Burndy, the Globetray by the Metal Products Division of United States Gypsum, or equal. Ladder shall be of mild steel construction. Rung spacing shall be approximately 18 inches for plastic pipe and 12 inches for rubber hose. Tray width shall be approximately 6-inch for single runs of rubber hose and 12 inches for double runs of rubber hose. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc. required for a complete support system. Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners equal to Globe Model M-CAC, Husky-Burndy Model SCR or equal. Spacing between clamps shall not exceed 9 feet. The cable trays shall provide continuous support along the length of the pipe.
- C. Individual clamps, hangers, and supports in contact plastic pipe shall provide firm support, but not so firm as to prevent longitudinal movement due to thermal expansion and contraction.

## **2.04 SPECIAL SUPPORTS**

- A. The pipes shall be supported by means of a supporting framework suitably anchored into the floor or curbing. The vertical piping shall be suitably secured to horizontal support members connected at each end to vertical support members and spaced as required to provide a rigid installation.
  - 1. The complete supporting system shall be as manufactured by the Unistrut Corporation, Globe-Strut as manufactured by the Metal Products Division of U.S. Gypsum, or equal.
  - 2. Vertical and horizontal supporting members shall be U-shaped channels similar to Unistrut Series P1000. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps equal to Unistrut Series P1100M and Series P2558. All components shall be of mild steel.
  - 3. The assemblies shall be furnished complete with all nuts, bolts, and fittings required for a complete assembly.
  - 4. The design of each individual framing system shall be the responsibility of the Contractor. Shop drawings shall be submitted and shall show all details of the installation including dimensions and types of supports.
- B. Any required pipe supports for which the supports specified in the Section are not applicable, including pipe supports for above 30-inch pipe, shall be fabricated or constructed

from standard aluminum shapes in accordance with Specifications, concrete and anchor hardware similar to items previous specified herein and shall meet the minimum requirements listed below and be submitted to the approval of the County.

1. Pipe support systems shall meet all requirements of this Section and all related Sections of this Specification.
  2. Complete design details of the entire pipe support systems shall be provided by the Contractor, for approval by the County.
  3. The pipe support system shall not impose loads on the supporting structures, in excess of the loads for which the supporting structure is designed.
  4. Hanger rods for above 30-inch pipe shall be a minimum of 1-1/2 inch diameter and shall not exceed the manufacturer's standard maximum recommended safe load.
- C. Pipe supports in lift stations shall be as shown in the Utility Standards details.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. All pipes, horizontal and vertical, shall be rigidly supported from the building structure by approved supports. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or specified herein. No piping shall be supported from other piping or from metal stairs, ladders, and walkways, unless it is so indicated on the Drawings, or specifically directed or authorized by the County.
- B. All pipe supports shall be designed with liberal strength and stiffness to support the respective pipes under the maximum combination of peak loading conditions to include pipe weight, liquid weight, liquid movement, and pressure forces, thermal expansion and contraction, vibrations, and all probable externally applied forces. Prior to installation, all pipe supports shall be approved by the County.
- C. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings, and sleeve type couplings and to minimize all pipe forces to pump housings. Pump housings shall not be utilized to support connecting pipes.
- D. Pipe supports shall be provided as follows:
  1. Cast iron and ductile iron shall be supported at a maximum support spacing of 10 feet-0-inches with a minimum of one support per pipe section at the joints.
  2. Supports for multiple PVC pipes shall be continuous wherever possible. Individually supported PVC pipes shall be supported as recommended by the manufacturer except that support spacing shall not exceed five (5) feet.
  3. Support spacing for galvanized steel pipe and copper tubing shall not exceed five (5) feet.
  4. All vertical pipes shall be supported at each floor or at intervals of at least 15 feet by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to insure rigid construction.
- E. Pipe supports shall not result in point loadings, but shall distribute pipe loads evenly along the pipe circumference.
- F. Effects of thermal expansion and contraction of the pipe shall be accounted for in pipe support selection and installation.

- G. Inserts for pipe hangers and supports shall be installed on forms before concrete is poured. Before setting these items, all drawings and figures shall be checked which have a direct bearing on the pipe locations. Responsibility for the proper location of pipe supports is included under this Section.
- H. Continuous metal inserts shall be embedded flush with the concrete surface.

**3.02 PRIME COATING**

- A. Prior to prime coating, all pipe hangers and supports shall be thoroughly clean, dry, and free from all mill-scale, rust, grease, dirt, paint, and other foreign substances to the satisfaction of the County.
- B. All submerged pipe supports shall be prime coated with TNEMEC 69-1211 Epoxy Primer or equal. All other pipe supports shall be prime coated with TNEMEC 66-1211, or equal.
- C. Finish coating shall be compatible with the prime coating used and shall be applied as specified in the Contract Documents.

**END OF SECTION**

## SECTION 15250 MECHANICAL INSULATION

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers the furnishing and installation of insulation, jackets, and accessories for the following mechanical systems:

- piping

Building insulation materials are specified in other sections. Insulation for mechanical equipment which is to be applied at the factory prior to shipment is specified in the individual equipment sections.

**1-2. GENERAL.** Materials furnished and installed under this section shall be in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

**1-2.01. Coordination.** Contractor shall be responsible for coordinating the installation of insulation with the installation of the items or systems to be insulated. Each item or system shall be tested and accepted by Engineer before installation of the insulation materials.

Contractor shall verify that each component of the insulation systems is compatible with all other parts of the system; that all insulation materials are appropriate for the intended applications; and that all necessary devices and accessories have been provided.

All insulation of the same class shall be the product of a single manufacturer; however, all the insulation types need not be the products of one manufacturer.

**1-2.02. General Equipment Stipulations.** The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

**1-2.03. Governing Standards.** Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern. All work shall comply with UL, NFPA, and ASTM safety requirements.

**1-2.04. Metal Thickness.** Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

**1-2.05. Surface Burning Characteristics.** Insulation, jackets, tapes, and adhesives to be used indoors shall have a composite flame spread rating not to exceed 25 and a composite smoke developed rating of 50 when tested by UL 723, NFPA 255, or ASTM E84. All testing shall be done on materials of the same densities and installed thicknesses as the materials being installed. Insulation materials which have been treated with a flame retardant additive to meet the required flame spread and smoke developed ratings are not acceptable.

**1-2.06. Painting and Identification.** Field painting and identification shall be as specified in the Protective Coatings section.

### **1-3. SUBMITTALS.**

**1-3.01. Drawings and Data.** A complete list of materials and catalog cuts, together with detailed specifications, materials performance data, installation instructions, parts, devices, and accessories furnished, shall be submitted in accordance with the Construction Schedule & Project Restraints section. Information shall include certified test results to show compliance with UL, NFPA, and ASTM safety requirements.

### **1-4. QUALITY ASSURANCE.**

**1-4.01. Manufacturer Experience.** A manufacturer shall have furnished material of the type specified which has been in successful operation for not less than the past 5 years.

**1-5. DELIVERY, STORAGE, AND HANDLING.** Shipping shall be in accordance with the Special Project Procedures section. Handling and storage shall be in accordance with the Storage and Protection section.

## **PART 2 - PRODUCTS**

**2-1. ACCEPTABLE MANUFACTURERS.** Acceptable manufacturers shall be as listed in the respective product description paragraphs.

**2-2. MATERIALS.** Insulation, vapor retarders, and field applied jackets shall be installed to cover piping, ductwork, equipment, fittings, and appurtenances as indicated in the Insulation Schedule.

## **2-2.01. Pipe Insulation.**

**2-2.01.01. Type PMF1 Insulation.** Type PMF1 mineral fiber pipe insulation shall be Johns Manville "Micro-Lok", Knauf "Pipe Insulation" or Owens-Corning.

Type PMF1 pipe insulation shall be a one-piece molded glass fiber material with all-purpose jacket. The all-purpose jacket shall be factory-applied, fiberglass reinforced vapor barrier type, with white kraft bonded to aluminum foil and self sealing adhesive lap. The insulation shall be suitable for a temperature range of 0°F to 850°F, shall have a maximum thermal conductivity (k) of 0.24 Btu in/hr ft<sup>2</sup> °F at 75°F, and shall conform to ASTM C547.

**2-2.01.02. Type PMW1 Insulation.** Not used.

**2-2.01.03. Type PFC1 Insulation.** Type PFC1 flexible cellular elastomeric pipe insulation shall be Armacell "AP/Armaflex" or K-Flex USA "Insul-Tube" for unslit insulation and Armacell "AP/Armaflex SS" or K-Flex USA "Insul-Lock Seam-Seal" for factory pre-slit insulation. Flexible cellular polyolefin foam insulation shall be IMCOA "Imcolock" or Plastic Technology, Inc. "Innofoam".

Type PFC1 pipe insulation shall be one-piece, molded elastomeric or polyolefin foam insulation suitable for a temperature range of -40°F to 180°F, and shall have a maximum thermal conductivity (k) of 0.28 Btu in/hr ft<sup>2</sup> °F at 75°F. The insulation shall be suitable for exposure to weather and direct sunlight or, where not indicated to be jacketed, shall be given two coats of an ultraviolet-resistant finish recommended by the manufacturer. Insulation shall conform to ASTM C534 for elastomeric or ASTM C1427 for polyolefin.

## **2-3. ACCESSORIES.**

**2-3.01. PVC Insulation Jackets.** Not used.

**2-3.02. Aluminum Insulation Jackets.** Aluminum insulation jackets for insulated piping systems shall be furnished and installed as indicated in the insulation schedule herein and where indicated on the Drawings. Aluminum jackets shall be manufactured from alloys 3003 and 3105 conforming with ASTM B209. The aluminum jacket shall have a nominal thickness of 0.020 in., with an embossed finish.

Fittings in insulated piping systems and equipment where indicated in the insulation schedule shall be provided with aluminum jackets of the same aluminum jacketing material as the piping systems. The jacket shall have a factory-applied moisture retarder of at least 3 mils permanently bonded to the interior surface and extending the full width of the jacket. The retarder shall consist of Polysurlyn or polyethylene film and kraft paper.

## **PART 3 - EXECUTION**

### **3-1. INSTALLATION.**

**3-1.01. General.** Contractor shall install all insulation materials as specified herein for the piping systems, ductwork, and equipment that are not factory insulated. Insulation materials shall be installed in accordance with the manufacturer's written instructions and recommendations. Surfaces to be insulated shall be cleaned and dried. All work shall be performed within the temperature ranges recommended by the insulation product manufacturer. Insulation shall be kept clean and dry and shall remain in the factory container until it is installed. Packages or factory containers shall bear the manufacturer's stamp or label with the name of the manufacturer and description of materials.

Seams of exposed insulation and jackets shall be in the least visible location.

#### **3-1.02. Piping Insulation.**

**3-1.02.01. Type PMF1 Insulation.** Pipe insulation, vapor retarders, and field applied jackets shall be installed to cover system piping, fittings, and appurtenances. Insulation shall be full factory unit lengths using a single cut piece to complete the run. Abutting cut pieces or scraps shall not be used. End joints and longitudinal seams shall be tightly butted. Insulation for fittings shall be of the same thickness and conductivity as the adjoining pipe insulation.

Insulated piping conveying fluids at lower than ambient temperatures shall be jacketed with a continuous vapor barrier. The insulation shall be continuous through hangers and penetrations, except at firewall penetrations, and shall be sealed with vapor barrier coating. The vapor barrier coating shall be applied at intervals not exceeding 15 feet for straight runs and not more than 6 inches from fittings. Fibrous insulation laps and butt strips that are not self-sealing shall be secured with adhesive and stapled. Staples and seams shall be coated with vapor barrier material.

On piping 2 inches and larger where the insulation is continuous through the hanger, an insert shall be installed between the support shield and piping. The insert shall be of the same thickness and contour as the adjacent insulation and installed to maintain a continuous vapor barrier through the support. The insert shall be constructed of wood or heavy density insulating material suitable for the system operating temperatures.

**3-1.02.02. Type PMW1 Insulation.** Not used.

**3-1.02.03. Type PFC1 Insulation.** Pipe insulation shall be installed to cover all pipe, fittings, and appurtenances with all seams and joints sealed by a factory or field applied adhesive. Insulation at fittings and appurtenances shall be carefully formed and fitted. Insulation at elbows shall be mitered using segments of pipe insulation.

**3-1.03. PVC Jacketing.** Not used.

**3-1.04. Aluminum Jacketing.** Aluminum jacketing for piping systems shall be installed as specified herein and indicated on the Drawings. Jacketing shall be held in place with stainless steel securing bands uniformly spaced at not more than 18 inches to produce tight joints without "bulging". The jacket shall overlap at least 2 inches at longitudinal and circumferential joints. Joints shall be overlapped and sealed with caulk to prevent moisture penetration, and longitudinal joints shall be placed to shed water. Exposed ends of pipe insulation shall be provided with covers constructed of the same material as the jacketing.

Elbows shall be jacketed with spirally wrapped aluminum strips or individual mitered segments or gores cut to fit the insulation.

**3-2. INSULATION SCHEDULE.**

INSULATION SCHEDULE				
Service	Size Inches	Mechanical Insulation		Notes
		Type	Thickness Inches	
<b>PIPING - INDOOR (CONCEALED OR EXPOSED)</b>				
Condensate Drain	All	PMF1	1	(2)
Refrigerant Suction and Hot Gas Bypass	Up to 1 1 & larger	PFC1	1-1/2	
		PFC1	1-1/2	
<b>PIPING - OUTDOOR (EXPOSED)</b>				
Refrigerant Suction and Hot Gas Bypass	Up to 1 1 & larger	PFC1	1-1/2	(1)
		PFC1	1-1/2	
Mechanical Insulation Types: FC - Flexible Cellular MF - Mineral Fiber  Notes: (1) Aluminum jacket. (2) Insulation shall be provided for portions of the piping system which pass through space above finished ceilings or is exposed above equipment, electrical panels, or cabinets.				

Unless otherwise indicated in the insulation schedule, all mechanical piping, ductwork, equipment, and accessories with an operating temperature in excess of 140°F and below 60°F shall be insulated.

**END OF SECTION**

## SECTION 15500 HEATING, VENTILATING, AND AIR CONDITIONING

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers the furnishing and installation of heating, ventilating, and air conditioning (HVAC) equipment, devices, and appurtenances associated with the HVAC systems.

Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

**1-2. GENERAL.** Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

**1-2.01. Coordination.** Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided.

Where two or more units of the same class of equipment are needed, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

**1-2.02. General Equipment Stipulations.** The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

**1-2.03. Seismic Design Requirements.** Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

**1-2.04. Governing Standards.** Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with UL safety requirements.

**1-2.05. Power Supply.** Power supply to equipment with motors shall be as indicated in schedules on the Drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise required for a properly operating system.

**1-2.06. Metal Thickness.** Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

**1-2.07. Mechanical Identification.** Mechanical identification shall conform to the requirements of the Basic Mechanical Building Systems Materials and Methods section.

### **1-3. SUBMITTALS.**

**1-3.01. Drawings and Data.** Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Construction Schedule & Project Restraints section. Device tag numbers indicated on the Drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but shall not be limited to, the following:

#### Packaged Air Handling Units

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Capacities.

Filter velocities.

Overall dimensions and required clearances.

Net weight and load distribution.

Performance tables with the specified operating point clearly identified for each unit, type, and model, with capacity in cubic feet per minute[m<sup>3</sup>/s], speed or rpm, brake horsepower, and static pressure listed.

Multiline wiring diagrams clearly indicating factory installed and field installed wiring with all terminals identified.

Electrical requirements including voltage, number of phases, and amperage.

## Fans

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Overall dimensions and required clearances.

Net weight and load distribution.

Performance curves with the specified operating point clearly identified for each unit, type, and model, with capacity in cubic feet per minute [m3/s] as the abscissa and brake horsepower, static pressure, and efficiency as the ordinate. The fan curves shall include a family of curves for at least 3 different rotative speeds on a single chart.

Certified AMCA standard test code sound power output data for the fan outlet and casing when operating at the specified volume flow rate.

Sound data shall list dB re 10-12 watts in each octave band, with midrange frequencies starting at 63 Hz and ending at 8,000 Hz.

## Equipment (not specifically listed)

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Manufacturer's performance data.

Overall dimensions and required clearances.

Net weight and load distribution.

Wiring diagrams.

## Sheet Metal Ductwork

Sheet metal duct fabrication drawings indicating dimensions of individual shop and field fabricated sections, top and/or bottom duct elevations, joint locations, and dimensions of duct from walls or column rows.

Pressure and seal classifications.

Reinforcement types and spacing.

Joint and seam types.

Hanger and support types, spacing, and attachment methods.

Access panel and door construction, sizes, and locations.

Duct sealant, adhesive, gasket, and tape information.

## Temperature Controls

Published descriptive data on each item of equipment and accessories, indicating all specific characteristics and options and identified with the designation used herein and on the Drawings.

Schematic control diagrams giving specific data on all settings, ranges, actions, adjustments, and normal positions. Although schematic, these diagrams shall, as closely as possible, represent the actual system with all significant equipment and devices identified and located relative to each other.

These diagrams shall also show detailed multiline wiring with all terminals accurately identified. The wiring diagrams shall show all field wiring to equipment, including wiring to Owner-furnished equipment. The wiring diagrams shall be complete, showing all connections necessary to place the temperature control systems in operation. Wiring diagrams shall be detailed to the degree necessary for field construction and shall include all related wiring.

Sequence of operation for each system corresponding to the control schematics.

Space thermostat schedule indicating the types of covers and means of adjustment for each space.

Conduit and wire types.

**1-3.02. Operation and Maintenance Data and Manuals.** Adequate operation and maintenance information shall be supplied as required in the Construction Schedule & Project Restraints section. Operation and maintenance manuals shall be submitted in accordance with the Construction Schedule & Project Restraints section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

In addition to the requirements of the Construction Schedule & Project Restraints section, the operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

**1-4. QUALITY ASSURANCE.** Quality assurance shall comply with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

**1-5. DELIVERY, STORAGE, AND HANDLING.** Shipping shall be in accordance with the Special Project Procedures section. Handling and Storage shall be in accordance with the Storage and Protection section.

**1-6. EXTRA MATERIALS.** Extra materials shall be furnished for the equipment as specified in the individual equipment paragraphs.

Extra materials shall be packaged in accordance with the Storage and Protection section, with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, equipment designation, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to Owner as directed.

Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.

## **PART 2 - PRODUCTS**

**2-1. SERVICE CONDITIONS.** All equipment shall be designed and selected to meet the specified conditions.

**2-2. PERFORMANCE AND DESIGN REQUIREMENTS.** Equipment and coil capacities shall be as indicated on the schedules. Where equipment is provided with special coatings, unit capacities shall be corrected to account for any efficiency losses from the selected special coating.

Each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve to the left of the peak pressure/efficiency point.

**2-2.01. Dimensional Restrictions.** Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

**2-3. ACCEPTABLE MANUFACTURERS.** Acceptable manufacturers shall be as listed in the respective product description paragraphs.

### **2-4. MATERIALS.**

**2-4.01. Gas Vent Systems.** Not used.

**2-4.02. Packaged Air Handling Units.** Packaged air handling units, denoted by the symbol "PAH" and an identifying number, shall be furnished and installed where indicated on the Drawings. Each unit shall be designed for indoor vertical or horizontal installation as indicated on the Drawings consisting of cabinet, coil(s), filter, drain pan, fan, and motor. Surfaces in contact with the airstream shall comply with the requirements of ASHRAE 62.1. The air handling unit manufacturer and model shall be Trane "TWE", Carrier, or York.

#### **2-4.02.01. Extra Materials.**

<u>Extra Materials</u>	<u>Quantity</u>
Sets of matched belts per unit	1
Sets of air filters per unit	2

**2-4.02.02. Performance and Design Requirements.** The units shall be completely factory assembled and tested, piped, internally wired, and shipped in one piece. Each unit shall be designed for direct expansion cooling suitable for use with the specified refrigerant. The unit shall be suitable for the power supply and shall have the capacities indicated on the Drawings.

**2-4.02.03. Cabinet.** The unit shall be constructed of zinc-coated steel properly reinforced and braced for maximum rigidity. The unit shall be given a factory-applied coat of rust-inhibitive primer and shall be provided with the manufacturer's standard enamel finish. Interior surfaces of the unit shall have 1 inch thick, 1 lb density, insulation foil faced or coated on the air side. Removable panels shall be provided to permit easy inspection and maintenance.

**2-4.02.04. Coil Section.** The coil shall be multirow of seamless copper tubing mechanically bonded to heavy-duty aluminum fins. The coil shall be factory pressure and leak tested to at least 300 psig or greater as needed for the system operating pressures. The coil shall be provided with expansion device or valve and filter-dryer. The coil section shall have fully insulated, sloped drain pan extending under the coil section and arranged to capture and collect any condensate including carryover that may be produced when the unit is operating within the specified operating conditions. The drain pan construction shall comply with the requirements of ASHRAE 62.1.

**2-4.02.05. Heating Section.** Not used.

**2-4.02.06. Fans and Motors.** The indoor supply fan shall be a double inlet, forward-curved, multiblade, centrifugal type statically and dynamically balanced by the unit manufacturer. The fan shall be direct or belt driven as indicated on the Drawings. Direct drive fan motors shall be multispeed with integral thermal-overload protection. Where belt driven fans are used, adjustable mounts and adjustable motor pulleys shall be provided.

Static pressure values indicated on the Drawings are external to the complete unit. Internal coil(s), filters and fan housing losses are not included. A filter allowance of 0.15 inch water column shall be used for 1 inch pleated filter losses and 0.35 inch water column shall be used for 2 inch pleated filter losses.

**2-4.02.07. Filters.** Filters shall be mounted integral within the unit and shall be 2 inches thick unless otherwise indicated on the Drawings. Filters shall conform to the requirements in the Air Filtration Equipment paragraph.

**2-4.02.08. Controls.** A thermostat for operation of the unit shall be furnished and installed as indicated on the Drawings. The thermostat shall be as needed to perform the sequence of operation as indicated on the Drawings. Thermostats

shall be programmable wall mounted type and shall conform to the requirements of the Thermostats paragraph.

**2-4.03. Furnaces.** Not used.

**2-4.04. Makeup Air Units.** Not used.

**2-4.05. Heaters.** Not used.

**2-4.06. Fans.** Fans shall be rated in accordance with AMCA standards, shall be licensed to bear the AMCA Certified Rating Label unless otherwise indicated in the Fan Schedule on the Drawings, and shall be UL listed. Surfaces in contact with the airstream shall comply with the requirements of ASHRAE 62.1.

Each fan shall be complete with an electric motor, factory mounted safety disconnect switch with wiring to the motor, drive, and accessories required for satisfactory operation. Belt-driven fans shall be complete with a V-belt drive designed for 50 percent overload capacity, sheaves, adjustable base or rails for belt tightening, and a belt guard. Adjustable pitch sheaves shall be furnished for fans with less than 10 horsepower motors and a single belt and fixed sheaves for 10 horsepower and larger motors with multiple belts. Adjustable sheaves shall be selected so that the fan speed at the specified conditions is at the mid-position of the sheave range. Sheaves shall be replaced with sheaves of the proper size after the air system balancing if necessary, to provide the required fan speed for the specified airflow.

Fan drive motors shall be as specified in the Electrical paragraph, unless otherwise indicated. Fans shall be suitable for use with the power supply indicated on the Drawings.

The external static pressure values indicated in the schedules on the Drawings are external to the complete unit. Internal fan housing and when furnished, backdraft damper and filter losses are not included.

A solid state variable speed controller shall be provided for each direct-driven fan motor less than 1/2 hp to balance the fan airflows to the specified rates. The speed controller shall have a capacity range of approximately 50 through 100 percent of the design airflow rate specified. The speed controller shall be mounted on or in the fan housing unless otherwise indicated.

Where indicated in the schedules on the Drawings, fans shall be given a special coating resistant to the corrosive atmosphere indicated.

**2-4.06.01. Extra Materials.**

<u>Extra Materials</u>	<u>Quantity</u>
Sets of matched belts per fan	1

**2-4.06.02. Cabinet Fans.** Not used.

**2-4.06.03. Duct Fans.** Not used.

**2-4.06.04. Power Roof Ventilators.** Power roof ventilators, denoted by the symbol "PRV" and an identifying number, shall be by the manufacturer and the model indicated in the schedules on the Drawings.

Power roof ventilators shall be centrifugal roof mounted type and shall be direct or belt driven as indicated in the schedules on the Drawings. Fan wheels shall be aluminum or fiberglass, backward inclined type statically and dynamically balanced at the factory for quiet, vibration-free operation. Fan housings shall be constructed of aluminum or fiberglass and shall have an aluminum or fiberglass base of the self-flashing type, suitable for mounting on the curbs indicated on the Drawings. Each fan shall be complete with 1/2 inch mesh aluminum or stainless steel bird screen over all openings, and, where indicated in the schedules on the Drawings, a backdraft damper.

Motors and drives shall be mounted outside the airstream. The wheel shaft shall be of ground and polished steel, mounted in heavy-duty, relubricatable or permanently sealed bearings with a minimum L<sub>50</sub> service life of at least 200,000 hours at the equipment's maximum cataloged operating conditions.

Where indicated on the Drawings, the motor enclosure shall be explosion proof, totally enclosed motor, with a housing constructed to contain any explosion within the motor caused by the hazardous atmosphere entering the enclosure and being ignited.

A safety disconnect switch shall be mounted in the hood. Where a factory installed integral disconnect switch is not available as a standard option, a disconnect for field installation shall be provided.

**2-4.07. Roof Hoods.** Not used.

**2-4.08. Dampers.** Not used.

**2-4.09. Damper Operators.** Not used.

**2-4.10. Air Outlet and Inlet Devices.** Air outlet and inlet devices shall be manufactured by Price, Tuttle & Bailey, or Titus. Air outlet and inlet devices shall be furnished and installed where indicated on the Drawings.

**2-4.10.01. Ceiling Diffusers.** Not used.

**2-4.10.02. Registers and Grilles.** Registers and grilles shall be constructed of aluminum or steel as indicated in the schedules on the Drawings. The front blades of adjustable blade models shall be parallel to the short dimension unless otherwise indicated, and the front blades of fixed blade models shall be horizontal unless otherwise indicated. All registers shall be furnished with key-operated opposed blade dampers. The dampers shall be constructed of the same material as the attached grille.

**2-4.11. Flexible Connections.** Flexible connections located indoors shall be Ventfabrics "Ventglas". Flexible connections installed outdoors or exposed to sunlight or weather shall be Ventfabrics "Ventlon".

Ductwork connections to the air handling equipment, and where indicated on the Drawings, shall be made using fabric connectors with sheet metal collars. The fabric shall be fire resistant, waterproof, mildew-resistant, and airtight. At least 3 inches of fabric shall be exposed. Flexible connections shall be in accordance with the requirements of UL and NFPA.

Fabric for flexible connections protected from sunlight and the weather shall be suitable for a temperature range of -20 to 180°F and shall weigh at least 27 ounces per square yard.

Fabric for flexible connections exposed to sunlight or the weather shall be suitable for a temperature range of -10 to 250°F and shall weigh at least 24 ounces per square yard.

**2-4.12. Air Filtration Equipment.**

**2-4.12.01. Pleated Air Filters.** Pleated air filters shall be American Air Filter "AM-AIR 300X" or Farr "30/30". Filters shall be disposable type, high-loft blend of cotton and synthetic fiber pleated media. The media shall be rated as Class 1 or Class 2 in accordance with UL 900. A metal support grid shall be bonded to the media. The filter frame shall be constructed of rigid, high-strength, moisture-resistant beverage board. The pleated media pack shall be bonded to the inside of the frame. All filters shall have a minimum efficiency reporting value (MERV) based on the ASHRAE 52.2 guidelines of at least MERV 6.

Two inch pleated air filters shall have at least 12 pleats per linear foot and at least 4.2 square feet of media per square foot of filter area. Two inch filters shall have a maximum initial resistance of 0.13 inch water column at 300 feet per minute.

**2-4.13. Draft Gauges.** Not used.

**2-4.14. Sheet Metal Ductwork.** Ductwork, accessories, bracing, and supports shall be constructed of galvanized steel. Ductwork, turning vanes, and other accessories shall be fabricated in accordance with the latest SMACNA HVAC Duct Construction Standards unless otherwise indicated. Accessories, bracing, and supports shall be constructed of similar materials as the ductwork.

Galvanized ductwork located in air conditioned spaces shall be constructed of G-60 or better lockforming quality in accordance with ASTM A653. All other galvanized ductwork shall be constructed of G-90 or better galvanized steel. All welds on galvanized metal shall be cleaned and coated with a zinc-rich paint.

Sealants shall be suitable for the duct service and shall maintain leakage integrity at pressures in excess of the ductwork pressure classification.

**2-4.15. Duct Insulation.** Interior duct liner shall be Knauf "Sonic XP Duct Liner", CertainTeed "ToughGard R", or Johns Manville "Linacoustic RC".

Interior duct liner shall be 1-1/2 pound per cubic foot density, spray coated duct liner with an "R" value of at least 4.2 ft<sup>2</sup> hr F/BTU per inch thickness at 75°F. The insulation shall be suitable for temperatures up to 250°F and shall have at least a 0.55 NRC per 1 inch thickness. The insulation shall conform to ASTM C1071. The insulation surface shall be resistant to microbial growth in accordance with UL 181, ASTM C1338, or comparable test method and shall be cleanable in accordance with NAIMA recommended practices.

**2-4.16. Flexible Duct and Takeoffs.** Not used.

**2-4.17. Access Doors.** Not used.

**2-4.18. Temperature Controls.** The temperature control components and systems shall be manufactured by Honeywell; Johnson Controls; or Siemens Building Technologies, Landis Division. Where manufacturers are not specified, materials and equipment furnished shall meet the performance and design requirements indicated.

**2-4.18.01. Performance and Design Requirements.** Contractor shall coordinate with the Work to make certain that the field wiring associated with the work of this section is completed in accordance with the requirements of the heating, ventilating, and air conditioning equipment furnished and their interconnection.

Where cable and conduit is not indicated on the Drawings but is needed for a complete and functional control system in accordance with the sequence of operation it shall be provided as specified herein. The control wiring shall be installed so that all HVAC equipment will function as described in the HVAC sequence of operation.

Conduit and control wiring for all control circuits needed between all field mounted HVAC controlling and indicating devices, such as, but not limited to, damper actuators, thermostats, temperature control panels, pressure differential switches, control switches, motor starters, and the HVAC equipment, shall be furnished and installed as specified in the Electrical Wiring paragraph. Cable and conduit for all HVAC power circuits shall be as specified in the Electrical section.

**2-4.18.02. Tolerances.** Unless otherwise indicated, the controls shall maintain space temperatures within  $\pm 2^{\circ}\text{F}$ , and the relative humidity within  $\pm 5$  percent of the setpoint.

**2-4.18.03. Thermostats.** Where indicated on the Drawings, thermostats shall be constructed of materials resistant to or shall be protected from the corrosive atmosphere indicated. Thermostats specified in the individual equipment paragraphs shall be provided with the respective equipment.

- a. Two Position Wall Mounted Thermostats. Not used.
- b. Low Limit Thermostats. Not used.
- c. Modulating Duct Mounted Thermostats. Not used.
- d. Explosion-proof Thermostats. Not used.
- e. Programmable Wall Mounted Thermostats. Programmable, wall mounted thermostats shall be Trane "XR303", Honeywell, or Siemens Building Technologies.

Programmable wall mounted thermostats shall be single or multistage as required by the controlled equipment, solid state programmable electronic type configurable for use with a conventional or heat pump system. The thermostats shall have a setpoint range of approximately  $45^{\circ}\text{F}$  to  $95^{\circ}\text{F}$  with the following features:

- 7 day programming with 2 occupied/unoccupied periods per day.
- Automatic heat/cool changeover.
- Battery backup.
- Setback controls to automatically restart and temporarily operate system during setback periods.
- Digital display.
- Temporary override of setpoints.
- 2 configurable LED's.

**2-4.18.04. Temperature Control Panels.** Not used.

**2-4.18.05. Dial Thermometers.** Not used.

**2-4.18.06. Smoke Detectors.** Not used.

**2-4.18.07. Pressure Differential Airflow Switches.** Not used.

**2-4.18.08. Control Stations.** Not used.

**2-4.18.09. Emergency Ventilation Shutoff Switches.** Not used.

**2-4.18.10. Accessory Components.** All additional control components, including, but not limited to, electric relays, temperature sensors and transmitters, humidity sensors and transmitters, controllers, and position switches, shall be furnished where necessary to ensure a complete, properly operating installation. All components shall be products of the temperature control manufacturer. Accessory components not mounted inside the temperature control panels shall be furnished with equipment enclosures. Relays shall be provided with 120 volt coils and at least 10 ampere contacts.

**2-4.18.11. Electrical Wiring.** Detailed wiring diagrams shall be submitted in accordance with the Construction Schedule & Project Restraints section. The wiring diagrams shall show the internal connections of the control panels and all field wiring to equipment remote from the control panels including wiring to Owner-furnished equipment. The wiring diagrams shall be complete, showing all connections necessary to place the temperature control systems in operation.

Control wiring shall be in accordance with the National Electric Code (NEC). Cable shall be multi-conductor, at least 18 AWG size, specifically designed for industrial systems and UL listed for indoor/outdoor installations.

Conduit for all HVAC control circuits in indoor locations shall be furnished and installed under this section. Conduit type shall be as specified in the Electrical Section.

**2-5. ELECTRICAL.** Electric motors and motor controls shall conform to the Basic Mechanical Building Systems Materials and Methods section. Motor starters and controls shall be furnished and installed under the Electrical section, except for equipment specified or furnished with prewired integral starters. Disconnects for equipment shall be furnished and installed under the Electrical section, except where specified with integral disconnects.

All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical Drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures.

**2-6. DRIVE UNITS.** Electric motors, V-belt drives, and safety guards shall be in accordance with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

**2-7. MANUFACTURE AND FABRICATION.** Manufacture and fabrication shall comply with the requirements of the Basic Mechanical Systems Materials and Methods section.

**2-8. SHOP TESTING.** The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, AHRI, NBS, NFPA, and UL Standards.

**2-9. BALANCE.** All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is avoided. In any case, the maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook.

At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

### **PART 3 - EXECUTION**

**3-1. INSPECTION.** Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

Where penetrations through existing concrete slabs are made, the Contractor shall locate and avoid damage to all rebar, embedded conduit, etc. when making new openings.

## **3-2. PREPARATION.**

**3-2.01. Field Measurement.** Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.

**3-2.02. Surface Preparation.** All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

Surface finish damaged during installation shall be repaired to the satisfaction of Engineer. Field painting shall be as specified in the Protective Coatings sections.

**3-3. INSTALLATION.** Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

The space beneath baseplates shall be grouted as specified in the Grouting section.

**3.01. Gas Vents.** Not used.

**3-3.02. Packaged Air Handling Units.** Units shall be installed level and with vibration isolators types where indicated on the Drawings. Flexible connections shall not be in tension when the fans are operating. Ductwork and piping installed adjacent to each unit shall not interfere with unit servicing or panel removal.

**3-3.03. Furnaces.** Not used.

**3-3.04. Makeup Air Units.** Not used.

**3-3.05. Heaters.** Not used.

**3-3.06. Fans.** Where fan inlets and outlets are exposed, safety screens shall be installed over the opening.

Power roof ventilators shall be secured with corrosion resistant lag screws to the roof curb.

**3-3.07. Roof Hoods.** Not used.

**3-3.08. Damper Operators.** Not used.

**3-3.09. Air Outlet and Inlet Devices.** Air outlet and inlet devices shall be installed level and plumb and in accordance with the manufacturer’s written instructions.

**3-3.10. Draft Gauges.** Not used.

**3-3.11. Sheet Metal Ductwork.** Ductwork, turning vanes, and other accessories shall be installed and supported in accordance with the latest SMACNA Duct Construction Standards unless otherwise indicated. The locations, arrangement, and sizes of ductwork shall be as indicated on the Drawings. The duct sizes indicated are clear dimensions inside the duct or duct lining. Sheet metal sizes are larger for ductwork with interior linings.

Ductwork shall be fabricated, reinforced, supported, and sealed for the operating pressures indicated in the schedules for the connected equipment. All ductwork shall have a pressure classification of at least 1 inch.

Sheet metal ductwork shall be sealed according to the classifications described in the SMACNA HVAC Duct Construction Standards in accordance with the following:

Duct Location	Duct Type			
	Supply		Exhaust	Return
	≤ 2 inches	> 2 inches		
	wc	wc		
Outdoors	A	A	A	A
Unconditioned Areas	B	A	B	B
Conditioned Spaces				
(concealed ductwork)	C	B	B	C
(exposed ductwork)	A	A	B	B

**Sealing Levels**

A - All transverse joints, longitudinal seams, and duct wall penetrations

B - All transverse joints and longitudinal seams

C - Transverse joints only

All joints, seams, connections, and penetrations in ductwork located outdoors shall be sealed watertight and weatherproof. Transverse joints shall be flanged and shall be provided with a continuous gasket and flange cap.

Ductwork shall be supported as required by SMACNA. Where ductwork is connected to equipment, it shall be independently supported with no weight bearing on the equipment and in such a manner that the equipment may be removed for service without temporary support of the ductwork. Ductwork shall be supported within 24 inches of each elbow and within 48 inches of each branch intersection. Strap or wire hangers shall not be used where the hanger length exceeds 5 feet.

Ductwork shall be constructed and installed in accordance with the Drawings. When acceptable to Owner, modifications in the size and location of ductwork may be made where required to avoid interference with the building structure, piping systems, or electrical work. The installation shall be coordinated with other phases of work to establish space and clearance requirements. Unless otherwise indicated by a bottom of duct elevation, all ductwork shall be routed as high as possible, with a minimum height of 8 feet above the finished floor.

Turning vanes shall be installed in all elbows with 45 degree or greater angles. Vanes shall be double thickness or a minimum 4.5 inch radius type for vanes 30 inches and longer, where installed in ducts with velocity greater than 2000 fpm, or where installed in ducts with a pressure classification greater than 2 inches wc. Where 4.5 inch or double thickness type turning vanes are required, each vane shall be welded to the vane runner.

**3-3.12. Duct Insulation.** Insulation materials shall be installed in accordance with the manufacturer's written instructions and recommendations. Surfaces which are to be insulated shall be cleaned and dried. Insulation shall be kept clean and dry and shall not be removed from the factory container until it is installed. Packages or factory containers shall have the manufacturer's stamp or label bearing the name of the manufacturer and description of the contents.

Insulation shall be terminated at items mounted in ductwork such as thermometers, controls, damper linkages, flexible connections, access doors, etc., to avoid interference with their function and/or replacement.

The duct liner in the corners of the duct sections shall be folded and compressed or shall be cut and fit to ensure overlapping, butted edges. Top and bottom pieces shall overlap the side pieces. Longitudinal seams shall be made only at corners unless duct dimensions and standard liner product dimensions make seams necessary at other locations.

The duct liner shall be held to the duct by a coat of waterproof, fire-retardant adhesive applied over the entire duct surface. Where duct dimensions exceed 8 inches on any side, mechanical fasteners shall be used in addition to the adhesive. All exposed edges of the duct liner shall be tightly butted and coated with adhesive.

The following ducts shall be insulated with interior duct liner unless indicated on the Drawings to be wrapped or otherwise indicated:

<u>Location</u>	<u>Ductwork</u>	<u>Insulation Thickness</u>
Interior within conditioned space	a. Cooling supply and return	1 inch
Note: Exhaust systems shall not be internally lined.		

**3-3.13. Flexible Duct and Takeoffs.** Not used.

**3-3.14. Access Doors.** Not used.

**3-3.15. Temperature Controls.** Automatic temperature controls shall be furnished and installed as indicated on the Drawings and as specified herein.

Contractor shall be responsible for determining that all equipment supplied is suitable for installation in the space indicated on the Drawings. Control equipment shall be installed with adequate space for operating and maintenance access.

**3-3.15.01. Temperature Control Panels.** Not used.

**3-3.15.02. Thermostats.** Wall-mounted thermostats shall be mounted above the finished floors as indicated in the Electrical section. Insulating spacers shall be provided for thermostats mounted on exterior building walls. The spacers shall be installed between the thermostat and its mounting surface, so that the thermostat will not be affected by surface temperatures.

**3-4. FIELD QUALITY CONTROL.**

**3-4.01. Installation Check.** An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section.

**3-4.02. Startup and Testing.** After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Engineer. Tests shall be as indicated in the Startup Requirements section.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

**3-5. CLEANING.** At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

**END OF SECTION**

## SECTION 15600 FUEL PIPING

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The work of this section includes all labor, materials and equipment required for the installation and testing of the diesel fuel piping system complete and ready for operation. The fuel piping will connect the new diesel engine with the above ground fuel storage tank.

#### 1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. All work shall conform to the applicable requirements of the city, county, state and federal codes. Where the requirements of such agencies are more stringent than specified herein, abide by such requirements and consider this specification as supplementary to those requirements.
- B. All work shall conform to the applicable requirements of the US Environmental Protection Agency, the Florida Department of Environmental Protection, and other applicable regulatory agencies.
- C. All work shall conform to the applicable requirements of the following: National Fire Protection Association (NFPA), The Florida Fire Prevention Code; and The Florida Building Code.
- D. All components of the fuel distribution system shall be UL listed, unless otherwise specified, or approved by the County.
- E. The fuel piping shall be designed and fabricated according to best practices and methods available to date.

#### 1.03 QUALIFICATIONS

- A. Installer shall have had supervisory experience with two similar fuel systems in the past three years and shall be a Pollutant Storage System Contractor certified by the Department of Business and Professional Regulation in accordance with Chapter 489, Florida Statutes. A copy of the license shall be submitted, prior to proceeding with construction.

#### 1.04 SUBMITTALS

- A. Complete shop drawings shall be submitted, including certification of shop test to the County for review, according to General Conditions.
  - 1. The shop drawings shall include sufficient information to demonstrate compliance with the specified standards, including copies of applicable sections of the specified standards, manufacturer's catalog data and descriptive literature for all equipment including a fully dimensioned shop layout drawing (1/4" = 1' scale or larger) showing all piping, valves, equipment connections, and test procedures.
  - 2. The shop drawings for pipe, fittings, and each item listed in the Specifications shall include manufacturer's catalog data and descriptive literature, fully dimensioned

shop layout drawing (1/4" = 1' scale or larger) showing all piping, equipment connections, and installation clearance requirements.

3. Submit all manufacturer's recommended installation, test procedures, operating, and maintenance instructions for all equipment.
4. Submit manufacturer's warranty for all equipment.

## **1.05 PRODUCT HANDLING**

- A. Deliver materials and equipment to project site in manufacturer's original, unopened containers with labels intact and legible. Labels shall indicate manufacturer's name and model number. Store equipment in dry protected area. All damaged items shall be replaced with new at no additional cost to County.
- B. Piping shall be supplied to the site with sealed end caps which shall remain in place until installation.

## **PART 2 PRODUCTS**

### **2.01 PIPE AND FITTINGS**

- A. The CONTRACTOR shall furnish and install fuel system piping and make all required fuel system connections between the diesel engine and the above ground fuel storage tank for a complete and properly operating generator set equipment fuel system. All parts of the fuel system shall meet the approval of, and be installed in complete compliance with all applicable NFPA guidelines and local, state and federal codes, laws and regulations.
- B. The fuel piping between the fuel storage tank and the engine shall be of a piping size as recommended by the pump supplier.
- C. All fuel piping shall be black iron pipe, Schedule 40 in conformance with ASTM A-795 and ANSI B31.3-1980 with 125 lb. butt-welded malleable iron fittings conforming to ANSI B16.3 and ANSI B31.3-1980.
- D. Flexible piping at tank and equipment connections shall be constructed of a seamless flexible plastic liner with corrosion resistant type 316 stainless steel wire braid reinforced cover, stainless steel collars, and ductile iron fittings.
- E. Provide piping transitions, sleeves, and supports as shown on the Drawings and as required for a rigidly supported and complete installation. Seal all wall penetrations watertight.
- F. All interior and exterior supports including hangers, brackets, fasteners, and miscellaneous metals shall be Type 316 stainless steel galvanized steel or aluminum.

### **2.02 JOINT COMPOUND**

- A. Joint compound for steel pipe threaded connections shall be a non-hardening, non-solvent joint sealer compatible with fuel products.

## **PART 3 EXECUTION**

### 3.01 INSTALLATION

#### A. Fuel Piping

1. All pipes shall be cut accurately to measurements established at the site and shall be worked into place without forcing or bending. All pipes shall be installed into place without traps or pockets and pitched 1-inch in 40-foot minimum to drain. All underground fuel piping shall be installed in containment piping.
2. Piping shall be installed to minimize the quantity of piping joints. Provide unions and/or flexible connections at all equipment connections.
3. Joints shall be fabricated in accordance with standard industry practices and manufacturer's instructions. All joints shall be liquid tight, screwed joints except where flanged connections to equipment or valves are required. Cut pipe square using pipe cutting tool and carefully ream pipe to remove all burrs. Cut a complete thread, using sharp dies properly set and centered, while applying oil graphite cutting lubricant.
4. All new above ground black iron pipe shall be painted safety yellow.

#### B. Flexible Fuel Piping

1. Provide flexible piping connectors at all generator connections and all storage tank connections and all equipment connections.
2. Flexible connections shall be a minimum of 12-inches long or as required for equipment removal or maintenance. Protect flexible connectors where physical damage may occur due to adjacent equipment, other piping, wiring, or where subject to possible damage from operating personnel.

### 3.02 TESTING

- A. Piping shall be tested in strict accordance with the manufacturer's testing requirements. Piping system shall be tested upon completion of the roughing-in before setting equipment. The entire system shall be pressure tested with fuel at 5 psig and proved tight at this pressure for a period of four (4) hours. The secondary containment pipe shall be leak tested at 2 psi for four (4) hours or at the manufacturer's suggested pressure and/or method. Defective work or material shall be replaced and retested. The system shall be test plugged or capped prior to testing to prevent test pressure from reaching any equipment or storage tank.
- B. Piping shall be precision tested by a state qualified tester, or as recommended by the applicable manufacturer.
- C. Contractor shall provide fuel for any required testing and retesting. If the fuel subsequently becomes contaminated, Contractor shall dispose of the fuel at no cost to the County and in accordance with all regulations. Upon completion of the testing and prior to final acceptance of the system, the Contractor shall make sure the fuel levels in the storage tanks are equal to when the work began.

## SECTION 15650 REFRIGERATION SYSTEMS

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers the furnishing and installation of refrigerant piping and accessories, condensing units, and appurtenances associated with the heating, ventilating, and air conditioning (HVAC) systems.

Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

**1-2. GENERAL.** Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

**1-2.01. Coordination.** Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, pumps, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided.

Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

**1-2.02. General Equipment Stipulations.** The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

**1-2.03. Seismic Design Requirements.** Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

**1-2.04. Governing Standards.** Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern. All work shall comply with UL safety requirements.

The refrigerant systems shall be constructed in accordance with ASHRAE Standard 15. Refrigeration system equipment shall have a minimum efficiency of not less than specified in the latest edition of ASHRAE 90.1, unless otherwise indicated on the Drawings.

Capacity ratings for condensing units, heat pumps, packaged air conditioning units, and packaged heat pumps with capacities less than 135,000 BTUH shall be in accordance with AHRI Standard 210/240.

**1-2.05. Power Supply.** Power supply to equipment with motors shall be as indicated in the schedules on the Drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise indicated or required for a properly operating system.

**1-2.06. Metal Thickness.** Metal thickness and gauges specified herein are minimum requirements. Gauges refer to US Standard gauge.

**1-2.07. Mechanical Identification.** Mechanical identification shall conform to the requirements of the Basic Mechanical Building Systems Materials and Methods section.

### **1-3. SUBMITTALS.**

**1-3.01. Drawings and Data.** Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Construction Schedule & Project Restraints section. Device tag numbers indicated on the Drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but shall not be limited to, the following:

#### Refrigerant Piping

Schematic arrangement showing equipment, coils, piping sizes, valves, and accessories.

A refrigerant piping schematic indicating refrigerant piping sizes and corresponding velocities, accessories, accessory pressure losses, and piping pitch and direction.

#### Air Cooled Condensing Units

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Locations and sizes of field connections.  
Certified performance data and ratings.  
Capacity and saturated suction temperature at specified conditions.  
Equipment efficiency ratings.  
Refrigerant type and charge.  
Overall dimensions and required clearances.  
Wiring diagrams with field and factory wiring clearly identified and electrical requirements.  
Net weight and load distribution.  
Where specified, information on equipment manufacturers' representatives.

**1-3.02. Operation and Maintenance Data and Manuals.** Adequate operation and maintenance information shall be supplied as required in the Construction Schedule & Project Restraints section. Operation and maintenance manuals shall be submitted in accordance with the Construction Schedule & Project Restraints section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

In addition to the requirements of the Construction Schedule & Project Restraints section, the operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

**1-4. QUALITY ASSURANCE.** Quality assurance shall comply with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

**1-5. DELIVERY, STORAGE, AND HANDLING.** Shipping shall be in accordance with the Special Project Procedures section. Handling and storage shall be in accordance with the Storage and Protection section.

**1-6. EXTRA MATERIALS.** Extra materials shall be furnished for the equipment as specified in the individual equipment paragraphs.

Extra materials shall be packaged in accordance with the Storage and Protection section, with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, equipment designation, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to Owner as directed.

Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.

## **PART 2 - PRODUCTS**

**2-1. SERVICE CONDITIONS.** All equipment shall be designed and selected to meet the specified conditions.

**2-2. PERFORMANCE AND DESIGN REQUIREMENTS.** Equipment and coil capacities shall be as indicated on the schedules. Where equipment is provided with special coatings, unit capacities shall be corrected to account for any efficiency losses from the selected special coating.

For equipment including fans, each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve, to the left of the peak pressure/efficiency point.

**2-2.01. Dimensional Restrictions.** Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract Drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

**2-2.02. Elevation.** Equipment shall be designed to operate at the elevation indicated in the Meteorological and Seismic Design Criteria section.

**2-3. ACCEPTABLE MANUFACTURERS.** Acceptable manufacturers shall be as listed in the respective product description paragraphs.

## **2-4. MATERIALS.**

**2-4.01. Refrigerant Piping and Accessories.** Refrigerant piping shall conform to the Copper Tubing and Accessories section. Piping shall be supported as specified in the Pipe Supports section. Refrigerant filter dryers, expansion valves, solenoid valves, combination sight glass and moisture indicators, charging valves, relief valves, and other accessories shall be furnished and installed as needed for proper operation of the system.

## **2-5. EQUIPMENT.**

**2-5.01. Condensing Units.** Condensing units, denoted by the symbol "CU" and an identifying number shall be furnished and installed where indicated on the Drawings. Each unit shall consist of compressor(s), condenser coil, condenser fan(s) and motor(s), starters, and all controls necessary for proper operation. Condensing units and heat pumps shall be manufactured by Trane, Carrier, McQuay, or York.

**2-5.01.01. Extra Materials.**

<u>Extra Materials</u>	<u>Quantity</u>
Complete change of lubricating oil	1

**2-5.01.02. Performance and Design Requirements.** Each unit shall be completely factory assembled and tested, piped, internally wired, and shipped in one piece. Each unit shall be fully charged with R-410A and compressor oil. Condensing units shall be selected to satisfy the cooling and cooling requirements of the air handling unit being served. A 2°F suction temperature difference for piping losses shall be allowed between the condensing unit and the air handling unit when in the cooling mode.

Condensing units shall be capable of satisfactory cooling operation at the maximum and minimum outdoor ambient air temperatures indicated on the Drawings.

The condensing units shall be designed to operate on the power supply as indicated on the Drawings.

Where indicated in the schedules on the Drawings, all copper and other unit surfaces subject to corrosion from the atmosphere indicated shall be given a special factory coating.

**2-5.01.03. Casing.** The unit casing shall be of weatherproof design, constructed of heavy gauge galvanized or zinc-coated steel, and reinforced and braced for maximum rigidity. All bracing and reinforcing members shall be integral to each unit. The casing shall be given a factory-applied coat of rust-inhibitive universal primer, followed by the manufacturer's standard baked enamel finish. Fasteners shall be stainless steel or coated for corrosion protection. Each unit shall have removable panels or access doors for access to all components and connections. Drainage holes shall be located in the base section for moisture removal. The unit shall be supported above the mounting surface with base rails or feet.

**2-5.01.04. Outdoor Coils.** Outdoor coils shall be of the air-cooled, finned tube type with liquid accumulator and integral subcoolers. The coils shall be constructed of 3/8 inch OD seamless copper tubing with aluminum fins securely bonded to the surface. Coils shall be factory leak and pressure tested at 425 psig

and then completely dehydrated and sealed with a holding charge of nitrogen or refrigerant. The coils shall be protected from hail damage by louvered metal grilles or on units 5 tons or less, corrosion resistant wire maybe used.

**2-5.01.05. Fans and Motors.** Outdoor fans shall be vertical discharge, direct-driven propeller type, and shall be statically and dynamically balanced. Fan guards shall be located on the discharge of each fan. Fan motors shall be totally enclosed suitable for outdoor installation and shall have permanently lubricated ball bearings and built-in overload protection.

**2-5.01.06. Compressors.** Compressors shall be of the reciprocating hermetic, semi-hermetic, or scroll type mounted on vibration isolators. The compressor motor shall have temperature and current sensitive overload protection devices. Where the compressors are located outside the cabinet, grilles shall be installed over the openings to protect the compressor area. Each condensing unit/heat pump shall have a minimum number of capacity reduction steps as indicated in the schedules on the Drawings.

Reciprocating hermetic compressors shall be suction gas cooled with internal pressure relief for high pressure protection, high and low pressure cutout switches, temperature actuated crankcase heater, and automatic reset timer to prevent the compressor from rapid cycling.

Reciprocating semi-hermetic compressors shall be suction gas cooled, internal pressure relief for high pressure protection, high and low pressure cutout switches, temperature actuated crankcase heater, oil level sight glass, and automatic reset timer to prevent the compressor from rapid cycling. Capacity reduction shall be provided by automatic suction valve unloaders. Each compressor shall start unloaded.

Scroll compressors shall be suction gas cooled with high and low pressure cutout switches and automatic reset timer to prevent the compressor from rapid cycling. The compressor shall have radial and axial compliant scroll plates to allow the compressor to handle liquid slugging without damage to the compressor.

**2-5.01.07. Refrigerant Circuit and Accessories.** Each refrigerant circuit shall be equipped with filter-dryer and multiuse liquid and gas line valves. The multiuse valves shall be constructed of brass with service pressure gauge ports. All factory installed gauges, switches, and other devices connected to the refrigerant circuit shall have isolation valves.

**2-5.01.08. Controls.** Condensing units shall be completely factory wired for a single point power supply connection and unit mounted disconnect switch. All wiring shall be installed in accordance with the National Electrical Code.

Condensing units larger than 5 tons shall be provided with a factory wired control panel containing full voltage magnetic starters for compressor and outdoor fan motors and internal control power transformer.

Units with multiple compressors shall have a built-in time delay to prevent both compressors from starting simultaneously.

All internal panel wiring shall be neatly run in gutters or bundles to terminal strips for connection of external wiring. All wires and terminal strips shall be numbered or color coded in accordance with the wiring diagram. All internal and external controls, gauges, lights, and switches shall be identified with nameplates. A complete wiring diagram showing the compressor and fan starting circuits and the control circuit shall be furnished.

Terminal blocks shall be factory wired to provide terminal points for permissive start for each stage of cooling or cooling and heating from a remotely located control panel or thermostat, supply voltage terminal points for remotely located refrigerant solenoid valves, and terminal points to energize remote condensing unit indicating lights.

**2-6. ELECTRICAL.** Electric motors and motor controls shall conform to the Basic Mechanical Building Systems Materials and Methods section. Motor starters and controls shall be furnished and installed under the Electrical section, except for equipment specified or furnished with prewired integral starters. Disconnects for equipment shall be furnished and installed under the Electrical section, except where specified with disconnects. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical Drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures.

**2-7. DRIVE UNITS.** Electric motors, V-belt drives, and safety guards shall be in accordance with the requirements of the Basic Mechanical Building Systems Materials and Methods section.

**2-8. MANUFACTURE AND FABRICATION.** Manufacture and fabrication shall comply with the requirements of the Basic Mechanical Systems Materials and Methods section.

**2-9. SHOP TESTING.** The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, AHRI, NBS, NFPA, and UL Standards.

**2-10. BALANCE.** All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is

avoided. In any case, the maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook.

At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

## **PART 3 - EXECUTION**

**3-1. INSPECTION.** Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

### **3-2. PREPARATION.**

**3-2.01. Field Measurement.** Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.

**3-2.02. Surface Preparation.** All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

Surface finish damaged during installation shall be repaired to the satisfaction of Engineer. Field painting shall be as specified in the Protective Coatings section.

**3-3. INSTALLATION.** Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

The space beneath the baseplate shall be grouted as specified in the Grouting section.

**3-3.01. Valves.** Valves shall be installed with their stems horizontal or vertical and above the valve body and with the applicable requirements of the valve sections.

**3-3.02. Refrigerant Piping and Accessories.** The refrigerant piping shall be sized and arranged in accordance with the manufacturer's recommendations. Pipe routing and isolation shall be selected to minimize vibration and transmission of sound to the conditioned space. The refrigerant piping system shall be provided with the necessary traps and risers for uniform return of oil to the compressor. The suction gas line shall be sized to produce a minimum load gas velocity of 1,000 feet per minute in vertical risers with upward gas flow and 500 feet per minute in horizontal piping. The full load pressure drop should not exceed 3 psi or 2°F change in saturated refrigerant temperature. The maximum gas velocity shall not exceed 4,000 feet per minute.

The liquid lines shall be sized to limit the pressure loss to the equivalent of 2°F of temperature change and a maximum liquid line velocity of 360 feet per minute.

**3-3.03. Condensing Units.** The condensing units shall be installed in accordance with the manufacturer's installation instructions. Each unit shall be leveled and installed to maintain the manufacturer's recommended clearances. The units shall be firmly anchored where indicated on the Drawings.

After the refrigerant system has been tested, the system shall be fully charged with refrigerant and compressor oil.

#### **3-4. FIELD QUALITY CONTROL.**

**3-4.01. Installation Check.** An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section.

**3-4.02. Startup and Testing.** After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Engineer. Tests shall be as indicated in the Startup Requirements section.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable

**3-5. CLEANING.** At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

**END OF SECTION**

## SECTION 15990 TESTING, ADJUSTING, AND BALANCING

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers the cleaning, testing, adjusting, and balancing of the air system(s) associated with the heating, ventilating, and air conditioning (HVAC).

**1-2. GENERAL.** Equipment and systems shall be cleaned, tested, adjusted, and balanced in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

**1-2.01. Coordination.** Contractor shall verify that all components and devices necessary for a properly functioning system have been provided. Prior to cleaning, testing, adjusting, and balancing, Contractor shall verify that each system has been installed properly and is operating as specified. Equipment bearings shall be lubricated in accordance with the manufacturer's recommendations.

Air systems shall be complete and operating, with dampers, filters, ductwork, air outlet and inlet devices, duct mounted equipment, and control components.

**1-2.02. Governing Standards.** Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with the latest edition of AABC, NEBB, or SMACNA standard manuals for testing, adjusting, and balancing of air systems.

### 1-3. SUBMITTALS.

**1-3.01. Drawings and Data.** Complete apparatus report sheets for all air systems shall be accurately and completely filled out in accordance with the Standard's manual. The testing and balancing results shall be submitted on the TAB report forms of the applicable standard. Copies of the final test readings and report sheets shall be submitted in accordance with the Construction Schedule & Project Restraints section. A description of the standard procedures used during testing, adjusting, and balancing shall be included in the submittal.

The submittal shall include a reduced set of drawings, with the air outlet devices, air inlet devices, and equipment identified to correspond with the report sheets.

Test dates shall be recorded on the individual TAB report forms indicating when the actual testing was performed.

The apparatus report sheets shall include the following information:

1. Title Page:
  - a. Company name
  - b. Company address
  - c. Company telephone number
  - d. Project name
  - e. Project location
  - f. Project Engineer
  - g. Project Contractor
  - h. Project altitude
  - i. Date
2. Instrument List:
  - a. Instrument
  - b. Manufacturer
  - c. Model
  - d. Serial number
  - e. Range
  - f. Calibration date
3. Air Moving Equipment:
  - a. Unit number
  - b. Location
  - c. Manufacturer
  - d. Model and serial number
  - e. Airflow, design and actual
  - f. Total static pressure (total external), design and actual
  - g. Static pressure, inlet and discharge
  - h. Total pressure
  - i. Fan RPM, design and actual
4. Electric Motors:
  - a. Manufacturer
  - b. Motor type and frame
  - c. HP/BHP
  - d. Phase, voltage, amperage, nameplate, actual, no load.
  - e. RPM
  - f. Service factor
  - g. Starter size, rating, heater elements
5. V-Belt Drive:
  - a. Required driven RPM
  - b. Driven sheave make, diameter, and RPM
  - c. Belt make, size, and quantity

- d. Motor sheave make, diameter, and RPM
- e. Center to center distance, maximum, minimum, and actual
- 6. Return Air/Outside Air Data: Not used.
- 7. Coil Data:
  - a. Unit number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Fin spacing and rows
  - f. Face area
  - g. Airflow, design and actual
  - h. Air velocity, design and actual
  - i. Entering air DB temperature, design and actual
  - j. Entering air WB temperature, design and actual
  - k. Leaving air DB temperature, design and actual
  - l. Leaving air WB temperature, design and actual
  - m. Air pressure drop, design and actual
- 8. Duct Traverse:
  - a. System zone/branch
  - b. Duct size
  - c. Area
  - d. Velocity, design and actual
  - e. Airflow, design and actual
  - f. Duct static pressure
  - g. Air temperature
  - h. Air correction factor
- 9. Outlet and Inlet Devices:
  - a. Air outlet and inlet device number
  - b. Room number/location
  - c. Air outlet and inlet device type
  - d. Air outlet and inlet device size
  - e. Area factor
  - f. Velocity, design, preliminary, and final
  - g. Air flow, design, preliminary, and final
  - h. Percent of design airflow
- 10. Sound Level Report: Not used.
- 11. Package Air Conditioning/Heat Pump Unit. Not used.
- 12. Air Terminal Unit Data: Not used.
- 13. Electric Duct Heater: Not used.
- 14. Air Cooled Condenser:
  - a. Unit number
  - b. Location
  - c. Manufacturer and model
  - d. Refrigerant type and capacity
  - e. Entering DB air temperature, design and actual

- f. Leaving DB air temperature, design and actual
- g. Number of compressors
- h. Suction pressure and temperature
- i. Condensing pressure and temperature

**1-4. QUALITY ASSURANCE.** Contractor shall provide the services of a licensed independent contractor, certified by AABC, NEBB, or TABB and with proven experience on at least three similar projects, to perform operational testing, adjusting, and balancing of the air systems. The work shall be performed in accordance with the latest edition of the procedural standards as published by the National Organization associated with the testing, adjusting, and balancing contractor.

**PART 2 - PRODUCTS**

**2-1. SERVICE CONDITIONS.** All equipment shall be adjusted or balanced to meet the specified conditions and to operate at the elevation indicated in the equipment sections.

**2-2. CONSTRUCTION.**

**2-2.01. Painting.** Surface finish damaged during cleaning, testing, adjusting, and balancing of equipment shall be repaired to the satisfaction of Engineer. Field painting shall be as specified in the Protective Coatings section.

**PART 3 - EXECUTION**

**3-1. INSPECTION.** Before testing and balancing the air system, doors and windows surrounding the area served by the system shall be closed. Fans shall be checked for correct rotation and rotative speed. Dampers shall be open and access doors and panels shall be closed during the testing and balancing period.

A resistance shall be placed at all filter locations to simulate dirty filter conditions. The filter resistance shall be as follows:

<u>Filter Type</u>	<u>Simulated Loss</u>
2 inch pleated	0.35 inch water column

**3-2. STARTUP REQUIREMENTS.** System equipment shall be subject to preliminary field tests as indicated in Startup Requirements section.

**3-3. FIELD PERFORMANCE TESTING.** Field performance tests shall be conducted for each system to demonstrate each is functioning as specified and

to the satisfaction of Engineer. All tests shall be conducted in a manner acceptable to Engineer and shall be repeated as many times as necessary to secure Engineer's acceptance of each system. If inspection or tests indicate defects, the defective item or material shall be replaced, and the inspection and tests shall be repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

Air filters which are subject to a pressure loss exceeding the dirty filter values shall be removed and replaced. The spare air filters furnished with equipment shall not be used as the replacement filters. Dirty filter values shall be as follows:

<u>Filter Type</u>	<u>Dirty Filter Conditions</u>
2 inch pleated	1 inch water column

**3-3.01. Hydronic Piping.** Not used.

**3-3.02. Refrigerant Piping.** The refrigerant piping system shall be tested in accordance with ANSI/ASME B31.5.

After testing of the refrigerant piping system is completed, the system shall be charged with the proper refrigerant and placed in operation.

The completed refrigerant system shall be guaranteed to be sufficiently free from leaks for 1 year from the date of acceptance. The loss of refrigerant shall not exceed 5 percent over that period.

**3-4. CLEANING.** At the completion of the testing, all parts of the installation shall be thoroughly cleaned. All equipment, ductwork, pipes, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

**3-5. ADJUSTING & BALANCING.** The air system shall be adjusted and balanced.

All instrumentation shall be calibrated in accordance with the governing standard manual and shall be checked for accuracy before testing, adjusting, and balancing the systems. The accuracy of the instrumentation shall be not less than specified by the testing, adjusting, and balancing standard manual or the instrument manufacturer.

All data, including system deficiencies encountered and corrective measures taken, shall be recorded. If a system cannot be adjusted to meet the design requirements, Contractor shall notify Engineer in writing as soon as practicable.

Following final acceptance of the certified balancing reports, the testing and balancing contractor shall permanently mark the settings of all adjustment devices, including valves and dampers, and shall lock the memory stops.

All ceiling tiles, belt guards, panels, and doors removed during testing, adjusting, and balancing shall be reinstalled.

**3-5.01. Air Systems.** Air systems shall be adjusted to the design airflows indicated on the Drawings. Airflows shall be adjusted to maintain a net positive (supply airflow greater than exhaust airflow) or negative (exhaust airflow greater than supply airflow) pressure as indicated on the Drawings. Dampers located behind air outlet and inlet devices shall be used to adjust the airflow only to the extent that the adjustments do not create objectionable air movement or noise. Fans shall not be adjusted above the maximum safe speed as determined by the fan manufacturer.

**END OF SECTION**

## SECTION 16050 ELECTRICAL

### PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of all equipment and materials needed for the electrical requirements of this Contract. It also covers conduit, wiring, and terminations for electrical equipment installed under Electrical Equipment Installation section.

This section covers the installation and interconnection of electrical equipment furnished under other sections, except electrical items designated to be installed under those sections.

#### Master Lift Station (MLS) 39A

Electrical work elements include demolition and replacement of existing electrical equipment including demolition of existing Switchboard, replacement of existing Adjustable Frequency Drives (AFDs), replacement of engine generator, and miscellaneous electrical equipment located in the Master Lift Station as indicated on plans.

A new air-conditioned room space will be constructed for locating new electrical equipment including new Service Entrance Rated Main Circuit Breaker, new Automatic Transfer Switch with maintenance bypass, new TryStar Model GDS-1 Generator docking station, new Manual Transfer Switch, replacement AFDs, new 120V lighting transformers and lighting distribution panels, and replacement of existing Data Flow Systems (DFS) SCADA Remote Terminal Unit (RTU).

All replacement electrical equipment will be re-wired to existing MLS pumps as indicated on plans.

1-2. GENERAL. Electrical apparatus on all equipment shall be installed complete and placed in readiness for proper operation.

Electrical materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all equipment provided under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Coordination. Electrical work shall conform to the construction schedule and the progress of other trades.

1-2.04. Anchor Bolts and Expansion Anchors. All anchor bolts, nuts, washers, and expansion anchors shall comply with Anchorage in Concrete and Masonry section, except smaller than 3/4 inch [19 mm] will be permitted to match NEMA standard size bolt holes on motors and electrical equipment.

1-2.05. Drawings. Supplementing this section, the Drawings indicate locations of equipment and enclosures and provide one-line and schematic diagrams regarding the connection and interaction with other equipment.

1-3. CODES AND PERMITS. All work shall be performed, and materials shall be furnished in accordance with the NEC - National Electrical Code, the NESC - National Electrical Safety Code, and the following standards where applicable:

AEIC	The Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
Fed Spec	Federal Specification
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
NEIS	National Electrical Installation Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters' Laboratories

Equipment covered by this section shall be listed by UL, or by a nationally recognized third-party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. If no third-party testing laboratory provides the required listing, an independent test shall be performed at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to be used.

#### 1-4. SEISMIC DESIGN REQUIREMENT.

1-4.01. Seismic Design Requirements. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

#### 1-5. IDENTIFICATION.

1-5.01. Conduit. Conduits in manholes, handholes, building entrance pull boxes, junction boxes, and equipment shall be provided with identification tags. Identification tags shall be 19 gage [1 mm thick] stainless steel, with 1/2 inch [13 mm] stamped letters and numbers as indicated on the Drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible.

1-5.02. Conductors. All conductors in power, control, and instrumentation circuits shall be identified and color coded as described herein.

1-5.02.01. Conductor Identification Number. Except for lighting and receptacle circuits, each individual conductor in power, control, and instrumentation circuits shall be provided with wire identification markers at the point of termination.

The wire markers shall be of the heat-shrinkable tube type, with custom typed identification numbers.

The wire numbers shall be as indicated on the equipment manufacturer's drawings.

The wire markers shall be positioned to be readily visible for inspection.

1-5.02.02. Conductor Color Coding. Power conductors shall be color coded as indicated below. For conductors 6 AWG and smaller, the color coding shall be the insulation finish color. For sizes larger than 6 AWG, the color coding may be by marking tape. The equipment grounding conductor shall be green or green with one or more yellow stripes if the conductor is insulated.

The following color coding system shall be used:

120/240V single-phase — black, red, and white  
120/208V, three-phase — black, red, blue, and white  
120/240V, three-phase — black, orange, blue, and white  
277/480V, three-phase — brown, orange, yellow, and gray

2400/4160V, three-phase — black, red, blue, and white  
7200/12470V, three-phase — black, red, blue, and white

Where 120/240VAC and 120/208VAC systems share the same conduit or enclosure, the neutral for either the 120/240 volt system or the 208 volt system shall be white with a permanent identifiable violet stripe.

Control and instrumentation circuit conductors shall be color coded as indicated in the Cable Data Figures at the end of this section.

1-5.03. Motor Starters. Motor starters shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the Drawings. Nameplates shall be laminated white-over-black plastic, with 1/8 inch [3 mm] engraved letters, and shall be securely fastened to the motor starters.

1-5.04. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the Drawings. Nameplates shall be laminated white-over-black plastic, with 1/8 inch [3 mm] engraved letters, and shall be securely fastened to the control stations.

1-5.05. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated white-over-black plastic, with 1/8 inch [3 mm] engraved letters, and shall be securely fastened to the circuit breakers.

1-5.06. Disconnect Switches. All switches shall have front cover-mounted permanent nameplates that include switch type, manufacturer's name and catalog number, and horsepower [kW] rating. An additional nameplate, engraved or etched, laminated white-over-black plastic, with 1/8 inch [3 mm] letters, shall be provided to identify the associated equipment. Both nameplates shall be securely fastened to the enclosure.

1-5.07. Arc Flash Hazard Labels. Lighting panels, power panels, power centers, switchgear, switchboards, motor control centers, motor control line ups, transfer switches, industrial control panels, adjustable frequency drives, fused switches, meter socket enclosures, and other electrical equipment likely to be worked on energized shall be provided with permanent labels warning the risk of arc flash and shock hazard. Labels shall be designed in accordance with ANSI Z535.4 and shall include the following:

**WARNING**  
Arc Flash and Shock Hazard

Appropriate personal protection equipment (PPE) required. SEE NFPA 70E. Equipment must be accessed by qualified personnel only. Turn off all power sources prior to working on or inside equipment.

Additional information shall be provided on the labels where specified in the Arc Flash Hazard Analysis section of this section.

1-6. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the work performed by the Contractor, shall be submitted in accordance with the Submittal Procedures section. The drawings and data shall include, but shall not be limited to, the following:

- Drawings and data.
- Operating manuals.
- Samples.
- Test reports
- Studies

1-6.01. Submittal Identification. Information covering all materials and equipment shall be submitted for review in accordance with the Submittal Procedures section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

- a. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.
- b. Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
- c. Sheets or drawings covering more than the item being considered shall have all inapplicable information crossed out.
- d. A suitable notation shall identify equipment and materials descriptive literature not readily cross-referenced with the Drawings or Specifications.
- e. Schematics and connection diagrams for all electrical equipment shall be submitted for review. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted, unless it is clearly marked to show the intended connections.

Contractor shall submit the name and qualifications of the Engineering and Testing Services firm proposed to perform the protective device study and the on-site testing.

Within 90 days after the Notice to Proceed, Contractor shall furnish a submittal for all types of cable and conduit to be provided. The submittal shall include the cable

manufacturer and type, and sufficient data to indicate that the cable and conduit meet the specified requirements.

In addition to the complete specifications and descriptive literature, a sample of the largest size of each type of cable shall be submitted for review before installation. Each sample shall include legible and complete surface printing of the cable identification.

1-6.02. Seismic Design Requirements. Submitted confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-7. PROTECTION AND STORAGE. During construction, the insulation on all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion by strip heaters, lamps, or other suitable means. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously.

## PART 2 - PRODUCTS

2-1. POWER SERVICE ENTRANCE. Contractor shall consult the local electric utility regarding their service installation requirements and shall furnish the service equipment in compliance with these requirements to be re-connected to existing electric utility pad-mounted transformer.

Power service equipment to be furnished by Contractor shall include, but is not limited to, meter socket, disconnecting means, grounding materials, conduits, and other service entrance fittings required by the utility and for compliance with local codes and regulations.

Contractor shall also provide trenching and backfill, conduits, service cables, concrete for duct banks and other underground service entrance fittings required by the utility for underground service installation.

2-2. TELEPHONE SERVICE ENTRANCE. Not used.

2-3. CABLE. All cables of each type (such as lighting cable or 600-volt power cable) shall be from the same manufacturer.

All types of cable shall conform to the Cable Data Figures at the end of this section and as described herein.

2-3.01. Lighting Cable. Lighting cable (Figure 1-16050 THHN-THWN) shall be provided only in lighting and receptacle circuits operating at 277 volts or less. Lighting and receptacle circuits, 8 AWG [10 mm<sup>2</sup>] or larger, shall be as specified for 600 volt (Figure 2-16050 XHHW) power cable.

2-3.02. 600 Volt Power Cable. Cable in power, control, indication, and alarm circuits operating at 600 volts or less, except where lighting, multiconductor control, and instrument cables are required, shall be 600-volt (Figure 2-16050 XHHW-2) power cable.

2-3.03. Instrument Cable. Cable for electronic circuits to instrumentation, metering, and other signaling and control equipment shall be two- or three-conductor instrument cable twisted for magnetic noise rejection and protected from electrostatic noise by a total coverage shield. Types of instrument cables shall be (Figure 4-16050 single pair).

2.3.04. Multiconductor Control Cable. Not used.

2-3.05. Medium Voltage Power Cable. Not used.

2-3.06. Tray Cable. Not used.

2-4. CONDUIT. Conduit and raceways shall be as described in the following paragraphs:

2-4.01. Rigid Steel Conduit. Not used.

2-4.02. Intermediate Metal Conduit (IMC). Not used.

2-4.03. Liquidtight Flexible Metal Conduit. Liquidtight flexible metal conduit shall be hot-dip galvanized steel, shall be covered with a moisture-proof polyvinyl chloride jacket, and shall be UL labeled.

2-4.04. Utility (PVC) Duct. Not used.

2-4.05. Rigid Nonmetallic (PVC) Conduit. PVC conduit shall be heavy wall, Schedule 40 UL labeled for aboveground and underground uses and shall conform to NEMA TC-2 and UL 651.

2-4.06. PVC-Coated Aluminum Conduit. The conduit shall be rigid aluminum. The PVC coating shall be bonded to the primed outer surface of the conduit. The bond on conduit and fittings shall be stronger than the tensile strength of the PVC coating. The thickness of the PVC coating shall be at least 40 mils [1000  $\mu\text{m}$ ].

A chemically cured two-part urethane coating, at a nominal 2 mil [50  $\mu\text{m}$ ] thickness, shall be applied to the interior of all conduit and fittings. The coating shall be sufficiently flexible to permit field bending the conduit without cracking or flaking of the coating.

Every female conduit opening shall have a PVC sleeve extending one conduit diameter or 2 inches [50 mm], whichever is less, beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit before coating. The wall thickness of the sleeve shall be at least 40 mils [1000 µm].

All fittings, condulets, mounting hardware, and accessories shall be PVC-coated. All hollow conduit fittings shall be coated with the interior urethane coating described above. Fittings shall be Form 8 Condulets, 1/2" through 4" diameters, shall have a v-seal tongue-in-groove gasket and supplied with plastic encapsulated stainless-steel cover screws to effectively seal against the elements. The screw heads on condulets shall be encapsulated with a corrosion-resistant material. Form 8 fittings shall be UL Type 4X and IP69 listed.

PVC coated rigid aluminum conduit shall be UL/cUL 6A Listed and NEMA RN-1 compliant, without exceptions. The PVC coated rigid steel conduit shall be manufactured by Calbond, Plasti-Bond, or approved equal.

2-4.07. Electrical Metallic Tubing (EMT). Not used.

2-4.08. Rigid Aluminum Conduit (RAC). Rigid aluminum conduit and fittings shall be manufactured of 6063-T1 alloy, shall conform to ANSI C80.5, and shall be manufactured in accordance with UL 6A.

2-4.09. Cable Tray. Not used.

2-5. WIRING DEVICES, BOXES, AND FITTINGS. Concealed conduit systems shall have flush-mounted switches and convenience outlets. Exposed conduit systems shall have surface-mounted switches and convenience outlets.

2-5.01. Conduit Boxes and Fittings.

- a. In applications utilizing aluminum conduit systems, aluminum boxes and fittings manufactured by Crouse-Hinds, Appleton, or O Z Gedney shall be installed.
- b. Rigid PVC device boxes and fittings shall be manufactured by Carlon or Cantex.
- c. Stainless steel device boxes shall be manufactured by Appleton, Raco, or Steel City.
- d. PVC coated device boxes shall be manufactured by Calbond, Ocal, or Robroy Industries.
- e. Hub arrangements on threaded fittings shall be the most appropriate for the conduit arrangement to avoid unnecessary bends and fittings.

### 2-5.02. Device Plates.

- a. Stainless steel device plates shall be used on surface mounted outlet boxes where weatherproof plates are not required.
- b. Device plates on flush mounted outlet boxes where weatherproof plates are not required shall be AISI Type 302 stainless steel, Eaton "93000 series", Hubbell "S series", or Leviton "840nn-40 series"; nylon or polycarbonate, Eaton "5000 series", Hubbell "Pn series", or Leviton "807nn-I series".
- c. Device plate mounting hardware shall be countersunk and finished to match the plate.
- d. Device plates for switches outdoors or indicated as weatherproof shall have provisions for padlocking switches "On" and "Off", and shall be Appleton "FSK-1VS", Crouse-Hinds "DS185" or O Z Gedney "FS-1-WSCA".
- e. Device plates for receptacles indicated as weatherproof shall be Appleton "FSK-WRD", Crouse-Hinds "WLRD1", or O Z Gedney "FS-1-WDCA".
- f. Flush-mounted, weatherproof plates shall be provided with adapter plates, Appleton "FSK-SBA" or Crouse-Hinds "FS031".
- g. Device plates for ground fault interrupter receptacles indicated to be weatherproof shall be Appleton "FSK-WGFI", Eaton "S966", or O Z Gedney "FS-1-GFCA".
- h. Receptacle covers outdoors or otherwise indicated to be weatherproof while in-use shall be die cast aluminum and shall include a padlock eye. Covers for standard convenience outlets shall be Hubbell "WP8M" or Thomas and Betts Red Dot "CKMUV". Covers for ground fault interrupter receptacles shall be Hubbell "WP26M" or Thomas and Betts Red Dot "CKMUV".
- i. Engraved device plates, where required, shall be manufactured by Leviton, or equal.
- j. Device plates on PVC conduit fittings shall be Carlon "E98 Series" or Cantex "513300 Series".

### 2-5.03. Wall Switches.

- a. Switches on ac lighting panel load circuits through 277 volts shall be 20 amperes, 120/277 volts, Eaton "AH1221V" through "AH1224V", Hubbell "HBL 1221I" through "HBL 1224I", or Leviton "1221-2I" through "1224-2I".

- b. Switches for pulse control of lighting contactors shall be 20 amperes, 120/277 volts, momentary, double-throw, center "Off", Eaton "1995V", Hubbell "1557I" or Leviton "1257-I".
- c. Switches on ac lighting panel load circuits through 277 volts in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the Drawings shall be 20 ampere, 120/277 volts. Hazardous area switches shall be factory sealed tumbler switches, Appleton "EDS" or Killark "FXS".

2-5.04. Receptacles.

- a. Standard convenience outlets shall be duplex, three-wire, grounding, 20 amperes, 125 volts, Eaton "AH5362V", Hubbell "5362I" or Leviton "5362-I" for 120 volt circuits, and 250 volts, Eaton "AH5462CV", Hubbell "5462I" or Leviton "5462-I" for 240 volt circuits.
- b. Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, Eaton "SGFH20", Hubbell "GF5362I" or Leviton "7899-I".
- c. Ground fault circuit interrupter receptacles in damp or wet locations shall be duplex, 20 amperes, 125 volts, Hubbell "GFWRST20I" or Leviton "WT899-HGI".
- d. Welding receptacles shall be 30 amperes, 600 volts, 3 phase, with grounding conductors connected through a fourth pole, Appleton "ADRE3034-100", Crouse-Hinds "AR348" plus "ARRC33" and "AR30" or Leviton "430MI5W". One matching plug, Appleton "ACP3034BC", Crouse-Hinds "APJ3485" or Leviton "430P5W" with appropriate woven grip and plug cap, shall be furnished for the cable size directed by Owner.
- e. Welding receptacles shall be 60 amperes, 240 volts, 3 phase, with grounding conductors connected through a fourth pole, Appleton "ADRE6034-150", Crouse-Hinds "AREA6425" or Leviton "460MI9W". One matching plug, Appleton "ACP6034BC", Crouse-Hinds "APJ6485" or Leviton "460P9W" with appropriate woven grip and plug cap, shall be furnished for the cable size directed by Owner.
- f. Receptacles in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the Drawings shall be three-wire, grounding, 20 amperes, 125 volts. Hazardous area receptacles shall be factory sealed, with an integral switch that is only activated when an approved matching plug is fully inserted and rotated into the engaged position. Hazardous area receptacles shall be Appleton "ENR", Crouse-Hinds "ENR", or Killark "UGR".

2-5.05. Special Outlets. Not used.

2-6. JUNCTION BOXES, PULL BOXES, AND WIRING GUTTERS. Indoor boxes (larger than switch, receptacle, or fixture type) and gutters shall be constructed of aluminum or stainless steel and shall be rigidly supported by stainless steel hardware and framing materials, including nuts and bolts.

Indoor boxes and gutters in corrosive areas indicated on the Drawings and outdoor boxes and gutters shall be NEMA Type 4X, ABS or stainless steel and shall be rigidly supported by PVC-coated or stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

Bolt-on junction box covers 3 feet [900 mm] square or larger, or heavier than 25 lbs [11 kg], shall have rigid handles. Covers larger than 3 by 4 feet [900 by 1200 mm] shall be split.

Where indicated on the Drawings, junction and pull boxes with a removable side opposite the underground conduits shall be provided over building ends of underground conduit banks. Boxes shall be sized in accordance with the National Electrical Code, including space for full size continuations of all underground conduits not originally continued. Conduit arrangement shall leave maximum space for future conduits.

2-7. LIGHTING FIXTURES. Lighting fixtures shall be furnished as described in the fixture schedule and as indicated on the Drawings. Lighting fixtures shall be furnished complete with lamps. Pendant fixtures shall have swivel type box covers and threaded conduit pendants unless otherwise specified. Lighting fixtures shall be provided with disconnects in accordance with NEC requirements.

2-7.01. Electronic Drivers. Electronic drivers furnished with LED type lighting fixtures shall be certified as meeting requirements of ANSI C82.77 with a THD level of not more than 20 percent.

2-8. LIGHTING PANELS. Each lighting panel shall be a dead-front, 120/240 volt, single phase or 120/208 volt, three phase panelboard with circuit breakers, in accordance with the Drawings and the following:

2-8.01. Cabinet. The panel shall have a flush-mounted or surface-mounted enclosure with a NEMA designation appropriate for the location where it will be installed. The enclosure shall have a hinged trim (cover). Breaker operating handles shall be accessible through a latched, lockable, door. At the completion of the Contract, a neatly printed or typed directory listing the panel and circuit identities shall be mounted inside the door.

2-8.02. Circuit Breakers. Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On", "Off", and "Tripped". Breakers indicated as multiple-pole shall be common trip. Breakers shall have interrupting ratings not less than 22,000 amperes. Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed. Breakers and provisions for future breakers shall be provided in the quantities, number of poles, and ampere ratings indicated on the Drawings.

2-8.03. Buses. The panel shall have main and neutral buses insulated from the cabinet, and a ground bus. Buses shall be copper, with ampere ratings and main lugs or breaker as indicated. The ground bus shall be similar to a neutral bus and shall have a good ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit. }

2-9. POWER PANELS. Unless otherwise specified, each power panel, with a neutral, shall be dead-front, 3 phase panelboard with circuit breakers, in accordance with the Drawings and the following:

2-9.01. Cabinet. The panel shall have a flush-mounted or surface-mounted enclosure with a NEMA designation appropriate for the location where it will be installed. The enclosure shall have a door with latch and lock. At the completion of the Contract, a neatly printed or typed directory listing the panel and circuit identities shall be mounted inside the door.

2-9.02. Circuit Breakers. Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On", "Off", and "Tripped". Breakers indicated as multiple-pole shall be common trip type. Breakers up to 240 volts shall have interrupting ratings not less than 22,000 amperes. Breakers for 277 volts shall have interrupting ratings not less than 65,000 amperes. Breakers for 480 volts shall be rated 600 volts, with interrupting ratings not less than 65,000 amperes at 480 volts. Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed.

2-9.03. Buses. panel shall have 3 phase buses, a neutral bus insulated from the cabinet, and a ground bus. Buses shall be copper, with ampere and voltage ratings and main lugs or breakers as indicated. The ground bus shall be similar to a neutral bus and shall have a good ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit.

2-10. SURGE PROTECTIVE DEVICES.

2 -10.01. Scope. Surge protective devices (SPD) shall be provided as specified herein and as indicated on the Drawings. Each unit shall be designed for parallel connection to the wiring system and shall utilize non-linear voltage-dependent metal oxide varistors (MOV) in parallel.

Each SPD shall be furnished and installed for the electrical equipment indicated on the Drawings or as specified herein. All new lighting and pump station power panels shall be furnished with an integral SPD.

Lighting panels shall be rated for the low exposure level capacity unless otherwise noted.

Scum Pump Motor Starters shall have SPD's rated for a medium exposure level.

The table below lists the specific SPD ratings for new scum pump motor starters.

Power Panel Name	Location	Voltage/ Phase	Exposure Level
MLS SWBD	As shown on plans	480VAC, 3 Phase	High
LP-39A	As shown on plans	120/208VAC, 1 Phase	Low
LP-39A1	As shown on plans	120/208VAC, 1 Phase	Low

2-10.02. Standards. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

ANSI/IEEE C62.41 and C62.45;

ANSI/IEEE C62.1 and C62.11;

IEEE C62.62;

National Electrical Manufacturers Association (NEMA LS1 Guidelines);

National Fire Protection Association (NFPA 20, 70 [NEC], 75, and 780);

Underwriters Laboratories UL 1449 and 1283

The unit shall be UL 1449 Listed as a Type 2 Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference (EMI) Filter.

2-10.03. Environmental Requirements.

- a. Operating Temperature: 0°F to +140°F [-18°C to +60°C].

- b. Relative Humidity: Reliable operation with 5 percent to 95 percent non-condensing.

2-10.04. Electrical Requirements.

- a. Unit Operating Voltage. The nominal unit operating voltage and configuration shall be as indicated on the Drawings.
- b. Maximum Continuous Operating Voltage (MCOV). The SPD shall be designed to withstand a MCOV of not less than 115 percent of nominal RMS voltage.
- c. Operating Frequency. Operating frequency range shall be 47 to 63 Hertz.
- d. Protection Modes. Four-wire configured systems shall provide, Line-to-Neutral (L-N), Line-to-Ground (L-G), and Neutral-to-Ground (N-G), and Line-to-Line (L-L) protection. Three-wire configured systems shall provide, Line-to-Line (L-L) protection and Line-to-Ground (L-G) protection.
- e. Rated Single Pulse Surge Current Capacity. The rated single pulse surge current capacity, in amps, for each mode of protection of the unit shall be as required and shall be no less than listed in the following table.

	L-N	L-G	N-G	L-L
High Exposure Level	120 kA	120 kA	120 kA	120 kA
Medium-High Exposure Level	100 kA	100 kA	100 kA	100 kA
Medium Exposure Level	80 kA	80 kA	80 kA	80 kA
Low Exposure Level	60 kA	60 kA	40 kA	60 kA

- f. UL 1449 Voltage Protection Rating (VPR). The maximum VPR per mode for the device (inclusive of disconnect) shall be as required and shall not exceed the following:

Voltage	L-N	L-G	N-G	L-L
120/240 1-phase	800 V	800 V	800 V	1200 V
480 V 4W	1200 V	1200 V	1200 V	2000 V

- g. Noise Attenuation. The unit shall be capable of a minimum -30 dB attenuation at 100kHz when tested per the 50 ohm insertion loss method as defined by MIL-STD-220C.
- h. Nominal Discharge Current. Each SPD shall have a nominal discharge current rating of 20 kA.

- i. Overcurrent Protection. At high and medium-high exposure levels, the SPD shall incorporate internal fusing capable of interrupting, at minimum, up to 200 kA symmetrical fault current with 600 volts ac applied.

At medium and low exposure levels, the SPD shall incorporate internal fusing capable of interrupting, at minimum, up to 65kA symmetrical fault current with 600 volts ac applied.

The device shall be capable of allowing passage of the rated maximum surge current for every mode without fuse operation.

- j. Unit Status Indicators. The unit shall include long-life, externally visible phase indicators that monitor the on-line status of the unit. When furnished integral to the panelboard, the status indicators shall be viewable when the panelboard door is opened.

2-10.05. Warranty. The manufacturer shall provide a minimum Five-Year Limited Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

2-10.06. Installation. Each SPD shall be installed according to the manufacturer's recommendations. If possible, for the integral units, provide direct bus connections.

2-10.07. Miscellaneous.

- a. Disconnect Switch. Each SPD shall be furnished with an integral disconnect switch. The unit shall be UL 1449 listed as such, and the UL 1449 Voltage Protection Ratings shall be provided. The disconnect switch shall be fused and capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.

2-10.08. Acceptable Manufacturers. Integral SPD's shall be manufactured by Eaton, General Electric, or Schneider-Electric. External SPD's shall be manufactured by Eaton, General Electric, Siemens Energy & Automation, Schneider-Electric, or Current Technology. The products of other manufacturers will not be acceptable.

2-11. SEPARATELY ENCLOSED MOTOR STARTERS.

2-11.01. Three Phase Starters. Three phase starters shall be circuit breaker combination type consisting of 3 phase, 60 Hz contactors with heaterless overloads, a 120 volt ac coil, a dry type control power transformer where required, and a circuit breaker disconnect. Control power transformers shall be sized to

handle all simultaneous loads. Starters shall be at least NEMA Size 1 or shall be sized as indicated on the Drawings.

Circuit breakers shall be 600 volt magnetic motor circuit protectors for motors smaller than 100 horsepower [75 kW] and 600 volt thermal-magnetic type for 100 horsepower [75 kW] and larger motors. Each breaker shall be manually operated with a quick-make, quick-break, trip-free toggle mechanism.

Three phase starters shall be furnished with external manual breaker operating handles and provisions for up to three padlocks. The access door shall be interlocked with the motor circuit protector, so that the door cannot be opened, except by an interlock override, while the breaker is closed. The starter enclosure shall be NEMA 4X, stainless steel.

The complete 3 phase starter shall have an interrupting rating of at least 65,000 amperes at 480 volts.

2-11.02. Single Phase Starters. Single phase starters shall consist of single phase, 60 Hz contactors with thermal overloads and an integral or separately enclosed short-circuit protection device. Starters shall be at least NEMA Size 0 or shall be sized as indicated on the Drawings. Integral short-circuit protection devices for single-phase starters shall be 120/240-volt AC magnetic motor circuit protectors.

Separately enclosed short-circuit protection devices for single phase starters shall be molded-case circuit breakers for motor loads 6 amperes and higher and fused switch disconnects for motor loads lower than 6 amperes. Circuit breaker disconnects shall be 120/240 volt, molded-case, thermal-magnetic circuit breakers. Fused switch disconnects shall have quick-make, quick-break mechanisms and 250-volt AC dual-element, time-delay fuses.

The short-circuit protection devices shall have external operating handles capable of being padlocked in the open position and shall have an interrupting rating of at least 22,000 amperes at 240 volts.

2-12. SEPARATELY ENCLOSED MANUAL STARTERS. Separately enclosed manual starters not specified elsewhere shall be provided hereunder. Manual starters shall be provided with thermal overload protection properly sized for the motors served and with a contact and overload in each phase lead. Manual starters shall be mounted in NEMA Type 1 enclosures unless otherwise noted. Manual starters outdoors or indicated to be weatherproof shall have NEMA Type 4X stainless steel enclosures.

2-13. CONTROL STATIONS. Control stations shall be provided as indicated on the one-line diagrams or schematics or as required by the equipment furnished. Pilot devices shall be 30.5 mm heavy-duty, oil-tight construction, and shall perform the functions indicated. Pilot lights shall be full voltage type with LED lamps. Indoor

control stations shall have NEMA Type 13 enclosures. Control stations outdoors or indicated to be weatherproof shall have NEMA Type 4X stainless steel enclosures with protective caps on the control devices. Control stations in NEC Class I, Division 1 and Division 2, Group D hazardous areas shall have NEMA Type 7 enclosures, or be factory sealed type, Appleton "Contender Series" or Killark "Seal-X Series". Control stations shall be provided with a main circuit breaker (MCB) or fused disconnect. 480 volt control station MCB shall have an interrupting rating of not less than 65kAIC. 240 volt and lower control station MCB shall have an interrupting rating of not less than 22kAIC.

**2-14. SEPARATELY ENCLOSED SERVICE-ENTRANCE RATED CIRCUIT BREAKERS.** Circuit breakers shall be 3 pole, 480 volt, molded-case circuit breakers of not less than 65,000 amperes interrupting rating at 480 volts ac, complete with thermal and instantaneous trip elements. Each breaker shall be manually operated with a quick-make, quick-break, trip-free toggle mechanism. Bimetallic thermal elements shall withstand sustained overloads and short-circuit currents without injury and without affecting calibration.

Molded-case circuit breakers shall have solid state electronic trip with short time delay mechanisms, and, shall have ground fault protection.

Compression type terminals shall be provided for terminating the number and size of copper conductors indicated on the Drawings.

Circuit breakers shall have "On", "Off", and "Tripped" indication and padlockable exterior handles.

**2-15. DISCONNECT SWITCHES.** Unless otherwise specified, each disconnect switch shall be 3 pole, non-fusible, 600 volts, with a continuous current rating as indicated on the Drawings.

Switches located outdoors shall have NEMA Type 4X stainless steel enclosures.

Switches shall have high conductivity copper, visible blades; non-teasible, positive, quick-make, quick-break mechanisms; and switch assembly plus operating handle as an integral part of the enclosure base. Each switch shall have a handle whose position is easily recognizable, and which can be locked in the "Off" position with three padlocks. The "On" and "Off" positions shall be clearly marked.

All switches shall be UL listed and horsepower [kilowatt] rated and shall meet the latest edition of NEMA KS1. Switches shall have defeatable door interlocks that prevent the door from being opened while the operating handle is in the "On" position.

**2-16. LIGHTING AND AUXILIARY POWER TRANSFORMERS.** Separately mounted transformers shall be provided in the phases, kVA, and voltages indicated

on the Drawings. Transformers shall be self-air-cooled, dry type, wall- or floor-mounted, and enclosed for wiring in conduit. Transformers installed outdoors shall be weatherproof. Transformers shall have at least two full capacity voltage taps. Transformers shall meet NEMA TP1 guidelines for energy efficiency.

2-17. MANUAL TRANSFER SWITCHES.

Manual transfer switches shall be provided where indicated on the Drawings. Switch voltage, number of poles, and continuous current rating shall be as indicated on the Drawings. The enclosure shall be rack mounted and shall have a NEMA Type 1 enclosure. Switches shall be UL 1008 listed.

2-18. POWER FACTOR CORRECTION CAPACITORS. Not used.

2-19. LIGHTING CONTACTORS. Not used.

2-20. PHOTOELECTRIC CONTROLS. Not Used.

2-21. TRYSTAR GDS-1 Generator Docking Station. A Trystar 1200 A Model GDS-1 docking station shall be provided and wired as indicating on plans.

2-22. ALARM HORN AND BEACON. Not used.

2-23. HEAT-TRACED PIPING. Not used.

PART 3 - EXECUTION

3-1. INSTALLATION, TESTING, AND COMMISSIONING. All material, equipment, and components specified herein shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

3-2. ARC FLASH HAZARD ANALYSIS. Contractor shall utilize Owner's Arc Flash Hazard Analysis for proper labeling of each new piece of electrical equipment including industrial control panels, and other electrical equipment likely to be worked on energized, in accordance with OSHA 29 CFR Part 1910, NEC, NFPA 70E, and IEEE 1584.

3-2.01. Arc Flash Labeling. Contractor shall furnish and install arc flash labels on the applicable electrical equipment. The arc flash labels shall comply with ANSI Z535.4 and NFPA 70E requirements. Labels shall include, at a minimum, the nominal system voltage, the arc flash boundary distance, worst-case incident energy and the corresponding working distance, date of the analysis, and equipment name.

Equipment with arc reduction maintenance mode switches shall include a dual label with the worst-case calculated incident energy level with and without the switch enabled. The label shall clearly identify the associated maintenance mode switch that shall be enabled in order for the lower incident energy level to apply.

3-3. COORDINATION STUDY. Contractor shall commission a short circuit study and protective-device coordination study of relays, fuses, circuit breakers, and all other protective devices and shall submit a coordination report as specified herein. The coordination study shall be done in conjunction with the arc flash hazard analysis, both studies shall be performed by the same contractor. The study shall include the entire distribution system, or the portion of the system indicated as required, starting with the smallest – 480 volt, 3 phase, 60 Hz – circuit protective device on the load end, to the nearest protective device on the power company's line side.

Contractor shall be responsible for and shall ensure that all relays and circuit breakers are set according to the study results.

The study shall include, but shall not be limited to, the following:

- Color-coded printouts of coordination curves prepared with calculation software.

- A tabulation of all protective relay and circuit breaker trip settings and recommended sizes and types of medium-voltage fuses.

- Motor starting profiles for all 50 horsepower [37 kW] and larger motors.

- Transformer damage curves and protection, evaluated in accordance with ANSI/IEEE C57.109.

- Coordination curve(s) from the power company, if available.

- Calculated short-circuit values at all nodes in the distribution system included within the scope of the coordination study.

An Engineering and Testing Services firm acceptable to Engineer shall conduct the coordination study.

Contractor shall be responsible for obtaining the following:

- The coordination curves for relays, fuses, and circuit breakers.

- Transformer damage curves.

- Motor data.

- Other applicable information for all new and existing electrical equipment.

Contractor shall coordinate with the power company to obtain the required protective device curves and shall be responsible for all the field work associated with obtaining the necessary data on existing relays, circuit breakers, fuses, and transformers to be included in the coordination study.

The available 3 phase, symmetrical fault current at the point of service shall be obtained from the Power Company.

The coordination report shall be bound in a standard 8-1/2 by 11 inch [210 by 275 mm] three-ring binder and shall be submitted in accordance with the Submittals section. Final selection of all protective device settings or sizes shall be subject to review and acceptance by Engineer.

3-4. POWER AND SERVICE ENTRANCE INSTALLATION. Contractor shall consult the local electric utility regarding their service installation requirements and shall install the replacement service equipment in compliance with these requirements. Contractor shall install all power service equipment components except for components installed by the utility as directed in the utility service installation requirements.

Contact information for the electric utility is as follows:

Name of electric utility	Florida Power & Light
Electric utility contact person and telephone number	Susan Stanfill <a href="mailto:Susan.Stanfill@fpl.com">Susan.Stanfill@fpl.com</a>

Contractor shall coordinate details and timing of service entrance installations with the utility. Contractor shall complete and submit service applications to the electric utility as necessary.

3-5. TELECOMMUNICATIONS SERVICE ENTRANCE INSTALLATION. Not used.

3-6. CABLE INSTALLATION.

3-6.01. General. Except as otherwise specified or indicated on the Drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage. Circuits to supply electric power and control to equipment and devices, communication and signal circuits as indicated on the one-line diagrams shall be installed continuous and may not be spliced unless approved by the Engineer.

- a. Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.
- b. Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may only be used for splicing solid cable and for terminations at lighting fixtures.
- c. Splices may be made only at readily accessible locations.
- d. Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions.
- e. All 5,000 volt rated cable and above shielded cable stress cone terminations shall be IEEE Class 1 molded rubber type. Shielded cable splices shall be tape or molded rubber type as required. Shielded cable splices and stress cone terminations shall be made by qualified splicers. Materials shall be by 3M Company, Plymouth/Bishop, or Raychem Electric Power Products.
- f. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.
- g. Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J".
- h. Cables operating at more than 2000 volts shall be fireproofed in all cable vaults, manholes, and handholes. Fireproofing shall be applied with a half-lapped layer of 3M "Scotch 77 Arc-Proofing Tape", anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Tape" or with equivalent tape by Anixter or Plymouth/Bishop.
- i. Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.
- j. Spare cable ends shall be taped, coiled, and identified.
- k. Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 diameters for non-shielded cable and 12 diameters for shielded cable.
- l. All cables in one conduit, over 1 foot [305 mm] long, or with any bends, shall be pulled in or out simultaneously.

- m. Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Circuits shall not be combined to reduce conduit requirements unless acceptable to Engineer.
- n. Instrument cable shields and drain wires shall be continuous over the entire length of the circuit and grounded at one end only. In general, the field end of the shield shall be ungrounded. At the ungrounded termination of the circuit, the shield and drain wire shall be insulated by taping to prevent grounding.
- o. Cables operating at more than 2,000 volts which terminate at medium-voltage pad mounted equipment bushings shall include a metal oxide varistor surge protective elbow terminator conforming to IEEE Standard 386. Elbows shall provide a weatherproof, dead-front, hot-stick operable separable connection. Surge protector rating shall be as recommended by the terminator supplier.

3-6.02. Underground Cable Pulling Procedure. Care shall be taken to prevent excessive physical stresses that would cause mechanical damage to cables during pulling. Before pulling cables into the underground duct system the Contractor shall submit a pulling procedure for the underground circuits.

The procedure shall include the following information:

- a. Point of cable entrance into the duct system.
- b. Point of cable exit from the duct system.
- c. Type of cable grip to be used.
- d. Type of pulling device to be used.
- e. Method of continuously monitoring cable tension during pulling.
- f. Identification of manholes through which cable will be pulled or where splices will be made.
- g. Size and type of cable sheave assemblies to be used.

3-6.03. Medium-Voltage Cable Insulation Test. Not used.

3-7. CONDUIT INSTALLATION. Contractor shall be responsible for routing all conduits. This shall include all conduits indicated on the one-lines, riser diagrams, conduit schedules, and home-runs shown on the plan Drawings. Conduits shall be routed as defined in these Specifications. Where conduit routing is shown on plans, it shall be considered a general guideline and shall be field verified to avoid interferences.

Except as otherwise specified or indicated on the Drawings, conduit installation and identification shall be completed according to the following procedures.

3-7.01. Installation of Interior and Exposed Exterior Conduit. This section covers the installation of conduit inside structures, above and below grade, and in exposed outdoor locations. In general, conduit inside structures shall be concealed. Large conduit and conduit stubs may be exposed unless otherwise specified or indicated on the Drawings. No conduit shall be exposed in water chambers unless so indicated on the Drawings.

Unless otherwise indicated on the Drawings, Contractor shall be responsible for routing the conduit to meet the following installation requirements:

- a. Conduit installed in all exposed indoor locations, except corrosive areas indicated on the Drawings, and in floor slabs, walls, and ceilings of hazardous (classified) locations, shall be rigid aluminum. Exposed conduit shall be rigidly supported by stainless steel hardware and framing materials, including nuts and bolts.
- b. Conduit installed in floor slabs and walls in non-hazardous locations shall be rigid Schedule 40 PVC.
- c. Conduit installed in all exposed outdoor locations shall be rigid aluminum, rigidly supported by stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.
- d. Final connections to dry type transformers, to motors without flexible cords, and to other equipment with rotating or moving parts shall be liquidtight flexible metal conduit with watertight connectors installed without sharp bends and in the minimum lengths required for the application, but not longer than 6 feet [1.8 m] unless otherwise acceptable to Engineer.
- e. Terminations and connections of rigid aluminum and intermediate metal conduit shall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings.
- f. Exposed conduit shall be installed either parallel or perpendicular to structural members and surfaces.
- g. Two or more conduits in the same general routing shall be parallel, with symmetrical bends.
- h. Conduits shall be at least 6 inches [150 mm] from high temperature piping, ducts, and flues.

- i. Conduit installed in corrosive chemical feed and storage areas as indicated by Area Type on the Drawings shall be rigid Schedule 80 PVC. Exposed conduit in corrosive areas shall be supported by FRP framing materials with stainless steel hardware, including nuts and bolts.
- j. Rigid Schedule 40 and 80 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.
- k. Metallic conduit connections to metal enclosures shall be securely fastened by locknuts inside and outside.
- l. Rigid Schedule 40 and 80 PVC conduit shall be secured to sheet metal device boxes using a male terminal adapter with a locknut inside or by using a box adapter inserted through the knockout and cemented into a coupling.
- m. Conduits in walls or slabs, which have reinforcement in both faces, shall be installed between the reinforcing steel. In slabs with only a single layer of reinforcing steel, conduits shall be placed under the reinforcement. Conduits larger than 1/3 of the slab thickness shall be concrete encased under the slab.
- n. Conduits that cross structural joints where structural movement is allowed shall be fitted with concrete-tight and watertight expansion/deflection couplings, suitable for use with metallic conduits and rigid Schedule 40 or 80 PVC conduits. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.
- o. Conduit shall be clear of structural openings and indicated future openings.
- p. Conduits through roofs or metal walls shall be flashed and sealed watertight.
- q. Conduit installed through any openings cut into non-fire rated concrete or masonry structure elements shall be neatly grouted. Conduit penetrations of fire rated structure elements shall be sealed in a manner that maintains the fire rating as indicated on the Architectural Drawings.
- r. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.
- s. Exposed conduit stubs for future use shall be terminated with galvanized pipe caps.
- t. Concealed conduit for future use shall be terminated in equipment or fitted with couplings plugged flush with structural surfaces.

- u. Where the Drawings indicate future duplication of equipment wired hereunder, concealed portions of conduits for future equipment shall be provided.
- v. Horizontal conduit shall be installed to allow at least 7 feet [2.1 m] of headroom, except along structures, piping, and equipment or in other areas where headroom cannot be maintained.
- w. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Engineer.
- x. PVC-coated rigid aluminum conduit shall be threaded and installed as recommended by the conduit manufacturer's installation procedure using appropriate tools.
- y. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.
- z. Conduit which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid aluminum conduit before it emerges. Conduits shall have PVC-coated rigid aluminum coupling embedded a minimum of 3 inches when emerging from slabs or walls and the coupling shall extend 2 inches from the wall.

3-7.02. Underground Conduit Installation. All excavation, backfilling, and concrete work shall conform to the respective sections of these Specifications. Underground conduit shall conform to the following requirements:

- a. All underground conduits shall be concrete encased unless indicated otherwise on the Drawings. Concrete encasement within 15 feet of building entrances, under and within 5 feet of roadways, and within 10 feet of indicated future excavations shall be reinforced as detailed on the Drawings.
- b. Concrete encased conduit shall be schedule 40 PVC. Conduits shall have PVC-coated rigid aluminum coupling embedded a minimum of 3 inches when emerging from walls and the coupling shall extend 2 inches from the wall. All PVC joints shall be solvent welded in accordance with the recommendations of the manufacturer.
- c. Concrete encasement on exposed outdoor conduit risers shall continue to 6 inches [150 mm] above grade, with top crowned and edges chamfered.
- d. Conduit and concrete encasement installed underground for future extension shall be terminated flush at the bulkhead with a coupling and a screw plug. The termination of the duct bank shall

be reinforced with bars 100 diameters long that shall be terminated 2 inches [50 mm] from the bulkhead. Matching splice bars shall be 50 bar diameters long. Each longitudinal bar shall be provided with a Lenton "Form Saver" coupler and plate or a Dayton "Superior DBR" coupler at the bulkhead. The coupler shall be threaded to accept a dowel of like diameter in the future. Threads shall be protected with screw-in plastic caps. A 1-3/4 by 3/4 inch [45 by 20 mm] deep horizontal shear key shall be formed in the concrete encasement above and below the embedded conduits. After concrete placement, conduit and bar connector ends shall be cleaned and coated with two coats of thixotropic coal tar.

- e. Underground conduits indicated not to be concrete encased shall be rigid PVC-coated aluminum.
- f. Underground conduit bend radius shall be at least 2 feet [600 mm] at vertical risers and at least 3 feet [900 mm] elsewhere.
- g. Underground conduits and conduit banks shall have at least 2 feet [600 mm] of earth cover, except where indicated otherwise.
- h. Underground conduit banks through building walls shall be cast in place, or concreted into boxouts, with water stops on all sides of the boxout. Water stops are specified in the Cast-In-Place Concrete section.
- i. Underground nonmetallic conduits, which turn out of concrete or earth in outdoor locations, shall be connected to 90 degree elbows of PVC-coated aluminum conduit before they emerge.
- j. Conduits not encased in concrete and passing through walls, which have one side in contact with earth, shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
- k. Underground conduits shall be sloped to drain from buildings to manholes.
- l. Each 5 kV or higher voltage cable, each 250 kcmil [120 mm<sup>2</sup>] or larger cable, and each conduit group of smaller cables shall be supported from manhole walls by Kindorf "D-990" or Unistrut "P-3259" inserts, with Kindorf "F-721-24" or Unistrut "P-2544" brackets and Unistrut "P1753" or "P1754" fiberglass reinforced polyester cable saddles.
- m. Telephone cables shall not be installed in raceways, conduits, boxes, manholes, or handholes containing other types of circuits.

- n. Intercommunication and instrument cables shall be separated the maximum possible distance from all power wiring in pull-boxes, manholes, and handholes.

3-7.03. Sealing of Conduits. After cable has been installed and connected, conduit ends shall be sealed by forcing nonhardening sealing compound into the conduits to a depth at least equal to the conduit diameter. This method shall be used for sealing all conduits at handholes, manholes, and building entrance junction boxes, and for 1 inch [25 mm] and larger conduit connections to equipment.

Conduits entering chlorine feed and storage rooms shall be sealed in a junction box or conduit body adjacent to the point of entrance.

Conduits entering hazardous (classified) areas and submersible or explosion proof enclosures shall have Appleton "Type ESU" or Crouse-Hinds "EYS" sealing fittings with sealing compound.

3-7.04. Reuse of Existing Conduits. Existing conduits may be reused subject to the concurrence of Engineer and compliance with the following requirements:

- a. A wire brush shall be pulled through the conduit to remove any loose debris.
- b. A mandrel shall be pulled through the conduit to remove sharp edges and burrs.

3-8. WIRING DEVICES, BOXES, AND FITTINGS INSTALLATION. Metallic and nonmetallic conduit boxes and fittings shall be installed in the following locations:

3-8.01. Conduit Boxes and Fittings.

- a. Stainless steel boxes and fittings shall be installed in concrete walls, ceilings, and floors; in the outdoor faces of masonry walls; and in all locations where weatherproof device covers are required. These boxes and fittings shall also be installed in exposed rigid steel and intermediate metal conduit systems.
- b. Stainless steel boxes shall be installed in the indoor faces of masonry walls, in interior partition walls, and in joist supported ceilings.
- c. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.
- d. PVC coated boxes and fittings shall be installed in PVC coated conduit systems.

- e. Telephone conduit shall be provided with separate junction boxes and pull fittings.

3-8.02. Device Plates. Oversized plates shall be installed where standard-sized plates do not fully cover the wall opening.

3-8.03. Wall Switches.

- a. Wall switches shall be mounted 3'-6" [1.05 m] above floor or grade.
- b. After circuits are energized, all wall switches shall be tested for proper operation.

3-8.04. Receptacles.

- a. Convenience outlets shall be 18 inches [450 mm] above the floor unless otherwise required.
- b. Convenience outlets outdoors and in garages; in basements, shops, storerooms, and rooms where equipment may be hosed down; shall be 4 feet [1.2 m] above floor or grade.
- c. Welding receptacles shall be surface-mounted 4 feet [1.2 m] above the floor.
- d. After circuits are energized, each receptacle shall be tested for correct polarity and each GFCI receptacle shall be tested for proper operation.
- e. Conduit and wire for convenience outlet installation is not shown on the Drawings and shall be sized, furnished, and installed by Contractor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for convenience outlet installation.

3-8.05. Special Outlets.

- a. Wall thermostats shall be 4'-6" [1.35 m] above the floor unless otherwise required. Thermostats on exterior walls shall be suitably insulated from wall temperature.
- b. Telephone outlets shall be 18 inches [450 mm] above the floor unless otherwise required. Telephone outlets outdoors and in garages; in basements, shops, storerooms, and rooms where equipment may be hosed down; shall be 4 feet [1.2 m] above floor or grade.
- c. Clock outlets shall be located 7 feet [2.1 m] above the floor.

- d. Horns and strobe lights for audio/visual alarms shall be mounted a minimum of 8 feet above finished floor and shall be positioned to provide maximum penetration of the surrounding area.

3-9. EQUIPMENT INSTALLATION. Except as otherwise specified or indicated on the Drawings, the following procedures shall be used in performing electrical work.

3-9.01. Setting of Equipment. All equipment, boxes, and gutters shall be installed level and plumb. Boxes, equipment enclosures, metal raceways, and similar items mounted on water- or earth-bearing walls shall be separated from the wall by at least 1/4 inch [6 mm] thick corrosion-resistant spacers. Where boxes, enclosures, and raceways are installed at locations where walls are not suitable or available for mounting, concrete equipment pads, framing material, and associated hardware shall be provided.

3-9.02. Sealing of Equipment. All outdoor substation, switchgear, motor control center, and similar equipment shall be permanently sealed at the base, and all openings into equipment shall be screened or sealed with concrete grout to keep out rodents and insects the size of wasps and mud daubers. Small cracks and openings shall be sealed from inside with silicone sealant, Dow-Corning "795" or General Electric "SCS1200".

### 3-10. GROUNDING.

3-10.01. General. The electrical system and equipment shall be grounded in compliance with the National Electrical Code and the following requirements:

- a. All ground conductors shall be at least 12 AWG [4 mm<sup>2</sup>] soft drawn copper cable or bar, bare or green-insulated in accordance with the National Electrical Code.
- b. Ground cable splices and joints, ground rod connections, and equipment bonding connections shall meet the requirements of IEEE 837, and shall be exothermic weld connections or irreversible high-compression connections, Cadweld "Exothermic" or Burndy "Hyground". Mechanical connectors will not be acceptable. Cable connections to bus bars shall be made with high-compression two-hole lugs.
- c. Ground cable through exterior building walls shall enter within 3 feet [900 mm] below finished grade and shall be provided with a water stop. Unless otherwise indicated, installation of the water stop shall include filling the space between the strands with solder and soldering a 12 inch [300 mm] copper disc over the cable.

- d. Ground cable near the base of a structure shall be installed in earth and as far from the structure as the excavation permits, but not closer than 24 inches [600 mm]. The tops of ground rods and ground cable interconnecting ground rods shall be buried a minimum of 30 inches [750 mm] below grade, or below the frost line, whichever is deeper.
- e. All powered equipment, including lighting fixtures and receptacles, shall be grounded by a copper ground conductor in addition to the conduit connection.
- f. Ground connections to equipment and ground buses shall be made with copper or high conductivity copper alloy ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be made with irreversible high-compression type lugs inserted under permanent assembly bolts or under new bolts drilled and inserted through enclosures, other than explosion proof enclosures, or by grounding locknuts or bushings. Ground cable connections to anchor bolts; against gaskets, paint, or varnish; or on bolts holding removable access covers will not be acceptable.
- g. The grounding system shall be bonded to the station piping by connecting to the first flange inside the building, on either a suction or discharge pipe, with a copper bar or strap. The flange shall be drilled and tapped to provide a bolted connection.
- h. Ground conductors shall be routed as directly as possible, avoiding unnecessary bends. Ground conductor installations for equipment ground connections to the grounding system shall have turns with minimum bend radii of 12 inches [300 mm].  
Ground rods not described elsewhere shall be a minimum of 3/4 inch [19 mm] in diameter by 10 feet [3 m] long, with a copper jacket bonded to a steel core.
- i.
- j. Test wells and covers for non-traffic areas shall be molded high density polyethylene. Test wells for traffic areas shall be precast concrete construction rated for traffic duty with concrete or cast iron covers.

3-10.02. Grounding System Resistance. The grounding system design depicted on the Contract Drawings is the minimum design required for each building or structure. Each system shall comply with the maximum resistance of 5 ohms to ground. Contractor shall confirm the system grounding resistance with the results of the testing specified herein. Systems exceeding the maximum resistance specified shall be supplemented with additional grounding provisions and retested until the maximum specified resistance is achieved.

3-10.03. Grounding System Testing. The grounding system of each new building or structure and each existing building or structure indicated below, shall be tested to determine the resistance to earth. Testing shall be performed by an independent electrical or grounding system testing organization. Testing shall be completed after not less than three full days without precipitation and without any other moistening or chemical treatment of the soil.

3-10.03.01. New Grounding Systems. Grounding systems of each new building or structure shall be tested for resistance to earth utilizing the three-point fall of potential test as defined by IEEE 81. Testing shall be completed prior to installation of the electrical distribution equipment to ensure the grounding system is isolated from the utility grounding system and the systems of other structures. The current source probe for the test shall be placed in soil at a distance of 5 to 10 times the distance of the widest measurement across the grounding system ring or grid to ensure adequate measurements outside of the grounding system's sphere of influence. Test probe measurements shall be taken at a distance of one foot from the grounding system reference connection and at each 10 percent increment from the grounding system reference connection to the current source probe location. Test results shall be documented on a graphical plot with resistance in ohms on the vertical axis and distance in feet on the horizontal axis. The results shall clearly indicate a system resistance plateau which confirms a valid test procedure.

3.10.03.02. Existing Grounding Systems. Grounding systems of each existing building or structure indicated shall be tested for resistance to earth.

Existing building(s) or structure(s) to be tested	MLS 39-A
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Where existing grounding systems can be isolated from the building power service or utility power service a three-point fall of potential test shall be completed as indicated above. Where isolation of the building grounding system is not practical, a clamp-on resistance test will be an acceptable alternative. Clamp-on resistance testing shall be completed utilizing a ground resistance tester specifically designed for clamp on resistance testing, such as the AEMC "Model 3711". Clamp-on resistance measurements shall be taken at the service side of the service entrance neutral, upstream of the neutral to ground bonding connection to ensure a single path between the grounding system and the utility reference.

3.10.03.03. Grounding System Test Report. A report certified by the testing organization shall be prepared and submitted in accordance with the Submittal Procedures section. The final report shall include complete testing results for each building or structure, graphical representation of the test point results for the three-point fall of potential method, and complete observations of all site weather conditions and other environmental conditions that may affect the test results. Final

acceptance of the results reported shall be subject to the review and approval of Engineer.

3-11. LIGHTING FIXTURE INSTALLATION. The Drawings indicate the general locations and arrangements of the lighting fixtures. Fixtures in rows shall be aligned both vertically and horizontally unless otherwise specified. Fixtures shall be clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.

Conduit and wire for lighting fixture installation is not shown on the Drawings and shall be sized, furnished and installed by Contractor. Circuits to emergency lighting units, exit signs, and fixtures indicated to be night lights shall not be switched. Circuits to lighting fixtures indicated to have emergency battery packs shall include an additional un-switched hot conductor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for lighting fixture installation.

3-12. POWER FACTOR CORRECTION CAPACITOR INSTALLATION. Not used.

3-13. HEAT-TRACED PIPING INSTALLATION. Not used.

3-14. MODIFICATIONS TO EXISTING EQUIPMENT. Modifications to existing equipment shall be completed as specified herein and indicated on the Drawings. All existing facilities shall be kept in service during construction. Temporary power or relocation of existing power and control wiring, equipment, and devices shall be provided as required during construction. Coordination and timing of outages shall be as specified in other sections of these Specifications. Electrical power interruptions will only be allowed where agreed upon in advance with Owner, and scheduling at times of low demand may be required.

The existing Data Flow Systems (DFS) SCADA Remote Terminal Unit (RTU) Pump Station Controller mounted on a sub-panel within the existing electrical equipment line-up shall be removed intact, relocated into a new free-standing NEMA 1 enclosure dimensionally suited to the existing DFS RTU mounting sub-panel and re-wired to all replacement VFDs, replacement ATS and other remaining MLS electrical equipment and instrumentation.

3-14.01. Demolition. Unless otherwise specified or indicated on the Drawings, all cable and all exposed conduit for power and control signals of equipment indicated to be removed shall be demolished. Conduit supports and electrical equipment mounting hardware shall be removed, and holes or damage remaining shall be grouted or sealed flush. Conduit partially concealed shall be removed where exposed and plugged with expanding grout flush with the floor or wall. Repairs shall be refinished to match the existing surrounding surfaces. Demolished equipment shall be discarded or salvaged as indicated on the Drawings and as specified in other sections of these Specifications.

End of Section

**STANDARD SPECIFICATIONS**

REFERENCE: UL 83, ICEA S-95-658 (NEMA WC70).  
 CONDUCTOR: Solid, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.  
 INSULATION: Polyvinyl chloride, UL 83, Type THHN and THWN, ICEA S-95-658.  
 SHIELD: None.  
 JACKET: Conductor: Nylon, 4 mils (100 µm) minimum thickness, UL 83.  
 FACTORY TESTS: Cable shall meet the requirements of UL 83 for Type THHN and THWN.

**Cable Details**

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm <sup>2</sup>		in.	µm	in.	mm
12	4.0	1	0.015	380	0.17	4.32
10	6.0	1	0.020	510	0.20	5.08

\*The average thickness shall be not less than that indicated above. The minimum thickness shall not be less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, THWN or THHN, conductor size, and 600 volt.

**600 Volt, Single Conductor Lighting Cable (600-1-PVC-THHN-THWN)**

**BLACK & VEATCH**

**Cable Data**

**Figure 1-16050**

**STANDARD SPECIFICATIONS**

REFERENCE: ICEA S-95-658 (NEMA WC 70).  
 CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Wet/dry maximum operating temperature 90°C.  
 INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.  
 SHIELD: None.  
 JACKET: None.  
 FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658.

**Cable Details**

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm <sup>2</sup>		in.	µm	in.	mm
14	2.5	7	0.030	760	0.17	4.32
12	4.0	7	0.030	760	0.19	4.83
10	6.0	7	0.030	760	0.21	5.33
8	10.0	7	0.045	1140	0.27	6.86
6	16.0	7	0.045	1140	0.31	7.87
4	25.0	7	0.045	1140	0.36	9.14
2	35.0	7	0.045	1140	0.42	10.67
1	40.0	19	0.055	1400	0.48	12.19
1/0	50.0	19	0.055	1400	0.52	13.21
2/0	70.0	19	0.055	1400	0.57	14.48
4/0	95.0	19	0.055	1400	0.68	17.27
250	120.0	37	0.065	1650	0.75	19.05
350	185.0	37	0.065	1650	0.85	21.59
500	300.0	37	0.065	1650	0.98	24.89
750	400.0	61	0.080	2030	1.22	31.00
1,000	500.0	61	0.080	2030	1.37	34.80

\*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, XHHW-2, conductor size, and voltage class.

**600 Volt, Single Conductor Lighting/Power Cable (600-1-XLP-NONE-XHHW-2)**

**BLACK & VEATCH**

**Cable Data**

**Figure 2-16050**

**STANDARD SPECIFICATIONS**

REFERENCE: UL 66, UL 1277.

CONDUCTOR: 16 AWG (1.5 mm<sup>2</sup>), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 66, Type TFN.

LAY: Twisted pair with 1-1/2 inch to 3 inch (38.10 mm - 63.5 mm) lay.

SHIELD: Cable assembly, combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm<sup>2</sup>) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 66.  
Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: One conductor black, one conductor white.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 66 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

**Cable Details**

	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
Single Pair	0.045	1140	0.34	8.64

\*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the value indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type TFN, conductor size, single pair, and voltage class.

**600 Volt, Single Pair, Shielded Instrument Cable (600-SINGLE-PAIR-SH-INSTR)**

**BLACK & VEATCH**

**Cable Data**

**Figure 4-16050**

## SECTION 16100 ELECTRICAL EQUIPMENT INSTALLATION

### PART 1 - GENERAL

1-1. SCOPE. This section covers the installation of electrical equipment.

1-2. GENERAL. Equipment specified to be installed under this section shall be erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

The electrical equipment identified as being provided by others will be furnished complete for installation by Contractor. Technical specifications under which the equipment will be purchased are available.

1-2.01. Coordination. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 14 days prior to the need for manufacturer's field services furnished by others.

Submittals for equipment furnished under the original procurement contract will be furnished to Contractor upon completion of review by Engineer. Contractor shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria.

### 1-3. DELIVERY, STORAGE, AND HANDLING.

1-3.01. Delivery. When sills are required for electrical equipment, they shall be shipped ahead of the scheduled equipment delivery to permit installation before concrete is placed.

1-3.02. Storage. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with Product Storage and Handling Requirements section, and in accordance with manufacturer's written instructions, until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on earth or grass surfaces or come into contact with earth or grass. Contractor shall keep the equipment clean and dry at all times. Openings shall be plugged or capped (or otherwise sealed by packaging) during temporary storage.

1-3.03. Handling. Electrical equipment shall be moved by lifting, jacking, or skidding on rollers as described in the manufacturer's instructions. Special lifting harness or apparatus shall be used when required. Lifting and jacking points shall

be used when identified on the equipment. Contractor shall have required unloading equipment on site to perform unloading work on the date of equipment delivery.

1-4. ARC FLASH HAZARD LABELS. Switchgear, switchboards, motor control centers, motor control line-ups, and transfer switches shall be provided with permanent labels warning the risk of arc flash and shock hazard. Labels shall be designed in accordance with ANSI Z535.4-1998 and shall include the following information:

WARNING  
Arc Flash and Shock Hazard

Appropriate personal protection equipment (PPE) required. See NFPA 70E.

Equipment must be accessed by qualified personnel only.

Turn off all power sources prior to working on or inside equipment.

Additional information shall be provided on the labels where specified in the Arc Flash Hazard Analysis section of Electrical section.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION

3-1. INSTALLATION, TESTING, AND COMMISSIONING. All installation work shall be in accordance with manufacturer's written instructions.

All material, equipment, and components specified to be installed according to this section shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

Electrical equipment cubicles and vertical sections shall be installed plumb and level. Drawout equipment carriages, circuit breakers, and other removable components shall operate free and easy without binding or distortion.

Unless otherwise indicated or specified, all indoor floor-mounted electrical equipment and control cabinets shall be installed on concrete equipment pads four inches [102 mm] in height.

Indoor metalclad switchgear shall be bolted to steel floor channels which are installed level and flush with the top of the concrete floor or equipment pad. Outdoor metalclad switchgear and interrupter gear with integral floor channels or beams shall be secured to concrete pads with anchor bolts and clips.

Motor control centers with integral floor sills shall be secured to concrete floors or equipment pads with anchor bolts.

Adequate bracing shall be provided for seismic forces. The bracing shall be designed to meet the requirements of the Meteorological and Seismic Design Criteria section.

3-1.01. Cleaning. All deposits of oil, grease, mud, dirt or debris shall be cleaned from the electrical equipment following installation and field wiring. A detergent water based solution, or other liquid cleaners not harmful to material or equipment finishes, shall be used as recommended by the manufacturer.

End of Section

## SECTION 16150 – ADJUSTABLE FREQUENCY DRIVES

### PART 1 - GENERAL

**1-1. SCOPE.** This section covers furnishing new pulse width modulated (PWM) type adjustable frequency drives (AFD) for the equipment and locations as specified. AFDs shall meet the design conditions and features specified herein.

Description	MLS 39-A Centrifugal Pumps
Unit designation	PCL-101, PCL-102, PCL-103

**1-2. GENERAL.** Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

Equipment provided under this section shall be fabricated as specified in this section and as shown on the schematics and one-line diagrams on the Drawings.

Unless otherwise indicated on the Drawings, one adjustable frequency drive, complete with all required control components, shall be furnished for each motor.

AFDs shall be designed, manufactured, supplied, and warranted as a complete system.

**1-2.01. Coordination.** The design of the adjustable frequency drive shall be coordinated with the driven equipment. Contractor, AFD and harmonic filter supplier shall be responsible for coordinating the collection of data and the design effort to limit harmonics to the levels specified.

The manufacturer of the driven equipment shall be responsible for furnishing the adjustable frequency drive. Contractor shall be responsible for coordinating adjustable frequency drive equipment to the existing Master Lift Station pumps to ensure all drives are rated for the pump motors for each facility.

**1-2.02. General Equipment Stipulations.** The General Equipment Stipulations section shall apply to all equipment furnished under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

**1-2.03. Dimensional Restrictions.** The supplier shall review the Drawings, the manufacturer's layout drawings and installation requirements, and make any modifications required for proper installation subject to acceptance by Engineer.

**1-2.04. Workmanship and Materials.** Equipment supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with applicable governing standards. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

**1-2.05. Governing Standards.** The adjustable frequency drive shall be designed, constructed, and tested in accordance with the applicable standards of NEMA, ANSI, UL, and IEEE, and shall be designed for installation in accordance with the NFPA 70.

The equipment covered by this section shall be listed by UL or a nationally recognized third-party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. In the event no third-party testing laboratory provides the required listing, an independent test shall be conducted at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to Engineer.

**1-2.06. Nameplates.** Nameplates with the description and designation of each control or indicating device shall be provided. Unless specified otherwise, each drive enclosure shall be provided with a nameplate bearing the unit designation as indicated above. Nameplates shall be white over black laminated phenolic material of suitable size, and shall be engraved with 3/8 inch high letters for the drive designation and 3/16 inch letters for other information. The engraving shall extend through the white exterior lamination to the black center.

Each control device and each control wire terminal block connection inside the enclosure shall be identified with permanent nameplates or painted legends to match the identification on the manufacturer's wiring diagram.

**1-3. DESCRIPTION.** The AFD shall produce an adjustable ac voltage/frequency output and shall be equipped with an output voltage regulator to maintain correct output V/Hz despite incoming voltage variations.

**1-3.01. Six-Pulse Drives.** Drives shall be of the pulse-width modulated type and shall consist of a full-wave diode or gated-open SCR bridge. The rectifier shall convert incoming fixed voltage and fixed frequency to a fixed dc voltage. The pulse-width modulation technology shall be of the space vector type, implemented in a microprocessor that generates a sine-coded output voltage.

The drive inverter output shall be generated by insulated gate bipolar transistors (IGBT) which shall be controlled by six identical base driver circuits. The drive shall not induce excessive power losses in the motor. The worst-case RMS motor line current measured at rated speed, torque, and voltage shall not exceed 1.05 times the rated RMS motor current for pure sine wave operation.

**1-3.02. Eighteen-Pulse Drives** Not Used.

**1-4. SUBMITTALS.** Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the drive shall be submitted in accordance with the Shop Drawings, Project Data and Samples section. The drawings and data shall include, but shall not be limited to, the following:

- a. Name of manufacturer.
- b. Types and model numbers.
- c. Rated drive input kVA and output kVA.
- d. Percent efficiency at 100 percent speed and 60 percent speed.
- e. Maximum Btu heat release data and verification of the drive cooling requirements.
- f. Total weight and lifting instructions, height, mounting, and floor space required.
- g. Panel interior and front and side exterior view details showing maximum overall dimensions of all transformer, ac line filter, ac line reactor, and drive compartments.
- h. Schematics, including all interlocks.
- i. Wiring diagrams, including all internal and external devices and terminal blocks.
- j. Locations and sizes of electrical connections, ground terminations, and shielded wires.
- k. List of diagnostic indicators.
- l. List of fault and failure conditions that the drive can recognize and indicate for simultaneous occurrence.
- m. List of standard features and options.
- n. Input line protection model numbers and manufacturer's data sheets.

- o. Output filter model number and manufacturer's data sheets.
- p. UL 508C Certificate of Compliance for short circuit current rating.
- q. Not used.
- r. Not used.

**1-5. OPERATION AND MAINTENANCE DATA AND MANUALS.** Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance with the Operating and Maintenance Data section.

Operation and maintenance manuals shall include the following:

- a. Manufacturer's operation and maintenance manual for each size of adjustable frequency drive.
- b. Manufacturer's standard manuals for each size and type of transformer, line reactor, and filter.
- c. Schematics, wiring diagrams, and panel drawings in conformance with construction record.
- d. Model numbers and up-to-date cost data for spare parts.
- e. Troubleshooting procedures, with a cross-reference between symptoms and corrective recommendations.
- f. Connection data to permit removal and installation of recommended smallest field-replaceable parts.
- g. Information on testing of power supplies and printed circuit boards and an explanation of the drive diagnostics.

The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

**1-6. SPARE PARTS.** Not used.

## **PART 2 - PRODUCTS**

**2-1. ACCEPTABLE MANUFACTURERS.** All drives shall be six-pulse width modulated type, as manufactured by Fuji without exception to match existing OWNER AFD standards. The products of other manufacturers will not be acceptable. Design, manufacture, and AFD integration of all harmonic filters required to ensure compliance with requirements of IEEE 519 shall be by TCI, without exception.

All adjustable frequency drives shall be a product of the same manufacturer.

## **2-2. PERFORMANCE AND DESIGN REQUIREMENTS.**

**2-2.01. Performance.** The adjustable frequency drive controller shall be of sufficient capacity and shall produce a quality output waveform for step-less motor control from 10 to 100 percent of base speed. The adjustable frequency drive shall be suitable for loads and shall have voltage ratings as follows:

Unit                   MLS Pumps  
designations       AFD-101, AFD-102, AFD-103

Load type            Variable Torque  
                          (VT)  
Input voltage       480 volt, 3-phase,  
                          250 HP @ 305 FLA

The adjustable frequency drive shall be suitable for operation at an elevation below 3300 ft. and shall meet the following ratings and parameters:

Input frequency	60 Hz
Input voltage and frequency variation	±10 percent voltage variation, ±2 Hz; imbalance, 2 percent maximum.  Continued operation with additional momentary 25 percent voltage dip of 0.5 second duration from nominal input voltage level.
Minimum drive efficiency	95 percent at 100 percent speed, 90 percent at 60 percent speed.
Ambient temperature	-10 to 40°C.
Relative Humidity	5 to 95 percent non-condensing.
Displacement Power Factor	95 percent or higher throughout the entire operating speed range, measured at drive input terminals.
Drive service factor	1.0.
Overcurrent capability	110 percent for 1 minute for variable torque; 150 percent for 1 minute for constant torque.

Volts/Hz ratio	Voltage varies as the square of frequency over the entire range of the unit for variable torque drives, linear over the entire range of the unit for constant torque drives; except under voltage boost condition.
Acceleration/deceleration time	Adjustable over a range that meets the requirements of the drive equipment.
Output speed regulation	0.5 percent.
Output frequency stability	0.5 percent of nominal.

**2-2.02. Adjustments.** The following drive adjustments shall be provided:

- Maximum speed.
- Minimum speed.
- Linear acceleration time.
- Linear deceleration time.
- Volts/Hz ratio; linear, squared, and automatic settings.
- Voltage boost.
- Process follower gain, offset, and bias.
- Torque limit.
- Critical frequency avoidance with adjustable bandwidth.

**2-2.03. Fault Protection.** Design of the power circuit shall include provisions for protection against fault conditions as follows.

**2-2.03.01. Input Protection.**

The drive assembly shall be UL 508C listed. A UL Certificate of Compliance shall be submitted to confirm product compliance with UL 508C and to indicate the short circuit current rating. The short circuit current rating shall meet or exceed the available short circuit current indicated on the Drawings. Drive shall withstand at minimum 65kAIC.

Solid state instantaneous overcurrent trip set at 180 percent.

Adjustable overvoltage and under-voltage protection with automatic restart.

Phase loss and reverse phase trip with manual restart.

**2-2.03.02. Internal Protection.**

AC line, phase-to-phase transient voltage surge suppression utilizing metal oxide varistors.

Power device snubbers.

Power devices rated 2.5 times line voltage.

Instantaneous overcurrent.

Static overspeed (over-frequency) protection.

DC bus overvoltage trip.

Components and labeling that comply with UL 508 requirements. Drives shall be equipped with an automatic discharge circuit to deplete the charge on the DC capacitor bank to less than 50 volts within 60 seconds after main input power is removed. Labels indicating derivative voltage sources and required wait time for servicing after power removal shall be placed on all applicable enclosures.

Individual transistor overtemperature and overcurrent protection.

Control logic circuit malfunction indication.

### **2-2.03.03. Output Protection.**

Inverse-time motor overload protection adjustable from 10 percent to 100 percent.

Overvoltage protection.

Over-frequency protection.

Short circuit protection (three phase, phase to phase, and ground fault protection).

Protection against opening or shorting of motor leads.

Static overspeed protection.

Stall protection on overload with inverse time overcurrent trip, adjustable current limit from 10 percent to 120 percent.

**2-2.04. Harmonic Distortion Abatement.** The electrical system shall be provided with the necessary equipment to protect the drive and the power system ahead of the drive from harmonic distortion, as described below. The harmonic distortion abatement analysis shall be based on the information on the Drawings and on the following:

Existing facility loads to be included in the analysis

Ref. Drawings

Short circuit current at utility interface                      Per Drawings

Total maximum running amperes of all equipment powered from the utility connection                      Per Drawings

The drive shall operate satisfactorily when connected to a bus supplying other solid-state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 volt-microseconds.

**2-2.04.01. Current Distortion Limits.** Maximum allowable total and individual harmonic current distortion limits for each odd harmonic shall be based on Owner's specification and TCI. The utility connection shall be the primary point of analysis for current distortion. The values of utility short circuit current at the utility interface and the total maximum running amperes of all equipment powered from the utility connection shall be as indicated above.

**2-2.04.02. Voltage Distortion Limits.** Individual or simultaneous operation of the drives shall result in a maximum total harmonic voltage distortion of 5 percent on the bus feeding the drives. Individual or simultaneous operation of the drives shall not add more than 10 percent total harmonic voltage distortion to the bus feeding the drives while operating from a standby generator. The point(s) of analysis for harmonic voltage distortion testing shall be the nearest electrical bus on the supply side of each drive. The maximum three phase fault current rating of the switchboard bus feeding the drives is 65,000 amps.

**2-3. CONSTRUCTION.** Construction requirements shall be as follows and as specified below:

Unit designations	AFD-101, AFD-102, AFD-103
Cable entry	Top
Cable exit	Top
Enclosure type	NEMA Type 1
Location	MLS 39-A Electrical Room
Maximum Dimensions	72" W x 24" D x 90" H

**2-3.01. Fabrication and Assembly.** The adjustable frequency drive system shall be shop assembled in a single enclosure using interchangeable plug-in printed circuit boards and power conversion components wherever possible. Shop assembly shall be performed by the drive manufacturer, or a manufacturer

approved assembly center under the direction and control of the drive manufacturer.

Input line reactors, fuses, and circuit breakers, where required, shall be mounted within the drive enclosure, without exception. Isolation/voltage matching transformers, and Filters where required, may be enclosed separately from the remaining drive equipment.

The adjustable frequency drive system shall be designed to fit in the spaces as shown on Drawings.

**2-3.02. Wiring.** Internal cabinet wiring shall be neatly installed in wireways or with wire ties where wireways are not practical. Where wireway is used, they are to be mounted to the panel surface with a continuous run of 3M brand, or equal, industrial two-sided adhesive strip. For 12 AWG wire sizes and smaller, and in bundles of six or less, wire tie-down square mounting straps shall be permitted.

Tie-down mounts shall be installed at 8" increments or less. All mounting surfaces shall be pre-cleaned with isopropyl alcohol to ensure proper adhesion over the life of the equipment.

Terminal blocks shall be non-brittle, interlocking, track-mounted type, complete with a marking strip, covers, and pressure connectors. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. In freestanding panels, 8 inches of clearance shall be provided between terminals and the panel base for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Terminals shall be labeled to agree with the identification on the submittal drawings. Each control loop or system shall be individually fused, clearly labeled, and located for ease of maintenance.

All grounding wires shall be attached to the sheet metal enclosure with a ring tongue terminal. The surface of the sheet metal shall be prepared to ensure good conductivity and corrosion protection.

Wires shall not be kinked or spliced and shall be color coded or marked on both ends. The markings or color coding shall agree with the submittal drawings.

With exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for at least 600 volts, with a moisture-resistant and flame-retardant covering rated for at least 90°C.

**2-3.03. Enclosures.** The drive shall consist of factory mounted and wired components within an enclosure, arranged so no electrically live high voltage

components, terminals, or conductors are accessible on the front panel or door when the enclosure door is open. Suitable removable barriers and personnel protection will be required for high voltage components, terminations, and cabling connections within the enclosure.

The complete drive package, including accessories, shall fit into the space as indicated on the Drawings.

Freestanding panels shall be suitable for mounting on a concrete pad and shall include provisions for anchoring to the supporting structure. Suitable lifting facilities shall be provided for handling and shipment.

Relays, terminals, and special devices inside the control enclosure shall have permanent markings to match the identification on the manufacturer's wiring diagrams.

**2-3.04. Printed Circuit Boards.** All plug-in type boards shall be mechanically held at the circuit board connector. Compression fit only at the connector will not be acceptable.

**2-3.05. Shop Painting.** All iron and steel surfaces, except machined surfaces and stainless steel, shall be shop cleaned in accordance with the coating manufacturer's recommendations, and finished with the drive manufacturer's standard coating. Finish color shall be manufacturer's standard color. Dry film thickness of the finish coat shall be at least 40 µm. Field painting, other than touch up, will not be required. A sufficient quantity of additional coating material and thinner shall be furnished for field touch up of damaged coatings.

## **2-4. OPTIONAL EQUIPMENT.**

**2-4.01. Bypass Starter.** An RVSS and contactor type bypass starter shall be provided for operation of the AC motor on either the AFD or the AC line. The bypass starter shall consist of mechanically and electrically interlocked, NEMA rated Solid State Reduced Voltage Starter (RVSS) and full voltage operation magnetic contactors with a common heater-less motor overload relay for motor protection of the circuits. The RVSS and contactors shall be rated for at least the horsepower rating of the motor. The RVSS and bypass contactors shall be part of the packaged unit and shall be mounted within the enclosure of the adjustable frequency drive. Heater-less overload protection shall be provided by three current sensors monitored by a microprocessor.

Door-mounted devices for the bypass shall include an "AFD-Line" switch and a push-pull "Stop/Reset" push button. The controls for the AFD, as indicated on the Drawings, shall start and stop the motor, regardless of whether it is connected to

the AFD or to the AC line. The "Stop/Reset" push button shall prevent motor operation when it is pulled out. Once the automatic bypass has been activated, no action of the "AFD-Line" switch can change the state of operation. The "Stop/Reset" push button must be depressed before the automatic mode can be restored.

The bypass shall include a door-interlocked circuit breaker so that when the circuit breaker is opened, the output lines are disconnected from the motor. The contactor for the AFD shall serve as an output contactor and shall be electrically interlocked with the input circuit breaker of the AFD so that when the circuit breaker is opened, the drive is disconnected from the motor.

**2-4.02. AC Line Reactors.** Each six-pulse AFD, where isolation/voltage matching transformers are not used, shall be supplied with an input ac line reactor. AC line reactors shall be designed to address performance issues of NEMA MG1-20.55 and to provide proper transient protection of the AFD input power devices. AC line reactors shall be factory mounted and wired within the AFD enclosure. AC line reactors shall be K-rated per IEEE C57-110 and shall be TCI Model KLR, or equal.

**2-4.03. Harmonic Filters.** Any harmonic filters required to comply with the total harmonic distortion limits specified herein, shall be provided by TCI and installed in a separate enclosure.

The AFD manufacturer in consultation with designated approved harmonic filter supplier (TCI) shall design and provide the required filters. The harmonic filters shall utilize an interlocking contactor that shall be automatically operated by the AFD run circuit. Per Owner agreement, TCI shall warrant the design of harmonic filters for the Fuji AFD.

**2-4.04. Isolation/Voltage Matching Transformers.** Not used.

**2-4.05. Power Factor Correction Capacitors.** Not used.

**2-4.06. Output dv/dt Filters.** Output filters shall be installed inside the drive enclosure on the inverter output for all AFDs where the distance from AFD to motor exceeds 150 feet. Supplier shall review Drawings and consult with Contractor to verify cable distances and need for inclusion of dv/dt filters. Output filters shall consist of a minimum 1.5 percent impedance reactor, in conjunction with a resistor and capacitor network, to form a damped low-pass filter. Use of output reactors alone is not acceptable. Output filters shall be TCI Model V1000 KLC, or pre-approved equal.

## **2-5. CONTROLS.**

**2-5.01. Features.** Each drive shall include the following features in addition to

those indicated on the Drawings:

- a. A door mounted membrane keypad with integral two-line, 24 character minimum LCD display that is capable of controlling the AFD and setting drive parameters. The keypad module shall be programmed with factory set drive parameters in nonvolatile EEPROM or FLASH memory and shall be resettable in the field through the keypad.
- b. Control switches and pilot lights shall be provided as indicated on the schematic diagrams. Manual-automatic and start-stop controls included as features of the drive keypad shall be lockable or password protected or disabled to prevent override of control switches and safety interlocks shown on the schematic diagrams.
- c. Control switches and pilot lights shall be 22 mm heavy-duty, oiltight construction. Pilot lights shall be full voltage type with LED lamps.
- d. Microprocessor-based regulator. Nonvolatile memory modules shall have a useful life of at least 20 years without requiring battery or module replacement.
- e. Input thermal-magnetic molded-case circuit breaker disconnect with interrupting capacity rated in RMS symmetrical amperes as required and labeled in accordance with UL standard 489. The disconnect shall be mounted inside the controller enclosure and shall have door interlocks and a handle with provisions for padlocking in the "Off" position.
- f. Manual speed adjustment.
- g. Indications of drive "Run", and drive "Fault". Indication of these parameters shall be provided by full voltage type LED pilot lights. Lamps shall be easily replaceable from the front of the indicating light.
- h. An AUTO signal under which the drive will be controlled by DFSRTU.
- i. Speed indication - calibrated in percent rpm.
- j. Control circuits of not more than 115 volts supplied by internal control power transformers. Control power transformers shall have additional capacity as required by external devices indicated on the Drawings. Control power transformers shall be equipped with two primary leads fused, one secondary lead fused, and one secondary lead grounded.
- k. Automatic controller shutdown on overcurrent, overvoltage, undervoltage, motor overtemperature and other drive fault conditions. Controller shutdown shall be manually reset type. Terminals shall be provided for control wiring from motor temperature switches, or a motor protection relay located in the drive enclosure.

- l. Diagnostic indicators that pinpoint failure and fault conditions. Indicators shall be manually reset to restore operation after abnormal shutdown.
- m. Accept a remote 4-20 mA speed control signal.
- n. Process control output for remote 4-20 mA speed indication, rated 0 to 100 percent speed.
- o. Spare interlock contacts rated 5 amperes at 120 volts ac, wired separately to the unit terminal board. One NO and one NC isolated spare interlock shall be furnished with each drive. Additional interlock contacts shall be provided as indicated on the Drawings.
- p. Drive fault and run status contacts for remote indication, rated 1 amperes at 250 VAC.
- q. Speed droop feature, which reduces the speed of the drive on transient overloads. The drive shall return to set speed after the transient is removed. If the acceleration or deceleration rates are too rapid for the moment of inertia of the load, the drive shall automatically compensate to prevent drive trip.
- r. Individual adjustable speed profile settings for start, stop, entry, slope, and minimum and maximum speed points.
- s. Coast, controlled ramp, or dc injection selectable modes of stopping.
- t. PID setpoint control selection.
- u. Adjustable PWM carrier frequency. The inverter output section shall be provided with adjustable PWM carrier frequency from 1 kHz to 15 kHz below 100 HP; 1 kHz to 10 kHz from 100 HP to 300 HP; 1 kHz to 5 kHz 350 HP and larger. (480 V Class).
- v. Noise level of installed equipment shall not exceed 85 dB, as measured by an appropriate calibrated instrument. The required sound level limit shall be met at a minimum of four locations, each not more than 3 feet above the floor and not more than 10 feet from the equipment. This requirement shall apply to all drives, motors, filters, reactors, and transformers supplied with the drive.

**2-5.02. Diagnostics.** Diagnostic indicators on the face of the drive shall display the type of fault responsible for drive shutdown, warning, or failure. If two or more faults occur simultaneously, the diagnostic segment shall record or indicate each condition. The drive shall be capable of storing 4 events.

**2-5.03. Motor Protection Relay.** Not used.

**2-6. TESTING.** All AFD testing shall follow standard manufacturer's factory testing procedures and practices.

### **PART 3 - EXECUTION**

**3-1. INSTALLATION.** Installation shall be in accordance with Electrical Equipment Installation section.

**3-2. FIELD QUALITY CONTROL.**

**3-2.01. Installation Check.** An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, set all relays in accordance with the settings designated in the coordination study, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Startup Requirements section, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price.

**3-2.02. Installation Supervision.** The equipment manufacturer shall furnish a qualified field installation supervisor during the equipment installation. Such services shall be included in the Contract price.

Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing Contractor's erection or installation procedures. The equipment manufacturer will be provided with written notification 10 days prior to the need for such services.

All costs for these services shall be included in the Contract Price. Contractor shall include a minimum of three day(s) and three trip(s) to the site.

**3-3. FIELD HARMONIC DISTORTION TEST.** Not Used.

**3-4. TRAINING.** The manufacturer's representative shall provide training of Owner's personnel as described in the Demonstration and Training specification. All costs for training services shall be included in the Contract Price.

Up to four employees of Owner, shall be trained in the proper operation, troubleshooting, and maintenance of the equipment. Training shall be conducted by a qualified representative, and shall consist of combined classroom and hands-on instruction. Training shall be conducted at a place and time mutually agreeable to Owner and the drive manufacturer.

Contractor shall include a minimum of one day(s) and one trip(s) to the site.

**END OF SECTION**

## SECTION 16220 COMMON MOTOR REQUIREMENTS FOR PROCESS EQUIPMENT

### PART 1 – GENERAL

1-1. SCOPE. This section covers single and three-phase, small (fractional) and medium (integral) horsepower, alternating current motors rated 500 horsepower and less (NEMA MG1).

Motors shall be designated and coordinated with the driven equipment and shall be located as indicated on the Drawings.

1-2. GENERAL. Motors furnished under driven equipment Specification sections shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the Engineer.

Where applicable, individual motor data sheets have been developed which specify additional requirements for specific motors.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all motors, unless otherwise specified. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Governing Standards. Motors furnished under this section shall be designed, constructed, and tested in accordance with the latest version of NEMA MG 1, NEMA MG 10, and IEEE 112, Test Method B.

1-2.04. Nameplates. All motor nameplate data shall conform to NEMA MG 1 requirements.

1-3. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the motor shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the following:

## Motors

Name of manufacturer.  
Type and model.  
Type of bearing and method of lubrication.  
Rated size of motor, hp [kW], and service factor.  
Temperature rise and insulation rating.  
Full load rotative speed.  
Net weight.  
Efficiency at full, 3/4, and 1/2 load.  
Full load current.  
Locked rotor current.  
Space heater wattage, where applicable.  
Motor temperature switch data, where applicable.  
Motor Shaft Grounding Ring data, where applicable.  
RTD data, where applicable.

## Seismic Design Requirements

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-4. OPERATION AND MAINTENANCE DATA AND MANUALS. Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section.

Operation and maintenance manuals shall include the following:

- a. Assembly, installation, alignment, adjustment, and checking instructions.
- b. Lubrication and maintenance instructions.
- c. Guide to troubleshooting.
- d. Parts lists and predicted life of parts subject to wear.
- e. Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams.
- f. Test data and performance curves, where applicable.

## PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. Service conditions for motors shall be as specified in the driven equipment Specification sections. Motors shall be designed for special conditions such as area classification, altitude, frequent starting,

intermittent overload, high inertia, mounting configuration, or service environment. Where site elevation and ambient temperature is not specified in the driven equipment Specification sections, the motors shall be designed for the following.

Site elevation	Below 3,300 ft [1,000 m]
Ambient temperature	50°C

Unless specified otherwise, all motors shall be designed for full voltage starting and to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.

Motors utilizing a reduced-voltage, autotransformer starter shall be capable of reduced-voltage starting at a 65 percent tap setting.

Motors utilizing a reduced voltage solid state starter shall be capable of starting at 50% of the specified voltage.

When powered from an adjustable frequency drive (AFD), motors shall be inverter duty and specifically selected for service with an adjustable frequency type speed controller and shall be derated as required to compensate for harmonic heating effects and reduced self-cooling capability at low speed operation. Each motor shall not exceed a Class B temperature rise when operating in the installed condition at load with power received from the adjustable frequency drive. All motors driven by AFDs shall be supplied with full phase insulation on the end turns and shall meet the requirements of NEMA MG 1, Part 31. In addition to the requirements of NEMA MG 1, Part 31, motors shall be designed to be continually pulsed at the motor terminals with a voltage of 1600 volts ac.

The number of starts per hour for motors shall be rated for the load cycling requirements of NEMA MG 10.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. Unless otherwise specified in the attached motor data sheet(s), design and construction of each general-purpose motor shall be as specified herein. Motor voltage, frequency, speed, service factor, and insulation class shall be as follows.

Motor voltage.	460, 3 phase for ½ horsepower and larger, 120, single phase for smaller than ½ horsepower
Frequency.	60 Hz
Speed.	Constant speed

Service factor.	1.0 , except for AFD driven motors which shall be 1.15
Insulation class and temperature rise above 40° C design ambient (by resistance method.	Class F with 90° C rise at 1.15 SF
Enclosure.	Totally enclosed fan cooled
Main conduit box sized to include.	Main motor leads and space heater leads where space heaters are specified

2-2.01. Nameplate Horsepower. Motor nameplate horsepower [kW] shall be equal to or greater than the maximum load imposed by the driven equipment.

2-2.02. Enclosures. All motors shall be self-ventilated. All self-ventilated open type motors, including those with dripproof, splashproof, and weather protected enclosures, and the fan covers of totally enclosed fan cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine.

2-2.02.01. Totally Enclosed Motors. Totally enclosed motors shall be furnished with drain holes and rotating shaft seals. Frames, bearing brackets, external terminal housings, and fan covers for fan cooled motors shall be cast iron. External cooling fans for fan cooled motors shall be fabricated of brass, bronze, aluminum alloy containing not more than 0.2 percent copper, malleable iron, or plastic. All plastic fans shall be fabricated of a reinforced thermosetting plastic and shall be UL approved.

2-2.02.02. Outdoor Motors. Outdoor motors shall have NEMA weather protected enclosures. All exposed metal surfaces shall be protected, where practical, with a corrosion resistant polyester coating. Exposed uncoated surfaces shall be of a corrosion resistant metal. Enclosure exterior and interior surfaces, air gap surfaces, and windings shall be protected with a corrosion resistant polyester, polyurethane or epoxy coating.

2-2.02.03. Motors for Hazardous Locations. Motors for hazardous locations shall be in accordance with the NEC and of the correct type enclosures for the particular service as specified in NEMA MG 1. Motors shall meet the requirements of UL 674.

2-2.02.04. Encapsulated Windings. Where specified in the motor data sheet(s), motors shall be provided with encapsulated windings meeting the requirements of NEMA MG1-1.27.2.

2-2.02.05. Severe Duty Chemical Service Motors. Not used.

2-2.03. Main Conduit Boxes. The main conduit box shall be in accordance with NEMA MG 1. The main conduit boxes shall be diagonally split for easy access to the motor leads, and designed for rotation in 90-degree increments. A gasket shall be furnished between the halves of the box. Conduit openings in the main conduit box shall match the size and quantity of conduits indicated on the one line Drawings.

The main conduit box shall be sized for all indicated accessory leads.

Motors furnished in NEMA 320 frame series and larger shall have conduit boxes designed and constructed to permit motor removal after installation without disconnecting raceways.

2-2.04. Leads. Motor power leads shall be wired into the main conduit box. Unless otherwise specified, space heater leads shall be wired into the main conduit box. All motor leads and their terminals shall be permanently marked in accordance with the requirements of NEMA MG 1, Part 2. Each lead marking shall be visible after taping of the terminals.

All motors rated 100 horsepower [74 kW] and larger, and all vertical motors shall have the direction of rotation marked by an arrow mounted visibly on the stator frame near the terminal housing, or on the nameplate, and the leads marked for phase sequence T1, T2, T3, to correspond to the direction of rotation and supply voltage sequence.

Leads for dual-voltage rated or for multispeed motors shall be easily connected or reconnected in the main conduit box for the operating voltage or for the specified speeds. Permanent instructions for making these connections shall be furnished inside the main conduit box or on the motor frame or nameplate.

2-2.05. Terminals. Cable type leads shall be provided with Burndy Type YA or acceptable equal compression type connectors.

2-2.06. Grounding Connections. All motors shall be furnished with a ground connection.

2-2.07. Bearings. All bearings shall be self-lubricating, shall have provisions for relubrication, and shall be designed to operate in any position or at any angle.

Motor bearings shall be antifriction type with L<sub>10</sub> life rating of 40,000 hours in accordance with ABMA Standards.

All bearing mountings shall be designed to prevent the entrance of lubricant into the motor enclosure or dirt into the bearings, and shall be fitted with pipes, drain

plugs, and fittings arranged for safe, easy relubrication from the outside of the motor while the motor is in service, as necessary.

2-2.07.01. Insulated Bearings. Motors over 100 horsepower controlled by an adjustable frequency drive shall be furnished with one insulated bearing. The insulated bearing shall be installed on the non-drive end of the motor.

2-2.08. Rotors. All induction motors shall have squirrel-cage rotors adequately sized to avoid overheating during acceleration of the motor and driven equipment. Rotors shall be dynamically balanced to 0.08 in./sec [2.03 mm/s] or less.

2-2.09. Shafts. Shafts shall be furnished with corrosion resistant treatment or shall be of a corrosion resistant material.

2-2.10. Torque Characteristics. Motors rated 200 horsepower [149 kW] and less shall have torques and locked-rotor current in accordance with NEMA MG 1, Part 12.

2-2.11. Motor Space Heaters. Unless otherwise specified in the attached motor data sheet(s), motors 1 horsepower and larger shall be provided with a space heater element sized to prevent condensation on the core and windings. The space heaters shall be isolated or so located as to prevent heat damage to adjacent painted surfaces and shall be suitable for 120 volt, 60 Hz, single phase power supply.

2-2.12. Temperature Sensing Devices. Each motor controlled by an adjustable frequency drive shall be furnished with at least one automatic reset winding temperature switch per phase. Temperature switch contacts shall be normally closed and rated 5 amps at 120 volts ac. The contacts shall be wired in series with the end leads brought out to the motor terminal box.

2-2.13. Motor Shaft Grounding Ring. Each motor controlled by an adjustable frequency drive shall be furnished with a maintenance free, conductive micro fiber, shaft grounding ring with circumferential micro fibers to discharge electrical shaft currents within the motor. Motor shaft grounding ring shall be installed on the drive end on the motor shaft. Shaft grounding ring shall be installed by the motor's manufacturer in accordance with grounding ring manufacturer's recommendations.

2-2.14. Assembly. All motors shall be completely assembled with the driven equipment, lubricated, and ready for operation.

2-2.15. Efficiency. Unless otherwise specified in the attached motor data sheet(s), motors shall be premium efficiency type and shall have a NEMA nominal efficiency

nameplate value equal to or greater than values indicated in the following table. Efficiency shall be determined in accordance with IEEE 112, Test Method B.

Vertical motors shall have efficiency values equal to or greater than those indicated in the following table minus 0.50.

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
0.7	1	84.0	85.5	82.5	75.0	77.0	85.5	82.5	75.5
1.1	1.5	84.0	86.5	86.5	78.0	84.0	86.5	87.5	80.0
1.5	2	85.5	86.5	87.5	86.5	85.5	86.5	88.5	85.5
2.2	3	85.5	89.5	88.5	89.5	87.0	89.5	89.5	86.5
3.7	5	86.5	89.5	89.5	89.5	88.5	89.5	89.5	85.5
5.6	7.5	88.5	91.0	90.2	88.5	90.0	91.7	91.0	86.5
7.5	10	89.5	91.7	91.7	91.0	91.0	91.7	91.0	91.0
11.2	15	90.2	93.0	91.7	91.0	91.0	92.4	92.0	91.0
14.9	20	91.7	93.0	92.4	92.0	92.0	93.0	92.0	91.0
18.7	25	92.4	93.6	93.0	92.0	92.0	93.6	93.0	91.0
22.4	30	93.0	94.1	93.6	93.0	92.4	93.6	93.0	93.0
29.8	40	93.0	94.1	94.1	93.0	92.4	94.1	94.1	93.0
37.3	50	93.0	94.5	94.1	93.0	93.0	94.5	94.1	93.0
44.8	60	93.6	95.0	94.5	94.0	93.6	95.0	94.5	93.0
56	75	94.0	95.0	95.0	94.0	93.6	95.4	95.0	94.0
74.6	100	94.5	95.4	95.0	95.0	94.1	95.4	95.0	94.0
93.2	125	95.0	95.4	95.0	95.0	95.0	95.4	95.0	94.0
112	150	95.0	95.8	95.4	95.0	95.0	95.8	95.8	94.0

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
149	200	95.4	95.8	95.4	95.0	95.4	96.2	95.8	94.1
186	250	95.0	95.8	95.4	95.0	95.8	96.2	95.8	94.5
224	300	95.4	95.8	95.4		95.8	96.2	95.8	
261	350	95.4	95.8	95.4		95.8	96.2	95.8	
298	400	95.8	95.8	95.8		95.8	96.2	95.8	
336	450	95.8	96.2	96.2		95.8	96.2	95.8	
373	500	95.8	96.2	96.2		95.8	96.2	95.8	

2-3. ACCESSORIES.

2-3.01. Special Tools and Accessories. Motors requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Each motor shall be provided with lifting eyebolts or lugs and appropriate fittings for adding bearing lubricant. Grease lubricated units shall be provided with a means of venting the casing. Oil lubricated units shall be provided with constant level oilers or with sight glasses arranged to indicate operating and static oil levels.

2-4. ANCHORS. Contractor shall furnish suitable anchors for each item of equipment as required for driven equipment.

2-5. BALANCE. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the unfiltered vibration displacement (peak-to-peak), as measured at any point on the machine, shall not exceed the limits as required by NEMA MG 1. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

PART 3 - EXECUTION

3-1. INSTALLATION. Each motor shall be installed in accordance with the Equipment Installation section.

## Motor Data Sheet

### Driven Equipment Tags

	PCL-101, PCL-102, PCL103	PRV-39A-2/3/4/5
<b>Design Requirements</b>		
Driven equipment specification section	11150	
Number of motors	3	4
Motor voltage		
460 V, 3 phase	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Speed		
Constant	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Service factor		
1.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.15	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Insulation class and temperature rise above 40°C		
Class F with 80°C rise at 1.0 SF	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Class F with 90°C rise at 1.15 SF	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Enclosure		
WP1	<input type="checkbox"/>	<input checked="" type="checkbox"/>
WP2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Motor space heater not required	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Encapsulated winding	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Main conduit box sized to include leads as specified in 16220 plus other items identified below		
Surge protection	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Efficiency		
As specified in 16220	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Minimum efficiency (%)		

End of Section

## SECTION 16425 SWITCHBOARDS

### PART 1 - GENERAL

1-1. SCOPE. This section covers switchboard equipment, which shall be furnished as specified herein and as indicated on the Drawings. Switchboards shall meet the following requirements, and the design conditions and features.

Switchboards shall be designated and located as follows:

Tag number(s)

Switchboard designation(s)

SWBD-1

Location of switchboard(s)

MLS 39A

1-2. GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all equipment furnished under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Dimensional Restrictions. Layout dimensions will vary between manufacturers, and the layout area indicated on the Drawings is based on typical values. The supplier shall review the Contract Drawings, the manufacturer's layout drawings and installation requirements, and make any modifications required for proper installation subject to acceptance by Engineer.

1-2.04. Workmanship and Materials. Equipment supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with applicable governing standards. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable.

Equipment shall not have been in service at any time prior to delivery, except as required by tests.

1-2.05. Governing Standards. All equipment furnished under this section shall be designed, constructed, and tested in accordance with all the applicable standards of ANSI, NEMA, and UL, including, but not limited to, NEMA PB 2 and UL 891 (switchboards); NEMA AB1 and UL 489 (molded-case circuit breakers); ICS-6 (enclosures); and NEMA PD 2.2 (Ground Fault Protection).

Equipment covered by this section shall be listed by UL or a nationally recognized third-party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. In the event no third-party testing laboratory provides the required listing, an independent test shall be conducted at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to Engineer.

1-2.06. Nameplates. Each switchboard section shall have a nameplate permanently affixed to it, listing the following information:

- Name of manufacturer
- System voltage
- Main bus rating
- Type
- Manufacturer's shop order number and date

In addition, each circuit breaker and instrument on the front of the switchboard shall have a suitable nameplate. Each incoming line section shall be furnished with a nameplate to indicate the power source or substation from which it is fed. The nameplates for the distribution circuit breakers shall indicate the equipment fed through the breaker. Nameplates shall be black and white laminated phenolic material of suitable size, and shall be engraved with 3/4 inch [19 mm] high letters for section and circuit breaker identity and 1/8 inch [3 mm] letters for other information. The engraving shall extend through the white exterior lamination to the black center.

Each control device and each control wire terminal block connection inside the units shall be identified with a permanent nameplate or painted legend to match the identification on the manufacturer's wiring diagram.

1-2.07. System Characteristics. The switchboard will be connected to a power system with characteristics as specified below.

Voltage rating	480 V
Frequency	60 Hz
Type	Three phase

1-3. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the switchboard, shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the following:

Switchboard

Elevation, plan, conduit entrance locations, and weight.

Circuit breaker time-current characteristic curves.

Nameplate legends and equipment schedule.

Single-line and control wiring interconnection diagrams.

Metering section details.

Shop test report.

Installation report.

Surge protective device submittals shall include drawings (including unit dimensions, weights, component and connection locations, mounting provisions, and wiring diagrams), equipment manuals that detail the installation, operation and maintenance instructions for the specified unit(s), and manufacturer's descriptive bulletins and product sheets.

Seismic Design Requirements

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-4. OPERATION AND MAINTENANCE DATA AND MANUALS. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1-5. SPARE PARTS. Spare parts shall be suitably packaged, as specified herein, with labels indicating the contents of each package. Spare parts shall be delivered to Owner as directed.

<u>Spare Parts</u>	<u>Quantity</u>
Fuses	100% replacement set
Spare Breaker for each amp rated and # poles	One per type

1-6. COORDINATION STUDY. A coordination study of the power distribution system will be conducted as specified in the Electrical section. The equipment manufacturer shall provide the following information to Engineer with the initial equipment drawing submittal:

Protective relay coordination curves for each solid-state trip device.

Time current curves shall be provided for the following circuit breakers:

Main breaker

Largest feeder breaker

Smallest breaker

Data for all devices with adjustable settings shall be submitted, with all literature necessary to determine the appropriate settings. This shall include, but shall not be limited to, Operation Manuals for each type of adjustable trip device.

1-7. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

Switchboards shall be equipped to be handled by a crane. Where cranes are not available, switchboards shall be suitable for skidding in place on rollers using jacks to raise and lower the groups.

## PART 2 - PRODUCTS

2-1. ACCEPTABLE MANUFACTURERS. The switchboard shall be manufactured by Eaton Cutler-Hammer, Rockwell Automation, Siemens, or Square D, without exception.

2-2. CONSTRUCTION. All equipment furnished under this section shall be front connected, and shall be designed and constructed in accordance with the following requirements and as indicated on the Drawings.

2-2.01. Enclosure. The switchboard shall be of deadfront, modular type construction with the required number of vertical sections bolted together to form one rigid, NEMA Type 1 metal-enclosed unit. All sections shall be aligned in both front and rear. The switchboard frame shall be of formed UL gauge steel, rigidly bolted together to support all cover plates, buses, and circuit breakers. Steel base

channels shall be bolted to the frame. Each section shall have a removable top plate and an open bottom for installation and termination of conduit. All front covers shall be removable with a single tool and all doors shall be hinged, with removable hinge pins. Enclosures shall have front access, and shall be designed to be installed against a wall.

Adequate bracing shall be provided for seismic forces. The bracing shall be designed to meet the requirements of the Meteorological and Seismic Design Criteria section.

2-2.02. Busing. The main a bus shall be tin-plated copper and shall be of sufficient size to limit the temperature rise to 65°C, based on UL tests. End sections shall be predrilled for units to be added in the future. The bus rating shall be as follows:

Bus current rating.	1200 A
Bus fault rating (symmetrical).	65,000 A

2-2.02.01. Neutral Bus. A tin-plated copper neutral bus shall be provided through all vertical sections and shall be rated full capacity.

2-2.03. Ground Bus. The ground bus shall extend the entire length of the switchboard and shall be firmly secured to each vertical section. A ground lug shall be provided at each end of the ground bus for connection to building grounding system with 4/0 AWG bare copper cables. Other ground lugs for feeder circuits shall also be supplied as indicated on the Drawings.

2-2.04. Incoming Line Sections. Incoming line sections shall be provided as shown on the one-line diagram and as specified herein.

Number of incoming line sections	1
Service entrance rated	No
Incoming cable entrance	Top

2-2.04.01. Cable Pull Box. Not used.

2-2.04.02. Busway Entry Compartment. Not used.

2-2.04.03. Power Utility Metering Compartment. Not used.

2-2.04.04. Incoming Line Metering Compartment. Not Used.

2-2.04.05. Surge Protective Devices.

2-2.04.05.01. Scope. Surge Protective Devices (SPD) devices shall be provided as specified herein and as indicated on the Drawings. Each unit shall be designed for parallel connection to the facility's wiring system and shall utilize non-linear voltage-dependent metal oxide varistors (MOV) in parallel.

SPD's shall be furnished and installed for the electrical equipment indicated on the Drawings and designated in this section as required and as specified herein. SPD's shall be installed integral to each switchboard. SPD's for switchboards shall be rated for high exposure levels.

2-2.04.05.02. Standards. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

ANSI/IEEE C62.41-1991 and C62.45-1992;

ANSI/IEEE C62.1 and C62.11;

National Electrical Manufacturers Association (NEMA LS1-1992 Guidelines);

National Fire Protection Association (NFPA 20, 70 [NEC], 75, and 78);

Underwriters Laboratories UL 1449 Third Edition and 1283

The unit shall be UL 1449 Third Edition Listed as a Type 2 Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference (EMI) Filter.

2-2.04.05.03. Environmental Requirements.

- a. Operating Temperature: 0°F to +140°F (-18°C to +60°C).
- b. Relative Humidity: Reliable operation with 5 percent to 95 percent non-condensing.

2-2.04.05.04. Electrical Requirements.

- a. Unit Operating Voltage. The nominal unit operating voltage and configuration shall be as indicated on the Drawings.
- b. Maximum Continuous Operating Voltage (MCOV). The SPD shall be designed to withstand a MCOV of not less than 115 percent of nominal RMS voltage.
- c. Operating Frequency. Operating frequency range shall be 47 to 63 Hertz.
- d. Protection Modes. Four-wire configured systems shall provide Line-to-Neutral (L-N), Line-to-Ground (L-G), and Neutral-to-Ground (N-G), and Line-to-Line (L-L) protection. Three-wire configured systems shall provide Line-to-Line (L-L) protection and Line-to-Ground (L-G) protection.

- e. Rated Single Pulse Surge Current Capacity. The rated single pulse surge current capacity, in amps, for each mode of protection of the unit shall be no less than as follows:

	L-N	L-G	N-G	L-L
High Exposure Level	120 kA	120 kA	120 kA	120 kA

- f. UL 1449 Third Edition Voltage Protection Rating (VPR). The maximum VPR for the device (inclusive of disconnect) shall not exceed the following:

Voltage	L-N	L-G	N-G	L-L
480 V 4W	1200 V	1200 V	1200 V	2000 V

- g. Noise Attenuation. The unit shall be capable of a minimum -30 dB attenuation at 100kHz when tested per the 50 ohm insertion loss method as defined by MIL-STD-220A.
- h. Nominal Discharge Current. Each SPD shall have a nominal discharge current rating of 20 kA.
- i. Overcurrent Protection. At high and medium-high exposure levels, the SPD shall incorporate internal fusing capable of interrupting, at minimum, up to 200 kA symmetrical fault current with 600 volts AC applied. The device shall be capable of allowing passage of the rated maximum surge current for every mode without fuse operation.
- j. Unit Status Indicators. The unit shall include long-life, externally visible phase indicators that monitor the on-line status of the unit.

2-2.04.05.05. Warranty. The manufacturer shall provide a minimum Five Year Limited Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

2-2.04.05.06. Installation. Each SPD shall be installed according to the manufacturer's recommendations. If possible for the integral units, provide direct bus connections.

2-2.04.05.07. Options

- a. Disconnect Switch. Each SPD shall be furnished with an integral disconnect switch. The unit shall be UL1449 Third Edition listed as

such, and the UL1449 Third Edition Voltage Protection Ratings shall be provided. The disconnect switch shall be fused and capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.

2-2.04.06. Main Breaker. Not used.

2-2.05. Tie Breaker Section. Not used.

2-2.06. Distribution Section. The distribution section shall be provided to house branch circuit breakers as indicated on the Drawings. Circuit breakers shall be molded case type, with a manually operated stored energy mechanism. Molded case circuit breakers shall have solid state electronic with short time delay trip mechanisms, and shall have ground fault protection.

Circuit breakers shall be removable from the front without disturbing adjacent units. The switchboard shall contain space for future units as indicated on the Drawings. The cable entry for the distribution section shall be from the bottom.

2-2.07. Molded Case Circuit Breakers. Molded case circuit breakers shall be panel mounted. Circuit breakers shall be rated to interrupt and withstand an available fault current of 65,000 A at the system line voltage. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break, over-center switching mechanism that is mechanically tripfree. Circuit breakers shall have trip units as specified herein. Electronic trip units shall be complete with built-in current transformers. The ampere rating of the trip unit shall be as indicated on the Drawings.

The trip unit shall have adjustable settings for continuous amperes, instantaneous pickup, and short-time pickup. Where specified herein, the trip unit shall be provided with additional short delay trip time adjustment for better system coordination. Circuit breakers indicated to be rated less than 100 amperes shall be thermal-magnetic types.

Where specified herein, built-in ground fault protection shall be provided having adjustable pick-up ratings not exceeding 1,200 amperes, time delay adjustable from 0.1 to 0.5 seconds, and a neutral ground fault current transformer.

Solid-state electronic trip breakers shall have built-in test points for testing long delay, instantaneous, and ground fault functions of the breaker by means of a 120 volts AC operated test kit.

2-2.08. Insulated Case Power Circuit Breakers. Insulated case breakers shall be UL listed for operation at 100 percent of continuous current rating. The circuit breakers shall be rated to interrupt and withstand an available fault current of 50,000 A at system line voltage. The breaker control faceplate shall include color-

coded visual indicators for open and closed positions as well as mechanism charged and discharged positions. Manual push buttons shall be provided for opening and closing the breaker. Internal control power transformers shall be provided to furnish control power for insulated case power circuit breakers

Each breaker shall be furnished with a solid-state tripping system consisting of three current sensors, a solid-state trip device, and shunt trip. The solid-state element shall have long delay current pickup, short delay pickup, instantaneous pickup, ground fault pickup and fault trip indicators. All elements of the solid-state trip device shall be of the sealed potentiometer type providing adjustable current pickup in percentage of current sensor primary rating and time delay adjustments. The current sensor primary ampere rating shall be as indicated on the Drawings.

The breaker shall have built-in test points for testing long delay, short delay, instantaneous, and ground fault functions of the breaker by means of a 120 volts AC operated test kit.

2-2.09. Shop Painting. All iron and steel surfaces, except machined surfaces and stainless steel, shall be shop painted with the manufacturer's standard coating. Finish color shall be ANSI 61. Field painting, other than touchup painting, will not be required. A sufficient quantity of additional coating material and thinner shall be furnished for field touch up of damaged coatings.

2-3. SHOP TESTS. After the equipment has been completely assembled, it shall be shop tested for general operating conditions, circuit continuity, and high potential and other standard tests for the particular class of equipment as defined by industry standards. Four certified copies of the test results shall be submitted to Engineer before the equipment is shipped.

### PART 3 - EXECUTION

3-1. INSTALLATION. Installation shall be in accordance with the Electrical Equipment Installation section.

#### 3-2. FIELD QUALITY CONTROL.

3-2.01. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Startup Requirements section, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is

free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract price. Contractor shall include a minimum of one day(s) and one trip(s) to the site for each installation location.

3-2.02. Installation Supervision. Installation supervision by the manufacturer is not required.

Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing Contractor's erection or installation procedures. The equipment manufacturer will be provided with written notification 10 days prior to the need for such services.

End of Section

SECTION 16491 BYPASS-ISOLATION AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1-1. SCOPE. This section covers both indoor and outdoor automatic transfer switches, and bypass-isolation automatic transfer switches, which shall be furnished, and tested as specified and as indicated on the Drawings.

Automatic transfer switch equipment shall meet the design conditions and features.

Automatic transfer switch equipment shall be designated and located as follows:

Tag number(s).	ATS-401
Transfer switch designation(s).	ATS
Location of transfer switch(es).	MLS 39A

1-2. GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all equipment furnished under this section. If stipulations in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values. Contractor shall review the Contract Drawings, the manufacturer's layout drawings and installation requirements, and make any modifications required for proper installation subject to acceptance by Engineer.

1-2.04. Workmanship and Materials. Equipment supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

1-2.05. Governing Standards. The equipment furnished under this section shall be designed, constructed, and tested in accordance with UL 1008, Standard for

Safety Transfer Switch Equipment; NFPA 110, Standard for Emergency and Standby Power Systems; and the latest applicable standards of ANSI, NEMA, and IEEE.

The automatic transfer switch shall be UL listed for use in standby power systems in accordance with Article 702, Optional Standby Systems, of the National Electrical Code.

1-2.06. Nameplates. Nameplates with designation of each control or indicating device shall be mounted on the switch enclosure. Nameplates shall be white and black laminated phenolic material of suitable size, and shall be engraved with 3/4 inch [19 mm] high letters for section identity and 1/8 inch [3 mm] letters for other information. The engraving shall extend through the white exterior lamination to the black center.

Each control device and each control wire terminal block connection inside the units shall be identified with a permanent nameplate or painted legend to match the identification on the manufacturer's wiring diagram.

1-2.07. System Characteristics. The equipment will be connected to a power system with characteristics as specified below:

Voltage, phase	480 VAC, 3-phase
Frequency	60 Hz
Number of conductors	3-wire

1-3. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the transfer switch, shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the following:

- Drawings showing front and side views, plan, and weight.
- Rating and specifications.
- Circuit breaker time-current characteristic curves, if applicable.
- Single-line, control schematic, and wiring connection diagrams.
- Operation and maintenance and manuals including a list of spare parts.
- Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-4. OPERATION AND MAINTENANCE MANUALS. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and Storage shall be in accordance with the Product Storage and Handling Requirements section.

1-6. SPARE PARTS. Spare parts shall be suitably packaged, as specified herein, with labels indicating the contents of each package. Spare parts shall be delivered to Owner as directed. Spare parts shall be provided as follows:

<u>Spare Parts</u>	<u>Quantity</u>
Fuses	Two sets for each size & type
Indicating Lamps	Two of each size & type

## PART 2 - PRODUCTS

2-1. ACCEPTABLE MANUFACTURERS. The automatic transfer switch shall be a product of a manufacturer who has supplied such equipment for at least 5 years.

The automatic transfer switch shall be manufactured by Automatic Switch Co. (ASCO), GE Zenith Controls, or Russelectric Inc., without exception.

### 2-2. CONSTRUCTION FEATURES.

2-2.01. Enclosure. The enclosure for the transfer switch shall be as follows:

Type of mounting	Freestanding
Enclosure rating	Indoor NEMA Type 1

Adequate bracing shall be provided for seismic forces. The bracing shall be designed to meet the requirements of the Meteorological and Seismic Design Criteria section.

2-2.02. Rating. Automatic transfer switches shall be rated for continuous duty in both normal and emergency positions. The switches shall have the number of poles as specified below, and shall be double-throw. Ampere ratings, and 3-cycle closing and withstand ratings shall be as specified below.

Number of poles	3-Pole
Ampere rating and 3-cycle closing and withstand rating	As indicated on the Drawings

2-2.03. Space Heaters. Not used.

## 2-3. PERFORMANCE AND DESIGN REQUIREMENTS.

2-3.01. Equipment Description. The automatic transfer switches shall transfer electric loads from the normal source of electric power to an emergency source of power as indicated on the Drawings. The transfer switches shall automatically transfer the electrical load circuits upon an interruption or a decrease in the voltage of the normal source of power and shall transfer the loads back to the normal source when it becomes available. The transfer switches shall be furnished without integral overcurrent protection. The switches shall be electrically operated but mechanically held in both the normal and emergency positions. The operating mechanism shall be momentarily energized from the source to which the load is being transferred. All main and arcing contacts and control elements shall be removable from the front of the switches without removing the switch from the enclosure and without removing the power cables. The automatic transfer switches shall be so designed that the load circuits cannot be connected to more than one source of power at a time. The automatic transfer switches shall be magnetic contactor type.

2-3.01.01. Automatic Transfer Switch. The automatic transfer switch shall be an electrically operated double throw switch. Main contacts shall be silver composition. Main and arcing contacts shall be visible without major disassembly to facilitate inspection and maintenance. A manual handle shall be provided for maintenance.

Switches composed of molded case breakers, contactors, or similar components not specifically designed for automatic transfer switch applications will not be acceptable.

2-3.01.02. Bypass-Isolation Switch. A bypass-isolation transfer switch shall be provided to permit manual bypassing and isolation of the automatic transfer switch.

Bypassing the load to either the normal or emergency source shall completely isolate the transfer switch from both sources and the load and shall be possible regardless of the status of the switch.

Provisions shall be made for testing the automatic transfer switch when operating in bypass. Testing in bypass shall not disturb power to the load.

2-3.02. Control System. The control system shall consist of all control devices necessary to operate the switch as described. The system shall incorporate a microprocessor control module connected to the power transfer components by a wire harness and keyed disconnect plugs. The control module shall be completely enclosed with a protective cover and shall be mounted separately from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on plug-in circuit boards. All interface relays shall be identical and shall be control grade, plug-in type, with dust covers.

All control components shall meet or exceed the voltage withstand capability in accordance with IEEE 472 and NEMA ICS 1-109.

2-3.02.01. Performance. The automatic transfer switch shall be designed to function in accordance with the following requirements:

- a. The voltage of each phase of the normal source shall be monitored and the pickup voltage shall be adjustable from 85 percent to 100 percent of nominal, and the dropout voltage shall be adjustable from 75 percent to 98 percent of the pickup value. The transfer to emergency will be initiated upon reduction of the normal source to 85 percent of the normal voltage, and retransfer to normal shall occur when the normal source restores to 90 percent of the normal voltage.
- b. A time delay to override momentary normal source outages to delay all transfer switch and engine starting signals shall be provided. The time delay shall be field adjustable from 0.5 to 6 seconds and shall be factory set at 1 second.
- c. A time delay to retransfer to the normal source shall be provided. The time delay shall be automatically bypassed if the emergency source fails and the normal source is available. The time delay shall be field adjustable from 0 to 30 minutes and shall be factory set at 10 minutes.
- d. An in-phase monitor shall be provided to control transfer so motor load inrush currents do not exceed normal starting currents. The monitor shall compare the phase relationship and frequency difference between the normal and emergency sources and shall permit transfer only at acceptable values of voltage, phase relationship, and frequency differential.
- e. An unloaded running time delay for engine-generator cool-down shall be provided. The time delay shall be field adjustable from 0 to 60 minutes and shall be factory set at 5 minutes.
- f. The ATS should contain at minimum two auxiliary contacts to communicate to the DFS RTU when normal and emergency power is available.

2-3.02.02. Indication. The automatic transfer switch shall include indication features in accordance with the following requirements:

- a. A detailed step-by-step operating instruction plate shall be provided on the front of the switch.

- b. Indicating lights or microprocessor control display indication shall be provided for, but shall not be limited to, the following:
  - Normal source available.
  - Emergency source available.
  - Bypass switch in normal position.
  - Bypass switch in emergency position.
  - Automatic transfer switch isolated.
  - Automatic transfer switch inhibit.
  - Automatic transfer switch in normal position.
  - Automatic transfer switch in emergency position.
  - Automatic transfer switch in test mode.
- c. One auxiliary contact shall be provided that is closed when the automatic transfer switch is connected to the normal source and one contact that is closed when the automatic transfer switch is connected to the emergency source.
- d. A contact, which will close when the normal source fails, shall be provided to initiate engine starting. The contact shall be rated 10 amperes, 32 VDC and shall be gold plated for low voltage service.

2-3.03. Shop Painting. All iron and steel surfaces, except machined surfaces and stainless steel, shall be shop painted with the manufacturer's standard coating. Finish color shall be ANSI 61. Field painting, other than touchup painting, shall not be required. A sufficient quantity of additional coating material and thinner shall be furnished to permit field touchup of damaged coatings.

2-3.04. Shop Tests. After the equipment has been completely assembled, it shall be shop tested for general operating condition, circuit continuity, high potential, and for compliance with the governing standards. Certified test results shall be submitted to Engineer before the equipment is shipped.

### PART 3 – EXECUTION

3-1. INSTALLATION. The transfer switch will be installed in accordance with Electrical Equipment Installation section.

#### 3-2. FIELD QUALITY CONTROL

3-2.01. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The

representative shall be present when the equipment is placed in operation in accordance with Startup Requirements section, and shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price. Contractor shall include a minimum of one day(s) and one trip(s) to each site.

End of Section

## SECTION 16670 LIGHTNING PROTECTION FOR STRUCTURES

### PART 1 – GENERAL

1-1. SCOPE. This section covers furnishing the design of lightning protection systems and the furnishing and installation of lightning protection equipment for the following structures:

#### Electrical Room

Lightning protection systems shall be furnished, installed, and tested as specified. Lightning protection equipment shall meet the requirements specified herein.

Lightning protection systems shall consist of, but not be limited to, air terminals; main, bonding, and down conductors; ground terminals; and all required connectors and fittings required to complete the system.

The lightning protection system shall include the bonding of all roof-mounted mechanical equipment, roof drains, roof mounted ladders, chimneys, antennas, and other roof mounted metal objects.

1-2. GENERAL. Contractor shall furnish all installation drawings, tools, equipment, materials, and supplies and shall perform all labor and obtain all inspections to complete the work as specified, and in compliance with all codes, standards, and regulations.

Contractor shall provide coordination with other contractors and supervision of installation as needed during construction.

The design of the system shall include determination of the overall lightning hazard for the geographic location of the project and for the structures, the selection of Class I and/or Class II materials, the need of corrosion protection for the copper and/or aluminum components used, and consideration of other pertinent factors. The design shall produce a zone of protection from lightning to prevent personal injury, structural damage, and equipment downtime.

Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of UL unless exceptions are noted by Engineer.

The system shall be installed by an installer who has UL listing and subscribes to the UL Follow-Up Service.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all equipment furnished under this section. If requirements

in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Governing Standards. All system components furnished under this section shall be designed in accordance with ANSI/UL 96 - Lightning Protection Components. All lightning protection systems furnished under this section shall be designed, constructed, and tested in accordance with UL 96A – Installation Requirements for Lightning Protection Systems and ANSI/NFPA 780 – Standard for the Installation of Lightning Protection Systems.

Lightning protection systems shall be bonded to grounding electrode systems in accordance with the National Electrical Code.

1-2.04. Workmanship and Materials. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, unless required by tests.

1-3. SUBMITTALS. Complete certification of design calculations; assembly, and installation drawings; together with complete engineering data covering the materials used and the parts, devices, and accessories forming the system, shall be submitted in accordance with the Submittals Procedures section.

Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-4. QUALITY ASSURANCE. The lightning protection system shall be inspected and tested after installation by conducting continuity and ground resistance tests as well as a visual inspection. Inspection results and test data shall be submitted in accordance with the Submittals Procedures section. Upon completion of the installation, Contractor shall apply for and deliver the UL Master Label Certificate of Inspection for each structure/building.

## PART 2 - PRODUCTS

2-1. ACCEPTABLE MANUFACTURERS. The system components shall be manufactured by a company that has been specializing in the design and manufacture of UL listed lightning protection equipment for at least 5 years.

2-2. MATERIALS. All manufactured and fabricated components shall conform to NFPA 780 Class I or Class II as needed for the structures on which they will be installed. The system components shall be fabricated from the following metals:

Conductors	Copper.
Air Terminals	Copper or bronze.
Grounding Electrodes	Copper clad steel.
Fasteners	Copper or bronze.
Bimetallic Fasteners	Bronze and aluminum.

Aluminum conductors and air terminals shall be mounted on aluminum surfaces only.

All materials furnished for the lightning protection system shall bear the inspection label of UL.

## PART 3 - EXECUTION

3-1. INSTALLATION. The lightning protection system shall be installed in a neat and inconspicuous manner so all components will blend in with the appearance of the building. All conductors shall be concealed or semi-concealed during construction using methods recommended in NFPA 780 and UL 96A.

Air terminals shall have base supports designed for the surface on which they are used and shall be securely anchored. All exposed metal eave troughs, roof vents, guy wires, antennas, and air handling equipment shall be bonded to the lightning protection system in such a way that two paths to ground are provided.

The lightning protection system shall be bonded to structure/building electrical ground rings wherever they are available.

End of Section

**BID ATTACHMENT 3, PLAN SET / DRAWINGS**

**NOTE - This attachment is uploaded as a separate document on the Procurement page of the County website with the solicitation document and available for download.**

**SECTION D, SAMPLE CONSTRUCTION AGREEMENT WITH GENERAL  
CONDITIONS OF THE CONSTRUCTION AGREEMENT AND AGREEMENT  
EXHIBITS**

CONSTRUCTION AGREEMENT

*for*

STIPULATED SUM

*between*

MANATEE COUNTY (AS OWNER)

*and*

\_\_\_\_\_ (AS CONTRACTOR)

**CONSTRUCTION AGREEMENT FOR  
STIPULATED SUM  
[PROJECT NAME]**

**THIS AGREEMENT** (“Agreement”) is made and entered into by and between Manatee County, a political subdivision of the State of Florida, referred to herein as “Owner”, and the firm of \_\_\_\_\_, incorporated in the State of \_\_\_\_\_ and registered and licensed to do business in the State of Florida (license # \_\_\_\_\_), referred to herein as “Contractor.”

**WHEREAS**, the Owner intends to construct **[PROJECT DESCRIPTION]**, the aforementioned improvements being hereinafter referred to and defined as the “Project”; and

**WHEREAS**, in response to Owner’s Invitation for Bid Construction No. \_\_\_\_\_ (the “IFBC”), Contractor has submitted its Bid (the “Contractor’s Bid”) to provide the aforementioned construction services.

**NOW THEREFORE**, the Owner and the Contractor, in consideration of the mutual covenants hereinafter set forth, the sufficiency of which is hereby acknowledged, agree as follows:

**1. Contract Documents.** The Contract Documents consist of this Agreement and attached Exhibits, the attached General Conditions of the Construction Agreement, Supplementary Conditions (if any), Special Conditions (if any), Drawings (the titles of which are attached hereto as Exhibit A), Specifications (the titles of which are attached hereto as Exhibit B), Addenda issued prior to execution of this Agreement, the Invitation for Bid (including any Instructions to Bidders, Scope of Work, Bid Summary, Supplements, and Technical Specifications), any interpretations issued pursuant to the Invitation for Bid, the Contractor’s Bid, permits, notice of intent to award, Notice to Proceed, purchase order(s), any other documents listed in this Agreement, and Modifications [to include written Amendment(s), Change Order(s), Work Directive Change(s) and Field Directive(s)] issued after execution of this Agreement. These form the Agreement, and are as fully a part of the Agreement as if attached or repeated herein. This Agreement represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. No other documents shall be considered Contract Documents.

**2. Work.** The Contractor shall fully execute the Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

**3. Date of Commencement and Substantial Completion.**

A. Date of Commencement. The date of commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner.

B. Contract Time. The Contract Time shall be measured from the date of commencement.

C. Substantial Completion. The Contractor shall achieve Substantial Completion of the entire Work not later than \_\_\_ days from the date of commencement, or as follows:

<b>Portion of Work</b>	<b>Substantial Completion Date</b>
------------------------	------------------------------------

subject to adjustments of this Contract Time as provided in the Contract Documents.

Time is of the essence in the Contract Documents and all obligations thereunder. If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents (to include not only the entire Work but any portion of the Work as set forth above), the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the sum of \$\_\_\_\_\_ per calendar day, commencing upon the first day following expiration of the Contract Time and continuing until the actual date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur because of delayed completion of the Work. The Owner may deduct liquidated damages as described in this paragraph from any unpaid amounts then or thereafter due the Contractor under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

**4. Contract Sum.**

A. Payment. The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be \_\_\_\_\_ Dollars and Zero Cents (\$\_\_\_\_\_), subject to additions and deductions as provided in the Contract Documents.

B. Alternates. The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner. *(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

C. Unit Prices. Unit prices, if any, are reflected in the Contractor's Bid.

**5. Payments.**

A. Progress Payments.

(1) Based upon Applications for Payment submitted to the Architect/Engineer by the Contractor and Certificates for Payment issued by the Architect/Engineer, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

(2) The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

- (3) Payments shall be made by Owner in accordance with the requirements of Section 218.735, Florida Statutes.
- (4) Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Owner or Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.
- (5) Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.
- (6) Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:
  - i. Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of five percent (5.00%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 3.3.B. of the General Conditions;
  - ii. Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), supported by paid receipts, less retainage of five percent (5.00%);
  - iii. Subtract the aggregate of previous payments made by the Owner; and
  - iv. Subtract amounts, if any, for which the Architect/Engineer has withheld or nullified an Application for Payment, in whole or in part as provided in Section 3.3.C. of the General Conditions.
- (7) The progress payment amount determined in accordance with Section 5.A(6) shall be further modified under the following circumstances:
  - i. Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect/Engineer shall determine for

incomplete Work, retainage applicable to such work and unsettled claims.

- ii. Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 3.2.B. of the General Conditions.

- (8) Reduction or limitation of retainage, if any, shall be as follows:

Notwithstanding the foregoing, upon completion of at least 50% of the Work, as determined by the Architect/Engineer and Owner, the Owner may, with the concurrence of the Architect/Engineer, reduce to two and one-half percent (2.5%) the amount of retainage withheld from each subsequent progress payment.

- (9) Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

B. Final Payment. Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when:

- (1) The Contractor has fully performed the Work except for the Contractor's responsibility to correct Work as provided in Section 2.4.C. of the General Conditions, and to satisfy other requirements, if any, which extend beyond final payment; and
- (2) A final Application for Payment has been approved by the Architect/Engineer.

## **6. Termination or Suspension.**

A. Termination. The Agreement may be terminated by the Owner or the Contractor as provided in Article XIV of the General Conditions.

B. Suspension by Owner. The Work may be suspended by the Owner as provided in Article XIV of the General Conditions.

## **7. Other Provisions.**

A. Substantial Completion Defined. Substantial Completion shall be defined as provided in Article I of the General Conditions. In the event a temporary certificate of occupancy or completion is issued establishing Substantial Completion, the Contractor shall diligently pursue the issuance of a permanent certificate of occupancy or completion.

B. Project Meetings. There shall be a project meeting, at the jobsite or other location acceptable to the parties, on a regularly scheduled basis. The meeting will be attended by a representative of the Contractor, Architect/Engineer and Owner. These representatives shall be authorized to make decisions that are not otherwise contrary to the requirements of this Agreement.

C. Weather. Any rainfall, temperatures below 32 degrees Fahrenheit or winds greater than 25 m.p.h. which actually prevents Work on a given day, shall be considered lost time and an additional day added to the Contract Time, provided no work could be done on site, and provided written notice has been submitted to the Owner by the Contractor documenting same.

D. Shop Drawings; Critical Submittals. In consideration of the impact of timely review of submittals and shop drawings on the overall progress of the Work, it is hereby agreed that the Owner shall cause his agents and design professionals to accomplish the review of any particular "critical" submittals and/or shop drawings and return same to the Contractor within fourteen (14) days.

E. Applications for Payment. Applications for Payment shall be submitted once monthly at regular intervals and shall include detailed documentation of all costs incurred.

F. Punch List. Within 30 days after obtainment of Substantial Completion, the Owner shall generate a "punch list" of all work items requiring remedial attention by the Contractor. Within 5 days thereafter the Architect/Engineer shall assign a fair value to the punch list items, which sum shall be deducted from the next scheduled progress payment to the Contractor. Upon satisfactory completion of the punch list items, as certified by the Architect/Engineer, the previously deducted sum shall be paid to the Contractor.

G. Closeout documentation. Within 30 days after obtainment of Substantial Completion and before final payment, Contractor shall gather and deliver to Owner all warranty documentation, all manufacturer's product and warranty literature, all manuals (including parts and technical manuals), all schematics and handbooks, and all as-built drawings.

H. Governing Provisions; Conflicts. In the event of a conflict between this Agreement and the Specifications or as between the General Conditions and the Specifications, the Specifications shall govern.

I. E-Verify. The Contractor's employment of unauthorized aliens is a violation of Section 274(e) of the Federal Immigration and Employment Act. The Contractor shall utilize the U.S. Department of Homeland Security E-Verify system to verify the employment eligibility of all new employees hired during the term of this Agreement, and shall require the same verification procedure of all Subcontractors.

**8. Insurance and Bonding.** If and to the extent required by the Invitation for Bid documents, the Contractor shall furnish insurance coverage for (but not necessarily limited to) workers' compensation, commercial general liability, auto liability, excess liability, and builder's risk. The Contractor shall furnish to the Owner all appropriate policies and Certificate(s) of Insurance. The Contractor shall also post a Payment and Performance Bond for the Contract Sum, within ten (10) days following notification of intent to award, and otherwise in accordance with the Invitation for Bid documents.

**9. Independent Contractor.** The Contractor acknowledges that it is functioning as an independent contractor in performing under the terms of this Agreement, and it is not acting as an employee of the Owner.

**10. Entire Agreement.** This Agreement (inclusive of the Contract Documents incorporated herein by reference) represents the full agreement of the parties.

**11. Amendments; Waivers; Assignment.**

A. Amendments. This Agreement may be amended only pursuant to an instrument in writing that has been jointly executed by authorized representatives of the parties hereto.

B. Waivers. Neither this Agreement nor any portion of it may be modified or waived orally. However, each party (through its governing body or properly authorized officer) shall have the right, but not the obligation, to waive, on a case-by-case basis, any right or condition herein reserved or intended for the benefit or protection of such party without being deemed or considered to have waived such right or condition for any other case, situation, or circumstance and without being deemed or considered to have waived any other right or condition. No such waiver shall be effective unless made in writing with an express and specific statement of the intent of such governing body or officer to provide such waiver.

C. Assignment. The rights and obligations of either party to this Agreement may be assigned to a third party only pursuant to a written amendment hereto.

**12. Validity.** Each of the Owner and Contractor represents and warrants to the other its respective authority to enter into this Agreement.

**13. Covenant to Defend.** Neither the validity of this Agreement nor the validity of any portion hereof may be challenged by any party hereto, and each party hereto hereby waives any right to initiate any such challenge. Furthermore, if this Agreement or any portion hereof is challenged by a third party in any judicial, administrative, or appellate proceeding (each party hereby covenanting with the other party not to initiate, encourage, foster, promote, cooperate with, or acquiesce to such challenge), the parties hereto collectively and individually agree, at their individual sole cost and expense, to defend in good faith its validity through a final judicial determination or other resolution, unless all parties mutually agree in writing not to defend such challenge or not to appeal any decision invalidating this Agreement or any portion thereof.

**14. Disclaimer of Third-Party Beneficiaries; Successors and Assigns.** This Agreement 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 Agreement is intended or shall be construed to confer upon or give any person, corporation, partnership, trust, private entity, agency, or other governmental entity any right, privilege, remedy, or claim under or by reason of this Agreement or any provisions or conditions hereof. This Agreement shall be binding upon, and its benefits and advantages shall inure to, the successors and assigns of the parties hereto.

**15. Construction.**

A. Headings and Captions. The headings and captions of articles, sections, and paragraphs used in this Agreement are for convenience of reference only and are not intended to define or limit their contents, nor are they to affect the construction of or be taken into consideration in interpreting this Agreement.

B. Legal References. All references to statutory sections or chapters shall be construed to include subsequent amendments to such provisions, and to refer to the successor provision of any such provision. References to “applicable law” and “general law” shall be construed to include provisions of local, state and federal law, whether established by legislative action, administrative rule or regulation, or judicial decision.

**16. Severability.** The provisions of this Agreement are declared by the parties hereto to be severable. In the event any term or provision of this Agreement shall be held invalid by a court of competent jurisdiction, such invalid term or provision should not affect the validity of any other term or provision hereof; and all such terms and provisions hereof shall be enforceable to the fullest extent permitted by law as if such invalid term or provision had never been part of this Agreement; provided, however, if any term or provision of this Agreement is held to be invalid due to the scope or extent thereof, then, to the extent permitted by law, such term or provision shall be automatically deemed modified in order that it may be enforced to the maximum scope and extent permitted by law.

**17. Governing Law; Venue.** This Agreement shall be governed by the laws of the State of Florida. Venue for any petition for writ of certiorari or other court action allowed by this Agreement shall be in the Circuit Court of the Twelfth Judicial Circuit in and for Manatee County, Florida.

**18. Attorney’s Fees and Costs.** In any claim dispute procedure or litigation arising from this Agreement, each party hereto shall be solely responsible for paying its attorney’s fees and costs.

**19. Notices.** All notices, comments, consents, objections, approvals, waivers, and elections under this Agreement shall be in writing and shall be given only by hand delivery for which a receipt is obtained, or certified mail, prepaid with confirmation of delivery requested, or by electronic mail with delivery confirmation. All such communications shall be addressed to the applicable addressees set forth below or as any party may otherwise designate in the manner prescribed herein.

To the Owner:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Email: \_\_\_\_\_

To the Contractor:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Email: \_\_\_\_\_

Notices, comments, consents, objections, approvals, waivers, and elections shall be deemed given when received by the party for whom such communication is intended at such party's address herein specified, or such other physical address or email address as such party may have substituted by notice to the other.

**20. Public Records Law.** The Contractor shall comply with the Florida Public Records Act (Chapter 119, Florida Statutes), and shall:

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

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE OWNER'S CUSTODIAN OF PUBLIC RECORDS AT 941-748-4501, EXT. 5845; [DEBBIE.SCACCIANOCE@MYMANATEE.ORG](mailto:DEBBIE.SCACCIANOCE@MYMANATEE.ORG); POST OFFICE BOX 1000, BRADENTON, FLORIDA 34206.

**21. Exhibits.** Exhibits to this Agreement are as follows:

Exhibit A—Title(s) of Drawings

Exhibit B—Title(s) of Specifications

Exhibit C—Affidavit of No Conflict

Exhibit D—Certificate(s) of Insurance

Exhibit E—Payment and Performance Bond

Exhibit F—Standard Forms

- 1—Application for Payment
- 2—Certificate of Substantial Completion
- 3—Final Reconciliation / Warranty / Affidavit
- 4—Change Order

*(Remainder of page intentionally left blank)*

SAMPLE

***WHEREFORE, the parties hereto have executed this Agreement as of the date last executed below.***

\_\_\_\_\_  
Name of Contractor

By: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**MANATEE COUNTY**, a political subdivision  
of the State of Florida

By: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

SAMPLE

GENERAL CONDITIONS  
*of the*  
CONSTRUCTION AGREEMENT

SAMPLE

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SAMPLE

**GENERAL CONDITIONS**  
**ARTICLE I**  
**DEFINITIONS**

**1.1 Definitions.** For purposes of the Contract Documents, the following terms shall have the following meanings.

A. Acceptance: The acceptance of the Project into the Owner's operating public infrastructure.

B. Application for Payment: The form approved and accepted by the Owner, which is to be used by Contractor in requesting progress payments or final payment and which is to include such supporting documentation as is required by the Contract Documents.

C. Architect/Engineer: \_\_\_\_\_, a \_\_\_\_\_ corporation or limited liability company, registered and licensed to do business in the State of Florida, OR \_\_\_\_\_, an employee of Owner.

D. Change Order: A written order signed by the Owner, the Architect/Engineer and the Contractor authorizing a change in the Project Plans and/or Specifications and, if necessary, a corresponding adjustment in the Contract Sum and/or Contract Time, pursuant to Article V.

E. Construction Services: The Construction Services to be provided by Contractor pursuant to Section 2.4, in accordance with the terms and provisions of the Contract Documents.

F. Construction Team: The working team established pursuant to Section 2.1.B.

G. Contract Sum: The total compensation to be paid to the Contractor for Construction Services rendered pursuant to the Contract Documents, as set forth in Contractor's Bid (or Guaranteed Maximum Price Addendum), unless adjusted in accordance with the terms of the Contract Documents

H. Contract Time: The time period during which all Construction Services are to be completed pursuant to the Contract Documents, to be set forth in the Project Schedule.

I. Contractor's Personnel: The Contractor's key personnel designated by Contractor.

J. Days: Calendar days except when specified differently. 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.

K. Defective: When modifying the term “Work”, referring to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or that does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or that has been damaged prior to Owner’s approval of final payment (unless responsibility for the protection thereof has been assumed by Owner).

L. Field Directive: A written order issued by Owner which orders minor changes in the Work not involving a change in Contract Time, to be paid from the Owner’s contingency funds.

M. Final Completion Date: The date upon which the Project is fully constructed and all Work required on the Project and Project Site is fully performed as verified in writing by the Owner.

N. Float Time: The time available in the Project Schedule during which an unexpected activity can be completed without delaying Substantial Completion of the Work.

O. Force Majeure: Those conditions constituting excuse from performance as described in and subject to the conditions described in Article XII.

P. Notice to Proceed: Written notice by Owner (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 the Work.

Q. Owner: Manatee County, a political subdivision of the State of Florida.

R. Owner’s Project Representative: The individual designated by Owner to perform those functions set forth in Section 7.8.

S. Payment and Performance Bond: The Payment and Performance Bond security posted pursuant to Section 2.4.Y to guarantee payment and performance by the Contractor of its obligations hereunder.

T. Permitting Authority: Any applicable governmental authority acting in its governmental and regulatory capacity which is required to issue or grant any permit, certificate, license or other approval which is required as a condition precedent to the commencement or approved of the Work, or any part thereof, including the building permit.

U. Procurement Ordinance: The Manatee County Procurement Code, Chapter 2-26 of the Manatee County Code of Laws, as amended from time to time.

V. Progress Report: A report to Owner that includes all information required pursuant to the Contract Documents and submitted in accordance with Section 2.4.EE, hereof.

W. Project: The total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by Owner and by separate contractors. For the purposes of the Contract Documents, the term Project shall

include all areas of proposed improvements and all areas which may reasonably be judged to have an impact on the Project.

X. Project Costs: The costs incurred by the Contractor to plan, construct and equip the Project and included within, and paid as a component of, the Contract Sum.

Y. Project Manager: Subject to the prior written consent of Owner, the individual designated to receive notices on behalf of the Contractor, or such other individual designated by the Contractor, from time to time, pursuant to written notice in accordance with the Contract Documents.

Z. Project Plans and Specifications: The one hundred percent (100%) construction drawings and specifications prepared by the Architect/Engineer, and any changes, supplements, amendments or additions thereto approved by the Owner, which shall also include any construction drawings and final specifications required for the repair or construction of the Project, as provided herein.

AA. Project Schedule: The schedule and sequence of events for the commencement, progression and completion of the Project, developed pursuant to Section 2.3., as such schedule may be amended as provided herein.

BB. Project Site: The site depicted in the Project Plans and Specifications, inclusive of all rights of way, temporary construction easements or licensed or leased sovereign lands.

CC. Subcontractor: Any individual (other than a direct employee of the Contractor) or organization retained by Contractor to plan, construct or equip the Project pursuant to Article IV.

DD. Substantial Completion and Substantially Complete: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy or completion and other permits, approvals, licenses, and other documents from any governmental authority which are necessary for the beneficial occupancy of the Project or any designated portion thereof.

EE. Substantial Completion Date: The date on which the Project or designated portion thereof is deemed to be Substantially Complete, as evidenced by receipt of (i) the Architect/Engineer's certificate of Substantial Completion, (ii) written Acceptance of the Project by the Owner, and (iii) approvals of any other authority as may be necessary or otherwise required.

FF. Substitute: Materials or equipment offered by the Contractor as an alternative to that set forth in the Project Plans and Specifications, where (i) the Project Plans and Specifications do not authorize an "approved equal", or (ii) the Owner, in its reasonable discretion, determines that a pre-authorized "approved equal" will result in a substantial change to the Work because of cost, quality or other difference in comparison to the materials or equipment specified.

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

HH. Work: The term “Work” means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.

II. Work Directive Change: A written directive to Contractor, issued on or after the effective date of the Agreement pursuant to Section 5.8 and signed by Owner’s 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 responding to emergencies.

## **ARTICLE II RELATIONSHIP AND RESPONSIBILITIES**

**2.1 Relationship between Contractor and Owner.** The Contractor accepts the relationship of trust and confidence established with Owner pursuant to the Contract Documents. The Contractor shall furnish its best skill and judgment and cooperate with Owner and Owner’s Project Representative in furthering the interests of the Owner. The Contractor agrees to provide the professional services required to complete the Project consistent with the Owner’s direction and the terms of the Contract Documents. All services provided hereunder by Contractor, either directly or through Subcontractors, shall be provided in accordance with sound construction practices and applicable professional construction standards.

A. Purpose. The purpose of the Contract Documents is to provide for the provision of construction services for the Project on the Project Site by the Contractor, and construction of the Project by the Contractor in accordance with the Project Plans and Specifications. The further purpose of the Contract Documents is to define and delineate the responsibilities and obligations of the parties to the Contract Documents and to express the desire of all such parties to cooperate to accomplish the purposes and expectations of the Contract Documents.

B. Construction Team. The Contractor, Owner and Architect/Engineer shall be called the “Construction Team” and shall work together as a team commencing upon full execution of the Contract Documents through Substantial Completion. As provided in Section 2.2, the Contractor and Architect/Engineer shall work jointly through completion and shall be available thereafter should additional services be required. The Contractor shall provide leadership to the Construction Team on all matters relating to construction. The Contractor understands, acknowledges and agrees that the Architect/Engineer shall provide leadership to the Construction Team on all matters relating to design.

C. Owner’s Reliance on Bid (or Guaranteed Maximum Price Addendum). The Contractor acknowledges that the representations, statements, information and pricing contained in its Bid (or Guaranteed Maximum Price Addendum) have been relied upon by the Owner and have resulted in the award of this Project to the Contractor.

**2.2 General Contractor Responsibilities.** In addition to the other responsibilities set forth herein, the Contractor shall have the following responsibilities pursuant to the Contract Documents:

A. Personnel. The Contractor represents that it has secured, or shall secure, all personnel necessary to perform the Work, none of whom shall be employees of the Owner. Primary liaison between the Contractor and the Owner shall be through the Owner's Project Representative and Contractor's Project Manager. All of the services required herein shall be performed by the Contractor or under the Contractor's supervision, and all personnel engaged in the Work shall be fully qualified and shall be authorized or permitted under law to perform such services.

B. Cooperation with Architect/Engineer. The Contractor's services shall be provided in conjunction with the services of the Architect/Engineer. In the performance of professional services, the Contractor acknowledges that time is critical for Project delivery. The Contractor acknowledges that timely construction utilizing the services of an Architect/Engineer and a Contractor requires maximum cooperation between all parties.

C. Timely Performance. The Contractor shall perform all services as expeditiously as is consistent with professional skill and care and the orderly progress of the Work, in accordance with the Project Schedule. Verification of estimated Project Schedule goals will be made as requested by the Owner.

D. Duty to Defend Work. In the event of any dispute between the Owner and any Permitting Authority that relates to the quality, completeness or professional workmanship of the Contractor's services or Work, the Contractor shall, at its sole cost and expense, cooperate with the Owner to defend the quality and workmanship of the Contractor's services and Work.

E. Trade and Industry Terminology. 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. 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 (or at the time of execution of the Guaranteed Maximum Price Addendum), 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 Owner or Contractor, or any of their agents or employees from those set forth in the Contract Documents. Computed dimensions shall govern over scaled dimensions.

**2.3 Project Schedule.** The Contractor, within ten (10) days after being awarded the Agreement, shall prepare and submit for the Owner's and Architect/Engineer's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the

extent required by the Contract Documents, and shall provide for expeditious and practicable execution of Work.

- A. The Project Schedule shall show a breakdown of all tasks to be performed, and their relationship in achieving the completion of each phase of Work, subject to review of Owner and Architect/Engineer and approval or rejection by Owner. The Project Schedule shall show, at 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 Project Schedule shall include all phases of procurement, approval of shop drawings, proposed Change Orders in progress, schedules for Change Orders, and performance testing requirements. The Project Schedule shall include a construction commencement date and Project Substantial Completion Date, which dates shall accommodate known or reasonably anticipated geographic, atmospheric and weather conditions.
- B. The Project Schedule shall serve as the framework for the subsequent development of all detailed schedules. The Project Schedule shall be used to verify Contractor performance and to allow the Owner's Project Representative to monitor the Contractor's efforts.
- C. The Project Schedule may be adjusted by the Contractor pursuant to Article V. The Owner shall have the right to reschedule Work provided such rescheduling is in accord with the remainder of terms of the Contract Documents.
- D. The Contractor shall prepare a submittal schedule, promptly after being awarded the Agreement and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect/Engineer's approval. The Architect/Engineer's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect/Engineer reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.
- E. The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect/Engineer.

**2.4 Construction Services.** The Contractor shall provide the following Construction Services:

- A. Construction of Project. The Contractor shall work from the receipt of a Notice to Proceed through the Substantial Completion of the Project in accordance with the terms of the Contract Documents to manage the construction of the Project. The Construction Services provided by the Contractor to construct the Project shall include without limitation (1) all services

necessary and commensurate with established construction standards, and (2) all services described in the Invitation for Bid (or Request for Proposal) and the Bid (or Guaranteed Maximum Price Addendum).

B. Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Agreement. 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 issuance of the Notice to Proceed.

C. Quality of Work. If at any time the labor used or to be used appears to the Owner as insufficient or improper for securing the quality of Work required or the required rate of progress, the Owner may order the Contractor to increase its efficiency or to improve the character of its Work, and the Contractor shall conform to such an order. Any such order shall not entitle Contractor to any additional compensation or any increase in Contract Time. The failure of the Owner to demand any increase of such efficiency or any improvement shall not release the Contractor 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 Documents. The Owner may require the Contractor to remove such personnel as the Owner deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Project is deemed to be contrary to the Owner's interest. The Contractor shall provide good quality workmanship and shall promptly correct construction defects without additional compensation. Acceptance of the Work by the Owner shall not relieve the Contractor of the responsibility for subsequent correction of any construction defects.

D. Materials. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by Architect/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.

E. Accountability for Work. The Contractor shall be solely accountable for its Work, including plans review and complete submittals. The Contractor shall be solely responsible for means, methods, techniques, sequences and procedures of construction. If a specific means, method, technique, sequence or procedure of construction is required by the Contract Documents, the Contractor may utilize an alternative means, method, technique, sequence or procedure acceptable to the Architect/Engineer if the Contractor submits sufficient information to allow the Architect/Engineer to determine that the alternative is equivalent to that required by the Contract Documents.

F. Contract Sum. The Contractor shall construct the Project so that the Project can be built for a cost not to exceed the Contract Sum.

G. Governing Specifications. In the absence of specified Owner design standards or guidelines, the Architect/Engineer shall use, and the Contractor shall comply with, the most recent version of the applicable FDOT or AASHTO design standards. In general, the Project shall be constructed by the Contractor in accordance with applicable industry standards. The Contractor shall be responsible for utilizing and maintaining current knowledge of any laws,

ordinances, codes, rules, regulations, standards, guidelines, special conditions, specifications or other mandates relevant to the Project or the services to be performed.

H. Adherence to Project Schedule. The development and equipping of the Project shall be undertaken and completed in accordance with the Project Schedule, and within the Contract Time described therein.

I. Superintendent. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project Site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

(1) The Contractor, as soon as practicable after award of the Agreement, shall furnish in writing to the Owner through the Architect/Engineer the name and qualifications of the proposed superintendent. The Architect/Engineer may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect/Engineer has reasonable objection to the proposed superintendent or (2) that the Architect/Engineer requires additional time to review. Failure of the Architect/Engineer to reply within 14 days shall constitute notice of no reasonable objection.

(2) The Contractor shall not employ a proposed superintendent to whom the Owner or Architect/Engineer has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not be unreasonably withheld or delayed.

J. Work Hours. 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 shall not permit overtime work or the performance of Work on a Saturday, Sunday or legal holiday without Owner's written consent given after prior notice to Architect/Engineer (at least seventy-two (72) hours in advance).

K. Overtime-Related Costs. Contractor shall pay for all additional Architect/Engineer charges, inspection costs and Owner staff time for any overtime work which may be authorized. Such additional charges shall be an obligation of Contractor and no extra payment shall be made by Owner because such overtime work. At Owner's option, such overtime costs may be deducted from Contractor's monthly payment request or Contractor's retainage prior to release of final payment. Contractor's obligation to pay all overtime-related costs shall not apply if Contractor is directed by Owner to work overtime solely for Owner's convenience.

L. Insurance, Overhead and Utilities. 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.

M. Cleanliness. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project Site. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from Contractor.

N. Loading. 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.

O. Safety and Protection. Contractor shall comply with all applicable federal, state and 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:

- (1) All employees on the Work and other persons and organizations who may be affected thereby;
- (2) All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project Site; and
- (3) Other property at the Project Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement during construction.

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 for the public and preservation of the Owner's business, taking into full consideration all local conditions. Contractor's duties and responsibilities for safety and protection with regard to the Work shall continue until such time as all the Work is completed.

P. Emergencies. In emergencies affecting the safety or protection of persons or the Work or property at the Project Site or adjacent thereto, Contractor, without special instruction or authorization from Architect/Engineer or Owner, shall act to prevent threatened damage, injury or loss. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Owner determines that a change in the Project 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.

Q. Substitutes. For Substitutes not included with the Bid (or Guaranteed Maximum Price Addendum), but submitted after the effective date of the Agreement (or

Guaranteed Maximum Price Addendum), Contractor shall make written application to Architect/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 provision 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 Architect/Engineer in evaluating the proposed Substitute. Architect/Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed Substitute. In rendering a decision, Owner, Architect/Engineer and Contractor shall have access to any available Float Time in the Project Schedule. If Substitute materials or equipment not included as part of the Bid (or Guaranteed Maximum Price Addendum), but proposed after the effective date of the Agreement, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the Owner and an appropriate Change Order executed to adjust the Contract Sum.

- (1) Architect/Engineer will be allowed a reasonable time within which to evaluate each proposed Substitute. Architect/Engineer will be the sole judge of acceptability and no Substitute will be ordered, installed or utilized without Architect/Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved shop drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any Substitute.
- (2) Contractor shall reimburse Owner for the charges of Architect/Engineer and Architect/Engineer's Consultants for evaluating each proposed Substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the Work while the Substitute was undergoing review.

R. Surveys and Stakes. The Contractor shall furnish, as part of the Contract Sum, 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 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 shall 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 shall be held responsible for the preservation of all stakes and marks and if for any reason any of the stakes or marks or batter boards become destroyed or disturbed, they shall be immediately and accurately replaced by the Contractor.

S. Suitability of Project Site. The Contractor has, by careful examination, satisfied itself as to the nature and location of the Work and all other matters which can in any way affect the Work, including, but not limited to details pertaining to borings, as shown on the drawings. Such boring information is not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the Project Site, approximately at the locations indicated. The Contractor has examined boring data, where available, made its own interpretation of the subsurface conditions and other preliminary data, and has based its Bid (or Guaranteed Maximum Price Addendum) on its own opinion of the conditions likely to be

encountered. Except as specifically provided in Sections 2.4.U., 5.4 and 5.5, no extra compensation or extension of time will be considered for any Project Site conditions that existed at the time of bidding (or at the time of execution of the Guaranteed Maximum Price Addendum). No verbal agreement or conversation with any officer, agent or employee of the Owner, before or after the execution of the Agreement, shall affect or modify any of the terms or obligations herein contained.

T. Project Specification Errors. If the Contractor, during the Work, finds that the drawings, specifications or other Contract Documents cannot be followed, the Contractor shall immediately inform the Owner in writing, and the Owner 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 sole risk of non-payment and delay.

U. Remediation of Contamination. Owner and Contractor recognize that remediation of subsurface conditions may be necessary due to potential hazardous materials contamination. Because the presence or extent of any contamination is not known, Contractor shall include no cost in the Contract Sum, and no time in the Project Schedule, for cost or delays that might result from any necessary remediation. The Project Schedule will provide a period of time between demolition activities and the start of the next activity to commence any remediation if needed. Contractor shall use all reasonable efforts in scheduling the Project to minimize the likelihood that remediation delays construction. Any hazardous materials remediation Work which Contractor agrees to perform shall be done pursuant to a Change Order or amendment consistent with the following:

- (1) The dates of Substantial Completion shall be equitably adjusted based on delays, if any, incurred in connection with remediation efforts.
- (2) Contractor, and any Subcontractors which have mobilized on the Project Site, shall be paid for demonstrated costs of overhead operations at the Project Site during any period of delay of more than seven (7) days, except to the extent that Work proceeds concurrently with remediation. The categories of costs to be reimbursed are limited to those reasonably incurred at the jobsite during the delay period (such as trailers or offices, telephones, faxes, and the like); equipment dedicated to the Project and located at the Project Site; salaries and associated costs of personnel dedicated to the Project to the extent that they do not perform work on other projects; and other jobsite costs that are reasonable and which are incurred during the delay period. Subcontractors and suppliers which have not mobilized are limited to the costs set forth in Section 2.4.U(3).
- (3) Contractor and any Subcontractor or supplier on the Project who is eligible for compensation shall be paid any demonstrated costs of escalation in materials or labor, and reasonable costs of off-site storage of materials identified to the Project, arising because of any delay of more than seven (7) days. Such Contractor, Subcontractors and suppliers are obligated to take all reasonable steps to mitigate escalation costs, such as through early purchase of materials.

- (4) Contractor, for itself and all Subcontractors and suppliers on the Project, hereby agrees that the extension of time for delays under Section 2.4.U(1), and payment of the costs identified in Sections 2.4.U(2) and/or Section 2.4.U(3), are the sole remedies for costs and delays described in this Section, and waives all claims and demands for extended home office overhead (including, but not limited to, "Eichleay" claims), lost profit or lost opportunities, and any special, indirect, or consequential damages arising as a result of delays described in this Section. The Contract Sum shall be adjusted to reflect payment of allowable costs.
- (5) If any delay described in this section causes the time or cost for the Project to exceed the Contract Time or the Contract Sum, then the Owner may terminate the Agreement pursuant to Section 14.2.
- (6) Contractor and any Subcontractor or supplier seeking additional costs under this Section 2.4.U. shall promptly submit estimates or any costs as requested by Owner, and detailed back-up for all costs when payment is sought or whenever reasonably requested by Owner. All costs are auditable, at Owner's discretion. Bid, estimate and pricing information reasonably related to any request for additional compensation will be provided promptly upon request.
- (7) Contractor shall include provisions in its subcontracts and purchase orders consistent with this Section.

V. Interfacing.

- (1) The Contractor shall take such measures as are necessary to ensure proper construction and delivery of the Project, including but not limited to providing that all procurement of long-lead items, the separate construction Subcontractors, and the general conditions items are performed without duplication or overlap to maintain completion of all Work on schedule. Particular attention shall be given to provide that each Subcontractor bid package clearly identifies the Work included in that particular separate subcontract, its scheduling for start and completion, and its relationship to other separate contractors.
- (2) Without assuming any design responsibilities of the Architect/Engineer, the Contractor shall include in the Progress Reports required under this Section 2.4 comments on overlap with any other separate subcontracts, omissions, lack of correlation between drawings, and any other deficiencies noted, in order that the Architect/Engineer may arrange for necessary corrections.

W. Job Site Facilities. The Contractor shall arrange for all job site facilities required and necessary to enable the Contractor and Architect/Engineer to perform their respective duties and to accommodate any representatives of the Owner which the Owner may choose to have present on the Project Site.

X. Weather Protection. The Contractor shall provide temporary enclosures of building areas to assure orderly progress of the Work during periods when extreme weather conditions are likely to be experienced. The Contractor shall also be responsible for providing weather protection for Work in progress and for materials stored on the Project Site. A contingency plan shall be prepared upon request of the Owner for weather conditions that may affect the construction.

Y. Payment and Performance Bond. Prior to the construction commencement date, the Contractor shall obtain, for the benefit of and directed to the Owner, a Payment and Performance Bond satisfying the requirements of Section 255.05, Florida Statutes, covering the faithful performance by the Contractor of its obligations under the Contract Documents, including but not limited to the construction of the Project on the Project Site and the payment of all obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the Contractor to provide the Payment and Performance Bond shall be approved by the Owner prior to the issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that the surety is rated A or better by Best's Key Guide, latest edition. For Changes in the Work that result in an increase in the Contract Sum, Owner reserves the right to require the Contractor to secure and deliver additive riders to the Payment and Performance Bond.

Z. Construction Phase; Building Permit; Code Inspections. Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

- (1) Building Permit. The Owner and Architect/Engineer shall provide such information to any Permitting Authority as is necessary to obtain approval from the Permitting Authority to commence construction prior to beginning construction. The Contractor shall pull any required building permit, and shall be responsible for delivering and posting the building permit at the Project Site prior to the commencement of construction. The cost of the building permit is included in the Contract Sum. The Owner and Architect/Engineer shall fully cooperate with the Contractor when and where necessary.
- (2) Code Inspections. The Project requires detailed code compliance inspection during construction in disciplines determined by any Permitting Authority. These disciplines normally include, but are not necessarily limited to, structural, mechanical, electrical, plumbing, general building and fire. The Contractor shall notify the appropriate inspector(s) and the Architect/Engineer, no less than 24 hours in advance, when the Work is ready for inspection and before the Work is covered up. All inspections shall be made for conformance with the applicable ordinances and building codes. Costs for all re-inspections of Work found defective and subsequently repaired shall not be included as Project Costs and shall be borne by the Contractor or as provided in the contract between Contractor and Subcontractor.

- (3) Contractor's Personnel. The Contractor shall maintain sufficient off-site support staff and competent full-time staff at the Project Site authorized to act on behalf of the Contractor to coordinate, inspect, and provide general direction of the Work and progress of the Subcontractors. At all times during the performance of the Work, the Owner shall have the right to demand replacement of Contractor Personnel to whom the Owner has reasonable objection, without liability to the Contractor.
- (4) Lines of Authority. To provide general direction of the Work, the Contractor shall establish and maintain lines of authority for its personnel and shall provide this information to the Owner and all other affected parties, such as the code inspectors of any Permitting Authority, the Subcontractors, and the Architect/Engineer. The Owner and Architect/Engineer may attend meetings between the Contractor and his Subcontractors; however, such attendance is optional and shall not diminish either the authority or responsibility of the Contractor to administer the subcontracts.

AA. Quality Control. The Contractor shall develop and maintain a program, acceptable to the Owner and Architect/Engineer, to assure quality control of the construction. The Contractor shall be responsible for and supervise the Work of all Subcontractors, providing instructions to each when their Work does not conform to the requirements of the Project Plans and Specifications, and the Contractor shall continue to coordinate the Work of each Subcontractor to ensure that corrections are made in a timely manner so as to not affect the efficient progress of the Work. Should a disagreement occur between the Contractor and the Architect/Engineer over the acceptability of the Work, the Owner, at its sole discretion and in addition to any other remedies provided herein, shall have the right to determine the acceptability, provided that such determination is consistent with standards for construction projects of this type and generally accepted industry standards for workmanship in the State of Florida.

BB. Management of Subcontractors. All Subcontractors shall be compensated in accordance with Article IV. The Contractor shall solely control the Subcontractors. The Contractor shall negotiate all Change Orders and Field Orders with all affected Subcontractors and shall review the costs and advise the Owner and Architect/Engineer of their validity and reasonableness, acting in the Owner's best interest. When there is an imminent threat to health and safety, and Owner's Project Representative concurrence is impractical, the Contractor shall act immediately to remove the threats to health and safety and shall subsequently fully inform Owner of all such action taken. The Contractor shall also carefully review all shop drawings and then forward the same to the Architect/Engineer for review and actions. The Architect/Engineer will transmit them back to the Contractor, who will then issue the shop drawings to the affected Subcontractor for fabrication or revision. The Contractor shall maintain a suspense control system to promote expeditious handling. The Contractor shall request the Architect/Engineer to make interpretations of the drawings or specifications requested of him by the Subcontractors and shall maintain a business system to promote timely response. The Contractor shall inform the Architect/Engineer which shop drawings or requests for clarification have the greatest urgency, to enable the Architect/Engineer to prioritize requests coming from the Contractor. The Contractor shall advise the Owner and Architect/Engineer when timely response is not occurring on any of the above.

CC. Job Requirements.

- (1) The Contractor shall provide each of the following as a part of its services hereunder:
  - (a) Maintain a log of daily activities, including manpower records, equipment on site, weather, delays, major decisions, etc;
  - (b) Maintain a roster of companies on the Project with names and telephone numbers of key personnel;
  - (c) Establish and enforce job rules governing parking, clean-up, use of facilities, and worker discipline;
  - (d) Provide labor relations management and equal opportunity employment for a harmonious, productive Project;
  - (e) Provide and administer a safety program for the Project and monitor for subcontractor compliance without relieving them of responsibilities to perform Work in accordance with best acceptable practice;
  - (f) Provide a quality control program as provided under Section 2.4.C above;
  - (g) Provide miscellaneous office supplies that support the construction efforts which are consumed by its own forces;
  - (h) Provide for travel to and from its home office to the Project Site and to those other places within Manatee County as required by the Project;
  - (i) Verify that tests, equipment, and system start-ups and operating and maintenance instructions are conducted as required and in the presence of the required personnel and provide adequate records of same to the Architect/Engineer;
  - (j) 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 after execution of the Agreement, Owner/Architect/Engineer's clarifications and interpretations of the Contract Documents, Progress Reports, as-built drawings, and other project related documents;
  - (k) 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, and provide copies of same to Owner/Architect/Engineer;

- (l) Record names, addresses and telephone numbers of all Contractors, Subcontractors and major suppliers of materials and equipment;
  - (m) Furnish Owner/Architect/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;
  - (n) Consult with Owner/Architect/Engineer in advance of scheduling major tests, inspections or start of important phases of the Work;
  - (o) Verify, during the course of the Work, that certificates, maintenance and operations manuals and other data required to be assembled and furnished are applicable to the items actually installed, and deliver same to Owner/Architect/Engineer for review prior to final Acceptance of the Work; and
  - (p) Cooperate with Owner in the administration of grants.
- (2) The Contractor shall provide personnel and equipment, or shall arrange for separate Subcontractors to provide each of the following as a Project Cost:
- (a) Services of independent testing laboratories, and provide the necessary testing of materials to ensure conformance to contract requirements; and
  - (b) Printing and distribution of all required bidding documents and shop drawings, including the sets required by Permitting Authority inspectors.

DD. As-Built Drawings. The Contractor shall continuously review as-built drawings and mark up progress prints to provide as much accuracy as possible. Prior to, and as a requirement for authorizing final payment to the Contractor due hereunder, the Contractor shall provide to the Owner an original set of marked-up, as-built Project Plans and Specifications and an electronic format of those records showing the location and dimensions of the Project as constructed, which documents shall be certified as being correct by the Contractor and the Architect/Engineer. Final as-built drawings shall be signed and sealed by a registered Florida surveyor.

EE. Progress Reports. The Contractor shall forward to the Owner, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the Work, to include those parts of the Work 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 Owner's review

and approval. In addition, more detailed schedules may be required by the Owner for daily traffic control.

FF. Contractor's Warranty. The Contractor warrants to the Owner and Architect/Engineer that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements will be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

- (1) Contractor shall use its best efforts and due diligence to ensure that during the warranty period, those entities or individuals who have provided direct warranties to the Owner as required by the Contract Documents perform all required warranty Work in a timely manner and at the sole cost and expense of such warranty providers. Any such cost or expense not paid by the warranty providers shall be paid by the Contractor, to include any costs and attorney's fees incurred in warranty-related litigation between Contractor and any Subcontractors.
- (2) The Contractor shall secure guarantees and warranties of Subcontractors, equipment suppliers and materialmen, and assemble and deliver same to the Owner in a manner that will facilitate their maximum enforcement and assure their meaningful implementation. The Contractor shall collect and deliver to the Owner any specific written guaranties or warranties given by others as required by subcontracts.
- (3) At the Owner's request, the Contractor shall conduct, jointly with the Owner and the Architect/Engineer, no more than two (2) warranty inspections within three (3) years after the Substantial Completion Date.

GG. Apprentices. If Contractor employs apprentices, their performance of Work shall be governed by and shall comply with the provisions of Chapter 446, Florida Statutes.

HH. Schedule of Values. Unit prices shall be established for this Agreement by the submission of a schedule of values within ten (10) days of receipt of the Notice to Proceed. The schedule shall include quantities and prices of items equaling the Contract Sum and will subdivide the Work into components in sufficient detail to serve as the basis for progress payments during construction. Such prices shall 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.

II. Other Contracts. The Owner 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 III COMPENSATION**

**3.1 Compensation.** The Contract Sum 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 Contractor's expense without change in the Contract Sum.

A. Adjustments. The Contract Sum may only be changed by Change Order or by a written amendment. Any claim for an increase or decrease in the Contract Sum 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 fifteen (15) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all amounts to which the claimant is entitled as a result of the occurrence of said event. Failure to deliver a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

B. Valuation. The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Sum shall be determined in one of the following ways (at Owner's discretion):

- (1) In the case of Unit Price Work, in accordance with Section 3.1.C, below; or
- (2) By mutual acceptance of a lump sum; or
- (3) On the basis of the cost of the Work, plus a negotiated Contractor's fee for overhead and profit. Contractor shall submit an itemized cost breakdown together with supporting data.

C. Unit Price Work. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment pursuant to a requested Change Order under the following conditions:

- (1) If the total cost of a particular item of Unit Price Work amounts to 5% or more of the Contract Sum 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 Agreement; and
- (2) If there is no corresponding adjustment with respect to any other item of Work; and
  - (i) If Contractor believes that it has incurred additional expense as a result thereof; or
  - (ii) If Owner believes that the quantity variation entitles it to an

adjustment in the unit price; or

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

**3.2 Schedule of Compensation.** All payments for services and material under the Contract Documents shall be made in accordance with the following provisions.

A. Periodic Payments for Services. The Contractor shall be entitled to receive payment for Construction Services rendered pursuant to Section 2.4 in periodic payments which shall reflect a fair apportionment of cost and schedule of values of services furnished prior to payment, subject to the provisions of this Section.

B. Payment for Materials and Equipment. In addition to the periodic payments authorized hereunder, payments may be made for material and equipment not incorporated in the Work but delivered and suitably stored at the Project Site, or another location, subject to prior approval and acceptance by the Owner on each occasion.

C. Credit toward Contract Sum. All payments for Construction Services made hereunder shall be credited toward the payment of the Contract Sum as Contractor's sole compensation for the construction of the Project.

**3.3 Invoice and Payment.** All payments for services and materials under the Contract Documents shall be invoiced and paid in accordance with the following provisions.

A. Invoices. The Contractor shall submit to the Owner periodic invoices for payment, in a form acceptable to the Owner, which shall include a sworn statement certifying that, to the best of the Contractor's knowledge, information and belief, the construction has progressed to the point indicated, the quality and the Work covered by the invoice is in accord with the Project Plans and Specifications, and the Contractor is entitled to payment in the amount requested, along with the cost reports required pursuant to Article II, showing in detail all monies paid out, Project Costs accumulated, or Project Cost incurred during the previous period. This data shall be attached to the invoice.

B. Additional Information; Processing of Invoices. Should an invoiced amount appear to exceed the Work effort believed to be completed, the Owner may, prior to processing of the invoice for payment, require the Contractor to submit satisfactory evidence to support the invoice. All Progress Reports and invoices shall be delivered to the attention of the Owner's Project Representative. Invoices not properly prepared (mathematical errors, billing not reflecting actual Work done, no signature, etc.) shall be returned to the Contractor for correction.

C. Architect/Engineer's Approval. Payment for Work completed shall be subject to the Architect/Engineer approving the payment requested by the Contractor and certifying the amount thereof that has been properly incurred and is then due and payable to the Contractor, and identifying with specificity any amount that has not been properly incurred and that should not be paid.

D. Warrants of Contractor with Respect to Payments. The Contractor warrants that (1) upon payment of any retainage, materials and equipment covered by a partial payment

request will pass to Owner either by incorporation in construction or upon receipt of payment by the Contractor, whichever occurs first; (2) Work, materials and equipment covered by previous partial payment requests shall be free and clear of liens, claims, security interests, or encumbrances; and (3) no Work, materials or equipment covered by a partial payment request which has been acquired by the Contractor or any other person performing Work at the Project Site, or furnishing materials or equipment for the Project, shall be subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or any other person.

E. All Compensation Included. Contractor's compensation includes full payment for services set forth in the Contract Documents, including but not limited to overhead, profit, salaries or other compensation of Contractor's officers, partners and/or employees, general operating expenses incurred by Contractor and relating to this Project, including the cost of management, supervision and data processing staff, job office equipment and supplies, and other similar items.

## **ARTICLE IV SUBCONTRACTORS**

**4.1 Subcontracts.** At the Owner's request, the Contractor shall provide Owner's Project Representative with copies of all proposed and final subcontracts, including the general and supplementary conditions thereof.

A. Subcontracts Generally. All subcontracts shall: (1) require each Subcontractor to be bound to Contractor to the same extent Contractor is bound to Owner by the terms of the Contract Documents, as those terms may apply to the portion of the Work to be performed by the Subcontractor, (2) provide for the assignment of the subcontracts from Contractor to Owner at the election of Owner, upon termination of Contractor, (3) provide that Owner will be an additional indemnified party of the subcontract, (4) provide that Owner will be an additional insured on all insurance policies required to be provided by the Subcontractor, except workers' compensation, (5) assign all warranties directly to Owner, and (6) identify Owner as an intended third-party beneficiary of the subcontract.

(1) A Subcontractor is a person or entity who has a direct contract with Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

(2) A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

B. No Damages for Delay. Except when otherwise expressly agreed to by Owner in writing, all subcontracts shall provide:

"LIMITATION OF REMEDIES – NO DAMAGES FOR DELAY. The Subcontractor's exclusive remedy for delays in the performance of the

contract caused by events beyond its control, including delays claimed to be caused by the Owner or Architect/Engineer or attributable to the Owner or Architect/Engineer and including claims based on breach of contract or negligence, shall be an extension of its contract time and shall in no way involve any monetary claim.”

Each subcontract shall require that any claims by the Subcontractor for delay must be submitted to the Contractor within the time and in the manner in which the Contractor must submit such claims to the Owner, and that failure to comply with the conditions for giving notice and submitting claims shall result in the waiver of such claims.

C. Subcontractual Relations. The Contractor shall require each Subcontractor to assume all the obligations and responsibilities which the Contractor owes the Owner pursuant to the Contract Documents, by the parties to the extent of the Work to be performed by the Subcontractor. Said obligations shall be made in writing and shall preserve and protect the rights of the Owner and Architect/Engineer, with respect to the Work to be performed by the Subcontractor, so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its sub-subcontractors.

D. Insurance; Acts and Omissions. Insurance requirements for Subcontractors shall be no more stringent than those requirements imposed on the Contractor by the Owner. The Contractor shall be responsible to the Owner for the acts and omissions of its employees, agents, Subcontractors, their agents and employees, and all other persons performing any of the Work or supplying materials under a contract to the Contractor.

**4.2 Relationship and Responsibilities.** Except as specifically set forth herein with respect to direct materials acquisitions by Owner, nothing contained in the Contract Documents or in any Contract Document does or shall create any contractual relation between the Owner or Architect/Engineer and any Subcontractor. Specifically, the Contractor is not acting as an agent of the Owner with respect to any Subcontractor. The utilization of any Subcontractor shall not relieve Contractor from any liability or responsibility to Owner, or obligate Owner to the payment of any compensation to the Subcontractor or additional compensation to the Contractor.

**4.3 Payments to Subcontractors; Monthly Statements.** The Contractor shall be responsible for paying all Subcontractors from the payments made by the Owner to Contractor pursuant to Article III, subject to the following provisions:

A. Payment. The Contractor shall, no later than ten (10) days after receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor’s Work, pay to each Subcontractor the amount to which the Subcontractor is entitled in accordance with the terms of the Contractor’s contract with such Subcontractor. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to sub-Subcontractors in a similar manner. After receipt of payment from Owner, if the need should arise to withhold payments to Subcontractors for any reason, as solely determined by Contractor, the Contractor shall promptly restore such monies to the Owner, adjusting subsequent pay requests and Project bookkeeping as required.

B. Final Payment of Subcontractors. The final payment of retainage to Subcontractors shall not be made until the Project has been inspected by the Architect/Engineer or other person designated by the Owner for that purpose, and until both the Architect/Engineer and the Contractor have issued a written certificate that the Project has been constructed in accordance with the Project Plans and Specifications and approved Change Orders. Before issuance of final payment to any Subcontractor without any retainage, the Subcontractor shall submit satisfactory evidence that all payrolls, material bills, and other indebtedness connected with the Project have been paid or otherwise satisfied, warranty information is complete, as-built markups have been submitted, and instruction for the Owner's operating and maintenance personnel is complete. Final payment may be made to certain select Subcontractors whose Work is satisfactorily completed prior to the completion of the Project, but only upon approval of the Owner's Project Representative.

**4.4 Responsibility for Subcontractors.** As provided in Section 2.4.BB, Contractor shall be fully responsible to Owner 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.

**4.5 Contingent Assignment of Subcontracts.** Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that:

- (1) assignment is effective only after termination of the Contract by the Owner for cause pursuant to Article XIV and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- (2) assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Agreement.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract. Upon such assignment, if the Work has been suspended for more than thirty (30) days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension. Upon such assignment to the Owner, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

## **ARTICLE V CHANGES IN WORK**

**5.1 General.** Changes in the Work may be accomplished after execution of the Agreement, and without invalidating the Agreement, by Change Order, Work Directive Change or order for a minor change in the Work, subject to the limitations stated in this Article V and elsewhere in the Contract Documents. A Change Order shall be based upon agreement among the Owner, Contractor and Architect/Engineer; a Work Directive Change requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect/Engineer alone. Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor

shall proceed promptly, unless otherwise provided in the Change Order, Work Directive Change or order for a minor change in the Work.

**5.2 Minor Changes in the Work.** The Owner or Architect/Engineer shall have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such change will be effected by written order signed by the Architect/Engineer and shall be binding on the Owner and Contractor. The Contractor shall abide by and perform such minor changes. Such changes shall be effected by a Field Directive or a Work Directive Change. Documentation of changes shall be determined by the Construction Team, and displayed monthly in the Progress Reports. Because such changes shall not affect the Contract Sum to be paid to the Contractor, they shall not require a Change Order pursuant to Section 5.6.

**5.3 Emergencies.** In any emergency affecting the safety of persons or property, the Contractor shall act at its discretion to prevent threatened damage, injury, or loss. Any increase in the Contract Sum or extension of time claimed by the Contractor because of emergency Work shall be determined as provided in Section 5.6. However, whenever practicable, the Contractor shall obtain verbal concurrence of the Owner's Project Representative and Architect/Engineer where the act will or may affect the Contract Sum or Contract Time.

**5.4 Concealed Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect/Engineer before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. The Architect/Engineer will promptly investigate such conditions and, if the Architect/Engineer determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer shall promptly notify the Owner and Contractor in writing, stating the reasons. If the Contractor disputes the Architect/Engineer's determination or recommendation, the Contractor may proceed as provided in Article VIII. If the Owner disputes the Architect/Engineer's determination or recommendation, the Owner may appeal directly to the Purchasing Official and shall thereafter follow the process set forth in Section 8.5.

**5.5 Hazardous Materials.** In the event the Contractor encounters on the Project Site material reasonably believed to be hazardous, petroleum or petroleum related products, or other hazardous or toxic substances, except as provided in Section 2.4.U, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect/Engineer in writing. The Work in the affected area shall not thereafter be resumed except by Change Order or written amendment, if in fact the material or substance has not been rendered harmless. The Work in the affected area shall be resumed when the Project Site has been rendered harmless, in accordance with the final determination by the Architect/Engineer or other appropriate professional employed by Owner. The Contractor shall not be required to perform without its consent any Work relating to hazardous materials, petroleum or petroleum related products, or

other hazardous or toxic substances. In the event the Contractor encounters on the Project Site materials believed in good faith to be hazardous or contaminated material, and the presence of such hazardous or contaminated material was not known and planned for at the time the Contractor submitted its Bid (or Guaranteed Maximum Price proposal), and it is necessary for the Contractor to stop Work in the area affected and delays Work for more than a seven (7) day period, adjustments to the Contract Sum and/or Contract Time shall be made in accordance with this Article V.

## **5.6 Change Orders; Adjustments to Contract Sum.**

A. Change Orders Generally. The increase or decrease in the Contract Sum resulting from a change authorized pursuant to the Contract Documents shall be determined:

- (1) By mutual acceptance of a lump sum amount properly itemized and supported by sufficient substantiating data, to permit evaluation by the Architect/Engineer and Owner; or
- (2) By unit prices stated in the Agreement or subsequently agreed upon; or
- (3) By any other method mutually agreeable to Owner and Contractor.

If Owner and Contractor are unable to agree upon increases or decreases in the Contract Sum and the Architect/Engineer certifies that the work needs to be commenced prior to any such agreement, the Contractor, provided it receives a written Change Order signed by or on behalf of the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined on the basis of the reasonable expenditures of those performing the Work attributed to the change. However, in the event a Change Order is issued under these conditions, the Owner, through the Architect/Engineer, will establish an estimated cost of the Work and the Contractor shall not perform any Work whose cost exceeds that estimated without prior written approval by the Owner. In such case, the Contractor shall keep and present in such form as the Owner may prescribe an itemized accounting, together with appropriate supporting data of the increase in overall costs of the Project. The amount of any decrease in the Contract Sum to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in costs will be the amount of the actual net decrease.

**5.7 Owner-Initiated Changes.** Without invalidating the Agreement and without notice to any Surety, Owner may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a written amendment, a Field Directive, a Change Order, or a Work Directive Change, as the case may be. 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). A Work Directive Change may not change the Contract Sum or the 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 Sum or Contract Time.

**5.8 Unauthorized Work.** Contractor shall not be entitled to an increase in the Contract Sum or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents.

**5.9 Defective Work.** Owner and Contractor shall execute appropriate Change Orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work, without adjustment to the Contract Sum.

**5.10 Estimates for Changes.** At any time Architect/Engineer may request a quotation from Contractor for a proposed change in the Work. Within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract Sum or Contract Time for the proposed change. Architect/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 Architect/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.

**5.11 Form of Proposed Changes.** 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 Owner. Standard Owner forms shall be utilized.

**5.12 Changes to Contract Time.** The Contract Time may only be changed pursuant to a Change Order or a written amendment to the Contract Documents. 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 to because of the occurrence of said event. 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 Owner or others performing additional Work; or to fires, floods, epidemics, abnormal weather conditions or acts of God. Failure to deliver a written notice of claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

## **ARTICLE VI ROLE OF ARCHITECT/ENGINEER**

### **6.1 General.**

A. **Retaining.** The Owner shall retain an Architect/Engineer (whether an individual or an entity) lawfully licensed to practice in Florida. That person or entity is identified as the Architect/Engineer in the Agreement and is referred to throughout the Contract Documents as if singular in number.

B. **Duties.** Duties, responsibilities and limitations of authority of the Architect/Engineer as set forth in the Contract Documents shall not be restricted, modified or

extended without written consent of the Owner and Architect/Engineer. Consent shall not be unreasonably withheld.

C. Termination. If the employment of the Architect/Engineer is terminated, the Owner shall employ a successor Architect/Engineer as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect/Engineer.

**6.2 Administration.** The Architect/Engineer will provide administration of the Agreement as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect/Engineer approves the final Application for Payment. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

A. Site Visits. The Architect/Engineer will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work complete, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. Unless specifically instructed by Owner, the Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect/Engineer will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

B. Reporting. Based on the site visits, the Architect/Engineer will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

**6.3 Interpretation of Project Plans and Specifications.** The Architect/Engineer will be the interpreter of the requirements of the Project Plans and Specifications. Upon receipt of comments or objections by Contractor or Owner, the Architect/Engineer will make decisions on all claims, disputes, or other matters pertaining to the interpretation of the Project Plans and Specifications.

**6.4 Rejection of Non-Conforming Work.** Upon consultation with Owner, the Architect/Engineer shall have the authority to reject Work which does not conform to the Project Plans and Specifications.

**6.5 Correction of Work.** The Contractor shall promptly correct all Work rejected by the Architect/Engineer for being defective or as failing to conform to the Project Plans and Specifications, whether observed before or after the Substantial Completion Date and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such

rejected Work, including compensation for Architect/Engineer's additional services made necessary thereby.

**6.6 Timely Performance of Architect/Engineer.** The Contractor shall identify which requests for information or response from the Architect/Engineer have the greatest urgency and those items which require prioritizing in response by the Architect/Engineer. The Contractor shall also identify the preferred time period for response and shall request a response time which is reasonably and demonstrably related to the needs of the Project and Contractor. If Architect/Engineer claims that Contractor's expectations for a response are unreasonable, Owner shall require Architect/Engineer to communicate such claim to Contractor in writing together with the specific time necessary to respond and the date upon which such response will be made. If Contractor believes that Architect/Engineer is not providing timely services or responses, Contractor shall notify Owner of same in writing not less than two (2) weeks before Contractor believes performance or response time from Architect/Engineer is required without risk of delaying the Project.

## **ARTICLE VII OWNER'S RIGHTS AND RESPONSIBILITIES**

**7.1 Project Site; Title.** The Owner shall provide the lands upon which the Work under the Contract Documents 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. The Owner hereby represents to the Contractor that it currently has and will maintain up through and including the Substantial Completion Date, good title to all of the real property constituting the Project Site. Owner agrees to resolve, at its expense, any disputes relating to the ownership and use of the Project Site which might arise during construction.

**7.2 Project Plans and Specifications; Architect/Engineer.** The parties hereto acknowledge and agree that Owner has previously entered into an agreement with Architect/Engineer. Pursuant to the terms of such agreement, the Architect/Engineer, as an agent and representative of Owner, is responsible for the preparation of Project Plans and Specifications which consist of drawings, specifications, and other documents setting forth in detail the requirements for the construction of the Project. All such Project Plans and Specifications shall be provided either by Owner or the Architect/Engineer, and Contractor shall be under no obligation to provide same and shall be entitled to rely upon the accuracy and completeness of the Project Plans and Specifications provided by the Architect/Engineer and all preliminary drawings prepared in connection therewith. The Contractor will be furnished a reproducible set of all drawings and specifications reasonably necessary for the performance of Contractor's services hereunder and otherwise ready for printing. The Contractor shall be notified of any written modification in the agreement between Owner and Architect/Engineer.

**7.3 Surveys; Soil Tests and Other Project Site Information.** Owner shall be responsible for providing a legal description and certified land survey of the Project Site in a form and content and with such specificity as may be required by the Architect/Engineer and Contractor to perform their services. To the extent deemed necessary by Owner and Architect/Engineer, and solely at Owner's expense, Owner may engage the services of a geotechnical consultant to perform test borings and other underground soils testing as may be deemed necessary by the Architect/Engineer or the Contractor. Contractor shall not be obligated to provide such surveys or

soil tests and shall be entitled to rely upon the accuracy and completeness of the information provided; subject, however, to the provisions of Section 2.4.S hereof. Owner shall provide Contractor, as soon as reasonably possible following the execution of the Contract Documents, all surveys or other survey information in its possession describing the physical characteristics of the Project Site, together with soils reports, subsurface investigations, utility locations, deed restrictions, easements, and legal descriptions then in its possession or control. Upon receipt of all surveys, soils tests, and other Project Site information, Contractor shall promptly advise Owner of any inadequacies in such information and of the need for any additional surveys, soils or subsoil tests. In performing this Work, Contractor shall use the standard of care of experienced contractors and will use its best efforts timely to identify all problems or omissions. Owner shall not be responsible for any delay or damages to the Contractor for any visible or disclosed site conditions or disclosed deficiencies in the Project Site which should have been identified by Contractor and corrected by Owner prior to the execution of the Contract Documents.

**7.4 Information; Communication; Coordination.** The Owner's Project Representative shall examine any documents or requests for information submitted by the Contractor and shall advise Contractor of Owner's decisions pertaining thereto within a reasonable period of time to avoid unreasonable delay in the progress of the Contractor's services. Contractor shall indicate if any such documents or requests warrant priority consideration. However, decisions pertaining to approval of the Project Schedule as it relates to the date of Substantial Completion, the Project Cost, Contractor's compensation, approving or changing the Contract Sum shall only be effective when approved by Owner in the form of a written Change Order or amendment to the Contract Documents. Owner reserves the right to designate a different Owner's Project Representative provided Contractor is notified in writing of any such change. Owner and Architect/Engineer may communicate with Subcontractors, materialmen, laborers, or suppliers engaged to perform services on the Project, but only for informational purposes. Neither the Owner nor the Architect/Engineer shall attempt to direct the Work of or otherwise interfere with any Subcontractor, materialman, laborer, or supplier, or otherwise interfere with the Work of the Contractor. Owner shall furnish the data required of Owner under the Contract Documents promptly.

**7.5 Governmental Body.** The Contractor recognizes that the Owner is a governmental body with certain procedural requirements to be satisfied. The Contractor has and will make reasonable allowance in its performance of services for such additional time as may be required for approvals and decisions by the Owner and any other necessary government agency.

**7.6 Pre-Completion Acceptance.** The Owner 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.

**7.7 Ownership and Use of Drawings, Specifications and Other Instruments of Service.**

- (1) The Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors and owners of their respective instruments of service, including the Project Plans and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The

Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the instruments of service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect/Engineer's or Architect/Engineer's consultants' reserved rights.

- (2) The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the drawings and specifications provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Project Plans and Specifications or other instruments of service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the drawings or specifications on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer and the Architect/Engineer's consultants.

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

A. Responsibilities. Except as otherwise instructed in writing by Owner, the Owner's Project Representative will:

- (1) Attend preconstruction conferences; arrange a schedule of progress meetings and other job conferences as required in consultation with Owner/Architect/Engineer and notify those expected to attend in advance; and attend meetings and maintain and circulate copies of minutes thereof;
- (2) Serve as Owner/Architect/Engineer's liaison with Contractor, working principally through Contractor's superintendent, to assist in understanding the intent of the Contract Documents. As requested by Owner/Architect/Engineer, assist in obtaining additional details or information when required at the job site for proper execution of the Work;
- (3) Report to Owner/Architect/Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents;
- (4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to Owner/Architect/Engineer;

- (5) Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Owner/Architect/Engineer; and
- (6) Perform those duties as set forth elsewhere within the Contract Documents.

B. Limitations. Except upon written instructions of Owner, Owner's Project Representative shall not:

- (1) Authorize any deviation from the Contract Documents or approve any substitute materials or equipment;
- (2) Exceed limitations on Owner/Architect/Engineer's authority as set forth in the Contract Documents;
- (3) Undertake any of the responsibilities of Contractor, Subcontractors or Contractor's superintendent, or expedite the Work;
- (4) 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;
- (5) Advise on or issue directions as to safety precautions and programs in connection with the Work;
- (6) Authorize Owner to occupy the project in whole or in part; or
- (7) Participate in specialized field or laboratory tests.

## **ARTICLE VIII RESOLUTION OF DISAGREEMENTS; CLAIMS FOR COMPENSATION**

**8.1 Owner to Decide Disputes.** The Owner shall reasonably decide all questions and disputes (with the exception of matters pertaining to the interpretation of the Project Plans and Specifications which shall be resolved by the Architect/Engineer pursuant to Section 6.3) that may arise in the execution and fulfillment of the services provided for under the Contract Documents, in accordance with the Procurement Ordinance.

**8.2 Finality.** The decision of the Owner upon all claims, questions, disputes and conflicts shall be final and conclusive, and shall be binding upon all parties to the Contract Documents, subject to judicial review as provided in Section 8.5 below.

**8.3 No Damages for Delay.** If at any time Contractor is delayed in the performance of Contractor's responsibilities under the Contract Documents as the result of a default or failure to perform in a timely manner by Owner or Owner's agents or employees, Contractor shall not be entitled to any damages except for compensation specifically authorized in Article III. Contractor's sole remedy will be a right to extend the time for performance. Nothing herein shall preclude Contractor from any available remedy against any responsible party other than Owner.

Contractor shall be responsible for liquidated damages for delay if otherwise provided for in the Contract Documents.

**8.4 Permitted Claims Procedure.** Where authorized or permitted under the Contract Documents, all claims for additional compensation by Contractor, extensions of time affecting the Substantial Completion Date, for payment by the Owner of costs, damages or losses due to casualty, Force Majeure, Project Site conditions or otherwise, shall be governed by the following:

- (1) All claims must be submitted as a request for Change Order in the manner as provided in Article V.
- (2) The Contractor must submit a notice of claim to Owner's Project Representative and to the Architect/Engineer within fifteen (15) days of the beginning of such occurrence. Failure to submit a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.
- (3) Within twenty (20) days of submitting its notice of claim, the Contractor shall submit to the Owner's Project Representative its request for Change Order, which shall include a written statement of all details of the claim, including a description of the Work affected.
- (4) After receipt of a request for Change Order, the Owner's Project Representative, in consultation with the Architect/Engineer, shall deliver to the Contractor, within twenty (20) days after receipt of request, its written response to the claim.
- (5) In the event the Owner and Contractor are unable to agree on the terms of a Change Order, the Owner shall have the option to instruct the Contractor to proceed with the Work. In that event, the Owner shall pay for those parts of the Work, the scope and price of which are not in dispute. The balance of the disputed items in the order to proceed will be resolved after completion of the Work, based upon completed actual cost.
- (6) The rendering of a decision by Owner with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Owner or Contractor of such right or remedies as either may otherwise have under the Contract Documents or by laws or regulations in respect of any such claim, dispute or other matter.

**8.5 Contract Claims and Disputes.** After completion of the process set forth in Section 8.4 above, any unresolved dispute under this Agreement shall be decided by the Purchasing Official in accordance with Section 2-26-63 of the Manatee County Code of Laws, subject to an administrative hearing process as provided in Section 2-26-64. The decision of the hearing officer in accordance with Section 2-26-64 of the Manatee County Code of Laws shall be the final and conclusive decision subject to exclusive judicial review in circuit court by a petition for certiorari.

**8.6 Claims for Consequential Damages.** The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Agreement. This mutual waiver includes:

- (1) damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons, unless any of such damages or losses are covered by insurance placed by the Contractor; and
- (2) damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article XIV. Nothing contained in this Section 8.6 shall be deemed to preclude assessment of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

## **ARTICLE IX INDEMNITY**

### **9.1 Indemnity.**

A. Indemnification Generally. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.1.

B. Indemnification; Enforcement Actions. The Contractor's duty to indemnify and hold harmless the Owner in Section 9.1 above shall extend to fines, penalties and costs incurred by the Owner as related to any enforcement action taken by local, state, regional or federal regulatory entities. The Owner may deduct any of such fines, penalties and costs as described in this Section from any unpaid amounts then or thereafter due the Contractor under the Contract Documents. Any of such fines, penalties and costs not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

C. Claims by Employees. In claims against any person or entity indemnified under this Section 9.1 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly

employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 9.1.A. shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

**9.2 Duty to Defend.** The Contractor shall defend the Owner in any action, lawsuit, mediation or arbitration arising from the alleged negligence, recklessness or intentionally wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of the Work. Notwithstanding any other provisions within this Article IX, so long as Contractor, through its own counsel, performs its obligation to defend the Owner pursuant to this Section, Contractor shall not be required to pay the Owner's costs associated with the Owner's participation in the defense.

## **ARTICLE X ACCOUNTING RECORDS; OWNERSHIP OF DOCUMENTS**

**10.1 Accounting Records.** Records of expenses pertaining to all services performed shall be kept in accordance with generally accepted accounting principles and procedures.

**10.2 Inspection and Audit.** The Contractor's records shall be open to inspection and subject to examination, audit, and/or reproduction during normal working hours by the Owner's agent or authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the Contractor or any of its payees during the performance of the Work. These records shall include, but not be limited to, accounting records, written policies and procedures, Subcontractor files (including proposals of successful and unsuccessful bidders), original estimates, estimating worksheets, correspondence, Change Order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to the Contract Documents. They shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with the Contract Documents. For such audits, inspections, examinations and evaluations, the Owner's agent or authorized representative shall have access to said records from the effective date of the Contract Documents, for the duration of Work, and until three (3) years after the date of final payment by the Owner to the Contractor pursuant to the Contract Documents.

**10.3 Access.** The Owner's agent or authorized representative shall have access to the Contractor's facilities and all necessary records to conduct audits in compliance with this Article. The Owner's agent or authorized representative shall give the Contractor reasonable advance notice of intended inspections, examinations, and/or audits.

**10.4 Ownership of Documents.** Upon obtainment of Substantial Completion or termination of the Agreement, all records, documents, tracings, plans, specifications, maps, evaluations, reports, transcripts and other technical data, other than working papers, prepared or developed by the Contractor shall be delivered to and become the property of the Owner. The Contractor at its own expense may retain copies for its files and internal use.

**ARTICLE XI  
PUBLIC CONTRACT LAWS**

**11.1 Equal Opportunity Employment.**

A. Employment. The Contractor shall not discriminate against any employee or applicant for employment because of race, creed, sex, color, national origin, disability or age, and will take affirmative action to ensure that all employees and applicants are afforded equal employment opportunities without discrimination because of race, creed, sex, color, national origin, disability or age. Such action will be taken with reference to, but shall not be limited to, recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of training or retraining, including apprenticeship and on-the-job training.

B. Participation. No person shall, on the grounds of race, creed, sex, color, national origin, disability or age, be excluded from participation in, be denied the proceeds of, or be subject to discrimination in the performance of the Agreement.

**11.2 Immigration Reform and Control Act of 1986.** Contractor acknowledges that it is responsible for complying with the provisions of the Immigration Reform and Control Act of 1986, located at 8 U.S.C. Section 1324, et seq., and regulations relating thereto. Failure to comply with the above statutory provisions shall be considered a material breach and shall be grounds for immediate termination of this Agreement.

**11.3 No Conflict of Interest.** The Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for the Contractor to solicit or secure this Agreement, and that it has not paid or agreed to pay any person, company, corporation, individual, or firm other than a bona fide employee working solely for the Contractor, any fee, commission, percentage, gift or any other consideration, contingent upon or resulting from the award or making of this Agreement.

A. No Interest in Business Activity. By accepting award of this Agreement, the 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 services required hereunder, including without limitation as described in the Contractor's own professional ethical requirements. An interest in a business or activity which shall be deemed a conflict includes but is not limited to direct financial interest in any of the material and equipment manufacturers, suppliers, distributors, or contractors who will be eligible to supply material and equipment for the Project for which the Contractor is furnishing its services required hereunder.

B. No Appearance of Conflict. The Contractor shall not knowingly engage in any contractual or professional obligations that create an appearance of a conflict of interest with respect to the services provided pursuant to the Agreement. The Contractor has provided the Affidavit of No Conflict, incorporated into the Contract Documents as Exhibit "C", as a material inducement for Owner entering the Agreement. If, in the sole discretion of the County Administrator or designee, a conflict of interest is deemed to exist or arise during the term of this Agreement, the County Administrator or designee may cancel this Agreement, effective upon the date so stated in a written notice of cancellation, without penalty to the Owner.

**11.4 Truth in Negotiations.** By execution of the Contract Documents, the Contractor certifies to truth-in-negotiations and that wage rates and other factual unit costs supporting the compensation are accurate, complete and current at the time of contracting. Further, the original Contract Sum and any additions thereto shall be adjusted to exclude any significant sums where the Owner determines the Contract Sum was increased due to inaccurate, incomplete or non-current wage rates and other factual unit costs. Such adjustments must be made within one (1) year after final payment to the Contractor.

**11.5 Public Entity Crimes.** The Contractor is directed to the Florida Public Entity Crimes Act, Section 287.133, Florida Statutes, specifically section 2(a), and the Owner's requirement that the Contractor comply with it in all respects prior to and during the term of the Agreement.

## **ARTICLE XII FORCE MAJEURE, FIRE OR OTHER CASUALTY**

### **12.1 Force Majeure.**

A. Unavoidable Delays. Delays in any performance by any party contemplated or required hereunder due to fire, flood, sinkhole, earthquake or hurricane, acts of God, unavailability of materials, equipment or fuel, war, declaration of hostilities, revolt, civil strife, altercation or commotion, strike, labor dispute, or epidemic, archaeological excavation, lack of or failure of transportation facilities, or any law, order, proclamation, regulation, or ordinance of any government or any subdivision thereof, or for any other similar cause to those enumerated, beyond the reasonable control and which with due diligence could not have been reasonably anticipated, shall be deemed to be events of Force Majeure and any such delays shall be excused. In the event such party is delayed in the performance of any Work or obligation pursuant to the Contract Documents for any of the events of Force Majeure stated in this Section 12.1, the date for performance required or contemplated by the Contract Documents shall be extended by the number of calendar days such party is actually delayed.

B. Concurrent Contractor Delays. If a delay is caused for any reason provided in Section 12.1.A. and during the same time period a delay is caused by Contractor, the date for performance shall be extended as provided in 12.1.A. but only to the extent the time is or was concurrent.

C. Notice; Mitigation. The party seeking excuse for nonperformance based on Force Majeure shall give written notice to the Owner, if with respect to the Contractor, or to the Contractor if with respect to the Owner, specifying its actual or anticipated duration. Each party seeking excuse from nonperformance based on Force Majeure shall use its best efforts to rectify any condition causing a delay and will cooperate with the other party, except that neither party shall be obligated to incur any unreasonable additional costs and expenses to overcome any loss of time that has resulted.

**12.2 Casualty; Actions by Owner and Contractor.** During the construction period, if the Project or any part thereof shall have been damaged or destroyed, in whole or in part, the Contractor shall promptly make proof of loss; and Owner and Contractor shall proceed promptly to collect, or cause to be collected, all valid claims which may have arisen against insurers or others based upon such damage or destruction. The Contractor shall diligently assess the damages or

destruction and shall prepare an estimate of the cost, expenses, and other charges, including normal and ordinary compensation to the Contractor, necessary for reconstruction of the Project substantially in accordance with the Project Plans and Specifications. Within fifteen (15) days following satisfaction of the express conditions described in subsections (1), (2) and (3) below, the Contractor covenants and agrees diligently to commence reconstruction and to complete the reconstruction or repair of any loss or damage by fire or other casualty to the Project to substantially the same size, floor area, cubic content, and general appearance as prior to such loss or damage:

- (1) Receipt by the Owner or the trustee of the proceeds derived from collection of all valid claims against insurers or others based upon such damage or destruction, and receipt of other sums from any source such that the funds necessary to pay the Project Cost and any additions to the Project Cost necessitated for repair or reconstruction are available;
- (2) Written agreement executed by the Contractor and the Owner, by amendment to the Contract Documents or otherwise, authorizing and approving the repair or reconstruction and any additions to the Project Cost necessitated thereby, including any required adjustment to the Contract Sum; and
- (3) Final approval by the Owner of the Project Plans and Specifications for such repair or reconstruction and issuance of any required building permit.

**12.3 Approval of Plans and Specifications.** The Owner agrees to approve the plans and specifications for such reconstruction or repair if the reconstruction or repair contemplated by such plans and specifications is economically feasible, and will restore the Project, or the damaged portion thereof, to substantially the same condition as prior to such loss or damage, and such plans and specifications conform to the applicable laws, ordinances, codes, and regulations. The Owner agrees that all proceeds of any applicable insurance or other proceeds received by the Owner or the Contractor as a result of such loss or damage shall be used for payment of the costs, expenses, and other charges of the reconstruction or repair of the Project.

**12.4 Notice of Loss or Damage.** The Contractor shall promptly give the Owner written notice of any significant damage or destruction to the Project, defined as loss or damage which it is contemplated by Contractor will increase the Contract Sum or extend the Substantial Completion Date, stating the date on which such damage or destruction occurred, the then expectations of Contractor as to the effect of such damage or destruction on the use of the Project, and the then proposed schedule, if any, for repair or reconstruction of the Project. Loss or damage which the Contractor determines will not affect the Contract Sum or Substantial Completion Date will be reported to Owner and Architect/Engineer immediately, and associated corrective actions will be undertaken without delay.

### **ARTICLE XIII REPRESENTATIONS, WARRANTIES AND COVENANTS**

**13.1 Representations and Warranties of Contractor.** The Contractor represents and warrants to the Owner each of the following.

A. The Contractor is a construction company, organized under the laws of the State of \_\_\_\_\_, authorized to transact business in the State of Florida, with \_\_\_\_\_ as the primary qualifying agent. Contractor has all requisite power and authority to carry on its business as now conducted, to own or hold its properties, and to enter into and perform its obligations hereunder and under each instrument to which it is or will be a party, and is in good standing in the State of Florida.

B. Each Contract Document to which the Contractor is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Contractor enforceable against the Contractor in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally and subject to usual equitable principles in the event that equitable remedies are involved.

C. There are no pending or, to the knowledge of the Contractor, threatened actions or proceedings before any court or administrative agency, within or without the State of Florida, against the Contractor or any partner, officer, or agent of the Contractor which question the validity of any document contemplated hereunder, or which are likely in any case, or in the aggregate, to materially adversely affect the consummation of the transactions contemplated hereunder, or materially adversely affect the financial condition of the Contractor.

D. The Contractor has filed or caused to be filed all federal, state, local, or foreign tax returns, if any, which were required to be filed by the Contractor, and has paid, or caused to be paid, all taxes shown to be due and payable on such returns or on any assessments levied against the Contractor.

E. Neither Contractor nor any agent or person employed or retained by Contractor has acted fraudulently or in bad faith or in violation of any statute or law in the procurement of this Agreement.

F. The Contractor shall timely fulfill or cause to be fulfilled all of the terms and conditions expressed herein which are within the control of the Contractor or which are the responsibility of the Contractor to fulfill. The Contractor shall be solely responsible for the means and methods of construction.

G. It is recognized that neither the Architect/Engineer, the Contractor, nor the Owner has control over the cost of labor, materials, or equipment, over a Subcontractor's methods of determining bid prices, or over competitive bidding, market, or negotiating conditions.

H. During the term of the Contract Documents, and the period of time that the obligations of the Contractor under the Contract Documents shall be in effect, the Contractor shall cause to occur and to continue to be in effect those instruments, documents, certificates, and events contemplated by the Contract Documents that are applicable to, and the responsibility of, the Contractor.

I. The Contractor shall assist and cooperate with the Owner and shall accomplish the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, or orders that are or will be applicable thereto.

J. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective, and that Owner, representatives of Owner, and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. Contractor shall give Architect/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 Owner.

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

L. 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, Owner 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 Architect/Engineers, attorneys and other professionals and any additional expenses experienced by Owner 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 the schedule and shall not be entitled to an extension of the Contract Time or the recovery of delay damages due to correcting or removing defective Work.

M. 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, Owner may correct and remedy any such deficiency to the extent necessary to complete corrective and remedial action. Owner may temporarily exclude Contractor from all or part of the site, temporarily take possession of all or part of the Work, Contractor's tools, construction equipment and machinery at the site or for which Owner has paid Contractor but which are stored elsewhere, all for such duration as is reasonably necessary to correct the deficiency. All direct and indirect costs of Owner in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Architect/Engineer and a Change Order will be issued incorporating the necessary revisions.

N. If within three (3) years after the Substantial Completion Date 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 Owner and in accordance with Owner's written instructions, either correct such defective Work or if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the

terms of such instruction, Owner may have the defective Work corrected/removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor. Failing payment by the Contractor and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall have the right to bring a direct action in the Circuit Court to recover such costs.

**13.2 Representations of the Owner.** To the extent permitted by law, the Owner represents to the Contractor that each of the following statements is presently true and accurate:

- A. The Owner is a validly existing political subdivision of the State of Florida.
- B. The Owner has all requisite corporate or governmental power and authority to carry on its business as now conducted and to perform its obligations under the Contract Documents and each Contract Document contemplated hereunder to which it is or will be a party.
- C. The Contract Documents and each Contract Document contemplated hereby to which the Owner is or will be a party has been duly authorized by all necessary action on the part of, and has been or will be duly executed and delivered by, the Owner, and neither the execution and delivery thereof nor compliance with the terms and provisions thereof or hereof: (a) requires the approval and consent of any other person or party, except such as have been duly obtained or as are specifically noted herein; (b) contravenes any existing law, judgment, governmental rule, regulation or order applicable to or binding on the Owner; or (c) contravenes or results in any breach of, default under, or result in the creation of any lien or encumbrance upon the Owner under any indenture, mortgage, deed of trust, bank loan, or credit agreement, the charter, ordinances, resolutions, or any other agreement or instrument to which the Owner is a party, specifically including any covenants of any bonds, notes, or other forms of indebtedness of the Owner outstanding on the date of the Contract Documents.
- D. The Contract Documents and each document contemplated hereby to which the Owner is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Owner enforceable against the Owner in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally, and subject to usual equitable principles in the event that equitable remedies are involved.
- E. There are no pending or, to the knowledge of the Owner, threatened actions or proceedings before any court or administrative agency against the Owner which question the validity of the Contract Documents or any document contemplated hereunder, or which are likely in any case or in the aggregate to materially adversely affect the consummation of the transactions contemplated hereunder or the financial or corporate condition of the Owner.
- F. The Owner shall use due diligence to timely fulfill or cause to be fulfilled all of the conditions expressed in the Contract Documents which are within the control of the Owner or which are the responsibility of the Owner to fulfill.
- G. During the pendency of the Work and while the obligations of the Owner under the Contract Documents shall be in effect, the Owner shall cause to occur and to continue to be in effect and take such action as may be necessary to enforce those instruments, documents,

certificates and events contemplated by the Contract Documents that are applicable to and the responsibility of the Owner.

H. The Owner shall assist and cooperate with the Contractor in accomplishing the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, orders, contracts, or agreements that are or will be applicable thereto or, to the extent permitted by law, enact or adopt any resolution, rule, regulation, or order, or approve or enter into any contract or agreement, including issuing any bonds, notes, or other forms of indebtedness, that will result in the Contract Documents or any part thereof, or any other instrument contemplated by and material to the timely and effective performance of a party's obligations hereunder, to be in violation thereof.

## **ARTICLE XIV TERMINATION AND SUSPENSION**

**14.1 Termination for Cause by Owner.** This Agreement may be terminated by Owner upon written notice to the Contractor should Contractor fail substantially to perform a material obligation in accordance with the terms of the Contract Documents through no fault of the Owner. In the event Owner terminates for cause and it is later determined by a court of competent jurisdiction that such termination for cause was not justified, then in such event such termination for cause shall automatically be converted to a termination without cause pursuant to Section 14.2.

A. Nonperformance. If the Contractor fails to timely perform any of its obligations under the Contract Documents, including any obligation the Contractor assumes to perform Work with its own forces, or if it persistently or repeatedly refuses or fails, except in case for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or fails, without being excused, to maintain an established schedule (failure to maintain schedule shall be defined as any activity that falls thirty (30) days or more behind schedule) which has been adopted by the Construction Team, or it fails to make prompt payment to Subcontractors for materials or labor, or disregards laws, rules, ordinances, regulations, or orders of any public authority having jurisdiction, or otherwise is guilty of substantial violations of the Agreement the Owner may, after seven (7) days written notice, during which period the Contractor fails to perform such obligation, make good such deficiencies and perform such actions. The Contract Sum shall be reduced by the cost to the Owner of making good such deficiencies, and the Contractor's compensation shall be reduced by an amount required to manage the making good of such deficiencies. Provided, however, nothing contained herein shall limit or preclude Owner from pursuing additional damages from Contractor because of its breach.

B. Insolvency. If the Contractor is adjudged bankrupt, or if it makes a general assignment for the benefit of its creditors, or if a receiver is appointed because its insolvency, then the Owner may, without prejudice to any other right or remedy, and after giving the Contractor and its surety, if any, fourteen (14) days written notice, and during which period the Contractor fails to cure the violation, terminate the Agreement. In such case, the Contractor shall not be entitled to receive any further payment. Owner shall be entitled to recover all costs and damages arising because of failure of Contractor to perform as provided in the Contract Documents, as well as reasonable termination expenses, and costs and damages incurred by the Owner may be deducted from any payments left owing the Contractor.

C. Illegality. Owner may terminate the Agreement if Contractor disregards laws or regulations of any public body having jurisdiction.

D. Rights of Owner. The Owner may, after giving Contractor (and the surety, if there is one) seven (7) days written notice, terminate the services of Contractor for cause; exclude Contractor from the Project Site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the Project Site and use the 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 Project Site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case, 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. If the direct and indirect costs of completing the Work exceed the unpaid balance of the Contract Sum, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Owner in writing; but in finishing the Work, Owner shall not be required to obtain the lowest quote for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement. In such event and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall be entitled to bring a direct action in the Circuit Court to recover such costs.

**14.2 Termination without Cause by Owner.** The Owner, through its County Administrator or designee, shall have the right to terminate the Agreement, in whole or in part, without cause upon sixty (60) calendar days' written notice to the Contractor. In the event of such termination for convenience, the Owner shall compensate Contractor for payments due through the date of termination, and one subsequent payment to cover costs of Work performed through the date of termination, subject to the terms and conditions of Section 3.1. The Contractor shall not be entitled to any other further recovery against the Owner, including, but not limited to, anticipated fees or profit on Work not required to be performed, or consequential damages or costs resulting from such termination.

A. Release of Contractor. As a condition of Owner's termination rights provided for in this subsection, Contractor shall be released and discharged from all obligations arising by, through, or under the terms of the Contract Documents, and the Payment and Performance Bond shall be released. Owner shall assume and become responsible for the reasonable value of Work performed by Subcontractors prior to termination plus reasonable direct close-out costs, but in no event shall Subcontractors be entitled to unabsorbed overhead, anticipatory profits, or damages for early termination.

B. Waiver of Protest. Contractor hereby waives any right to protest the exercise by Owner of its rights under this Section that may apply under the Procurement Ordinance.

**14.3 Suspension without Cause.** Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than 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 Sum or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes an approved claim therefor.

**14.4 Termination Based Upon Abandonment, Casualty or Force Majeure.** If, after the construction commencement date (i) Contractor abandons the Project (which for purposes of this paragraph shall mean the cessation of all construction and other activities relating to the Project, excluding those which are necessary to wind down or otherwise terminate all outstanding obligations with respect to the Project, and no recommencement of same within one hundred twenty (120) days following the date of cessation), or (ii) the Project is stopped for a period of thirty (30) consecutive days due to an instance of Force Majeure or the result of a casualty resulting in a loss that cannot be corrected or restored within one hundred twenty (120) days (excluding the time required to assess the damage and complete the steps contemplated under Section 12.2), the Owner shall have the right to terminate the Agreement and pay the Contractor its compensation earned or accrued to date.

**14.5 Vacation of Project Site; Delivery of Documents.** Upon termination by Owner pursuant to Section 14.2 or 14.4, Contractor shall withdraw its employees and its equipment, if any, from the Project Site on the effective date of the termination as specified in the notice of termination (which effective date shall not be less than two (2) working days after the date of delivery of the notice), regardless of any claim the Contractor may or may not have against the Owner. Upon termination, the Contractor shall deliver to the Owner all original papers, records, documents, drawings, models and other material set forth and described in the Contract Documents.

**14.6 Termination by the Contractor.** If, through no act or fault of Contractor, the Work is suspended for a period of more than ninety (90) consecutive days by Owner or under an order of court or other public authority, or Owner fails to act on any Application for Payment or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon fourteen (14) days written notice to Owner terminate the Agreement and recover from Owner payment for all Work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Owner has failed to act on any Application for Payment or Owner has failed to make any payment as aforesaid, Contractor may upon fourteen (14) days written notice to Owner stop the Work until payment of all amounts then due.

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Exhibit A  
Title(s) of Drawings

SAMPLE

Exhibit B  
Title(s) of Specifications

SAMPLE

Exhibit C  
Affidavit of No Conflict

SAMPLE

Exhibit D  
Contractor's Certificate(s) of Insurance

SAMPLE

Exhibit E  
Contractor's Payment and Performance Bond

SAMPLE

Exhibit F  
Standard Forms

SAMPLE