



**INVITATION FOR BID
IFB #14-0131CD
REHABILITATION OF HEADWORKS AND INTERNAL RECYCLE PUMPS AT
THE SOUTHEAST WATER RECLAMATION FACILITY**

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

NON-MANDATORY INFORMATION CONFERENCE

In order to ensure that all prospective Bidders have sufficient information and understanding of County's needs, an Information Conference will be held at: **2:00 PM on February 20, 2014** at the **Southeast Water Reclamation Facility, 3331 Lena Road, Bradenton, FL 34202.** Attendance is not mandatory, but is highly encouraged.

DEADLINE FOR CLARIFICATION REQUESTS: **3:00 PM on February 28, 2014**
(Reference Bid Article A.05)

TIME AND DATE DUE: **3:00 PM on March 14, 2014**

FOR INFORMATION CONTACT:

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Manatee County Financial Management Department
Purchasing Division

AUTHORIZED FOR RELEASE: 

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SECTION A
INFORMATION TO BIDDERS

A.01 OPENING LOCATION

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

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

A.02 SEALED & MARKED

Bids shall be submitted in **triplicate, one original (marked Original) and two (2) copies (marked Copy)** of your **signed Bid** shall be submitted in one **sealed** package, clearly marked on the outside **"Sealed Bid #14-0131CD- Rehabilitation of Headworks and Internal Recycle Pumps at the Southeast Water Reclamation Facility"** along with your company name. For your convenience, a mailing label is provided with this Invitation for Bid package. Or, you may address the package as follows:

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

All blank spaces must be filled in as noted with amounts extended and totaled and no changes shall be made in the wording of the forms or in the items mentioned therein. In the event a change is made in your submittal, the Bidder shall write its initials by the change. Any Bid may be rejected which contains any omissions, alterations, irregularities of any kind, or which shall in any manner fail to conform to Bid requirements.

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

A.03 SECURING OF DOCUMENTS

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

Additionally, Manatee County collaborates with the Manatee Chamber of Commerce by emailing solicitation opportunities to its members.

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

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

A.04 MODIFICATION OF IFB DOCUMENTS

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

A.05 DEADLINE FOR CLARIFICATION REQUESTS

3:00 PM on February 28, 2014 shall be the deadline to submit all inquiries, suggestions, or requests concerning interpretation, clarification or additional information pertaining to this Invitation for Bid to the Manatee County Purchasing Division.

This deadline has been established to maintain fair treatment of all potential Bidders, while maintaining progression of the Project to promote economic stimulus.

A.06 CLARIFICATION & ADDENDA

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

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

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

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

A.07 LOBBYING

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

A.08 UNBALANCED BIDDING PROHIBITED

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

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

A.08 UNBALANCED BIDDING PROHIBITED (Continued)

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

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

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

A.09 FRONT END LOADING OF BID PRICING PROHIBITED

Prices offered for performance and/or acquisition activities to 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 end loaded. Front end 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 end loaded, it will request the opportunity to, and reserves the right to, review all source quotes, bids, price lists, letters of intent, etc., which the Bidder obtained and upon which the Bidder relied upon to develop the pricing or acquisition timing for these Bid items. County reserves the right to reject as non-responsive any presumptive front end loaded Bids where the Bidder is unable to demonstrate the validity and/or necessity of the front end loaded costs.

A.10 WITHDRAWAL OF OFFERS

Bidders may withdraw offers as follows:

- a. Mistakes discovered before the opening of a solicitation may be withdrawn by written notice from the Bidder submitting the Bid. This request must be received in the office designated for receipt of Bids in the solicitation document prior to the time set for delivery and opening of the Bids. A copy of the request shall be retained and the unopened Bid returned to that Bidder; or

- b. After the responses to a solicitation are opened or a selection has been determined, but before a Contract is signed, a Bidder alleging a material mistake of fact may be permitted to withdraw their Bid if:

A.10 WITHDRAWAL OF OFFERS (Continued)

1. the mistake is clearly evident in the solicitation document; or
2. Bidder submits evidence which clearly and convincingly demonstrates that a mistake was made. Request to withdraw a Bid must be in writing and approved by the Purchasing Official.

A.11 IRREVOCABLE OFFER

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

A.12 BID EXPENSES

All expenses for making Bids to County are to be borne by the Bidder.

A.13 RESERVED RIGHTS

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

The lowest, responsible Bidder shall mean that Bidder who makes the lowest Bid to sell goods and/or services of a quality which meets or exceeds the quality of goods and/or services set forth in the IFB documents or otherwise required by County, and who is fit and capable to perform the Bid as made.

To be responsive, a Bidder shall submit a Bid which conforms in all material respects to the requirements set forth in the Invitation for Bid.

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

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

A.14 APPLICABLE LAWS

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

A.15 COLLUSION

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

- a. any prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices and/or cost data, with any other Bidder or with any competitor;
- b. any prices and/or cost data quoted for this Bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder, prior to the scheduled opening, directly or indirectly to any other Bidder or to any competitor;
- c. no attempt has been made or will be made by the Bidder to induce any other person or firm to submit or not to submit a Bid for the purpose of restricting competition;
- d. the only person or persons interested in this Bid, principal or principals is/are named therein and that no person other than therein mentioned has any interest in this Bid or in the resulting Contract to be entered into; and
- e. no person or agency has been employed or retained to solicit or secure the resulting Contract upon an agreement or understanding or a commission, percentage, brokerage, or contingent fee except bona fide employees or established commercial agencies maintained by Bidder for purpose of doing business.

A.16 CODE OF ETHICS

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

A.16 CODE OF ETHICS (Continued)

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

A.17 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES

A person or affiliate who has been placed on the State's convicted vendor list following a conviction for a public entity crime, as that term is defined in Florida Statute § 287.133, may not submit a Bid to provide any goods or services to a public entity; may not submit a Bid with a public entity for the construction or repair of a public building or public work; may not submit Bids on leases of real property to a public entity; may not be awarded or perform Work as a Contractor, Supplier, Subcontractor, or Consultant under a Contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Florida Statutes § 287.017 for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted list.

In addition, the Manatee County Code prohibits the Award of any resulting Contract 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 contract 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 included (reference Form B of this document) for this purpose.

A.18 BID FORMS

Bids must be submitted on attached provided forms, although additional pages may be attached. **Bidders must fully complete all pages of the Bid Forms. Bid Forms must be executed by an authorized signatory who has the legal authority to make the Bid and bind the company. Bidders must fully comply with all requirements of this IFB in its entirety.** Failure to comply shall result in default of the resulting Contract, whereupon, the defaulting Contractor shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by County.

A.19 LEGAL NAME

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

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

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

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

A.20 DISCOUNTS

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

A.21 TAXES

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

A.22 DESCRIPTIVE INFORMATION

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

A.23 AMERICANS WITH DISABILITIES ACT

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

A.24 EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

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

A.25 MBE/DBE

The State of Florida, Office of Supplier Diversity provides the certification process and the database for identifying certified MBE/DBE firms. This service may be directly accessed at: <http://www.osd.dms.state.fl.us/iframe.htm>

If you have any questions regarding this State service, please contact their office at (850) 487-0915.

A.26 MATHEMATICAL ERRORS

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

A.27 DISCLOSURE

Upon receipt, all inquiries and responses to inquiries related to this Invitation for Bid 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 Bid 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 and any amount presented as a total offer without any verification of the mathematics or the completeness of the Bid.

A.27 DISCLOSURE (Continued)

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

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

- a. Keep and maintain public records that ordinarily and necessarily would be required by County in order to perform the service;
- b. Provide the public with access to public records on the same terms and conditions that County would provide and at a cost that does not exceed the cost provided in Florida Statutes, Chapter 119, or as otherwise provided by law;
- c. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law, and;
- d. Meet all requirements for retaining public records and transfer, at no cost, to County all public records in possession of Successful Bidder upon termination of the awarded Contract and/or PO and destroy any duplicate public records that are exempt or confidential from public records disclosure requirements. All records stored electronically must be provided to County in a format that is compatible with County's information technology systems.

A.28 LOCAL PREFERENCE

- a. Local business is defined as a business legally authorized to engage in the sale of the goods and/or services to be procured, and which certifies within its Bid that for at least six (6) months prior to the announcement of the solicitation of Bids it has maintained a physical place of business in Manatee, Desoto, Hardee, Hillsborough, Pinellas or Sarasota County with at least one full-time employee at that location.
- b. Local preference shall not apply to the following categories of Contracts:
 1. Purchases or Contracts which are funded, in whole or in part, by a governmental or other funding entity, where the terms and conditions of receipt of the funds prohibit the preference;

A.28 LOCAL PREFERENCE (Continued)

2. Any Bid announcement which specifically provides that the general local preference policies set forth in this section are suspended due to the unique nature of the goods or services sought, the existence of an emergency as found by either the County Commission or County Administrator, or where such suspension is, in the opinion of the County Attorney, required by law.
- c. To qualify for local preference under this section, **a local business must certify to County** by completing an “**Affidavit as to Local Business Form**”, which is available for download at www.mymanatee.org/vendor. Click on “Affidavit for Local Business” to access and print the form. Complete, notarize, and mail the notarized original to the following address: Manatee County Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205.

It is the responsibility of the Bidder to ensure accuracy of the Affidavit as to Local Business and notify County of any changes affecting same. Bidder attests that it:

1. Has not within the five (5) years prior to the Bid announcement admitted guilt or been found guilty by any court or state or federal regulatory enforcement agency of violation of any criminal law, or a law or administrative regulation regarding fraud;
2. Is not currently subject to an unresolved citation or notice of violation of any Manatee County Code provision, except citations or notices which are the subject of a current legal appeal, as of the date of the Bid announcement;
3. Is not delinquent in the payment of any fines, liens, assessments, fees or taxes to any governmental unit or taxing authority within Manatee County, except any such sums which are the subject of a current legal appeal.

A.29 VENDOR REGISTRATION

All vendors are encouraged to register with Manatee County using the on-line “Vendor Registration” web page on www.mymanatee.org/purchasing.

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

You will note that Manatee County collaborates with the Manatee Chamber of Commerce (www.manateechamber.com) by emailing solicitation opportunities to its members.

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

A.29 VENDOR REGISTRATION (Continued)

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

A link to Vendor Registration is listed on the Purchasing Division's web page under "Register as a Vendor".

Click on "Vendor Registration Form" for on-line input.

Thank you for reviewing this information and considering registering your business with Manatee County. Registration is not mandatory; however, by taking the time to register, you are helping County to provide timely notifications of Quotation, Bid and Proposal opportunities to your business.

A.30 ePAYABLES

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

After goods are delivered or services rendered, vendors submit invoices to the remit to address on the purchase order according to the current process. When payments are authorized, an email notification is sent to the vendor. The email notification includes the invoice number(s), invoice date(s), and amount of payment. Once the vendor receives the email, the credit card has been authorized to be charged for the amount listed in the email. When the vendor charges the full amount authorized in the email, the card will return to a zero balance until the next payment is authorized.

There is no cost for vendors to participate in this program; however, there may be a charge by the company that processes your credit card transactions.

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

NOTE: ANY OR ALL STATEMENTS CONTAINED IN THE FOLLOWING SECTIONS: MINIMUM QUALIFICATIONS & BASIS OF AWARD, GENERAL TERMS AND CONDITIONS, OR SPECIFICATIONS, WHICH VARY FROM THE INFORMATION TO BIDDERS, SHALL HAVE PRECEDENCE.

END OF SECTION A

SECTION B
BID SUMMARY

B.01 THE WORK

The Work included in this Bid consists of rehabilitation of the Headworks and Internal Recycle Pumps at the Manatee County Southeast Water Reclamation Facility located at 3331 Lena Road in Bradenton, Florida.

The rehabilitation work for the Headworks consists of the following:

- removal and replacement of the mechanical bar screen units, conveyors, grit removal systems, and associated equipment;
- removal and relocation of the existing electrical and control systems in the Headworks structure to the MCC Building No.2;
- installation of a PVC channel liner and structural repairs to the eastern concrete channel;
- repair and resurfacing of the existing concrete deck with specified coating and any other additional work requirements covered in these contract documents.

The rehabilitation work for the Internal Recycle Pumps consists of the following:

- removal and replacement of the internal recycle pumps and motors, piping, valves, and electrical and control equipment;
- cleaning and structural repair of the oxidation ditch basins; disposal of the grit material and any additional requirements covered in these contract documents.

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

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

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

B.02 EXAMINATION OF BID DOCUMENTS AND SITE(S)

It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Bid Documents thoroughly; (b) visit the site(s) to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the Work; (c) consider federal, state, and local codes, laws, and regulations that may affect costs, progress, performance, or furnishing of the Work; (d) study and carefully correlate Bidder's

observations with the Bid Documents; and (e) notify County of all conflicts, errors, or discrepancies in the Bid Documents.

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

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

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

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

END OF SECTION B

SECTION C
BASIS OF AWARD & MINIMUM QUALIFICATIONS

C.01 BASIS OF AWARD

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

Two schedules for completion of Work shall be considered. Each Bid for completion by the specified stated time shall be offered as a separate "total offer". County has the sole authority to select the Bid based on the completion time which is in the best interest of County. Only one Award shall be made.

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

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

Whenever two or more Bids are equal with respect to price, the Bid received from a local business shall be given preference in Award. Whenever two or more Bids which are equal with respect to price are received, and 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 Purchasing Division and open to the public.

C.02 MINIMUM QUALIFICATIONS OF BIDDERS

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

END OF SECTION C

SECTION D
GENERAL TERMS & CONDITIONS

D.01 CONTRACT FORMS

The Contract resulting from the acceptance of a Bid shall be in the form of the Contract stated in this Bid (reference Section F of this document).

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

D.02 ASSIGNMENT OF CONTRACT

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

D.03 COMPLETION OF WORK

The Work will be completed and ready for final inspection within the specified calendar days from the date the Contract Time commences to run. Two Bids shall be considered, **Bid "A"** based on **365 calendar days** and **Bid "B"** based on **476 calendar days**. County has the sole authority to select the Bid based on the completion time which is in the best interest of County. **Only one Award shall be made.**

D.04 LIQUIDATED DAMAGES

If the Contractor refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will hinder its completion within the time specified, County may seek damages. The actual damages for delay will be impossible to determine and in lieu thereof, the Contractor shall pay to County the sum of **\$2374** as fixed, agreed, and liquidated damages for each calendar day of the delay until the Work is finally accepted by County and the Contractor and his Surety shall be liable for the amount thereof.

D.05 PAYMENT

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

D.05 PAYMENT (Continued)

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

In accordance with the Prompt Payment Act, Florida Statutes § 218.735(7), a Punch List shall be formulated.

Time allowed for development of Punch List:

- a. Awarded Contracts with an estimated cost of less than \$10 million will be within thirty (30) calendar days after reaching Substantial Completion.
- b. Awarded Contracts with a cost of \$10 million dollars or more will be within thirty (30) calendar days OR if extended by Contract, up to sixty (60) calendar days after reaching Substantial Completion.

The Final Completion date of the resulting Contract must be at least thirty (30) days after delivery of the list of items. If the list is not provided to the awarded Contractor by the agreed upon date, the Contract completion time must be extended by the number of days County exceeds the delivery date.

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

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

The Contractor agrees to furnish an affidavit stating that all laborers, material men, and Subcontractors have been paid on the Project for Work covered by the Application for Payment and that a partial or complete release of lien, as may be necessary, be properly executed by the material men, laborers, Subcontractors on the Project for Work covered by the Application for Payment, sufficient to secure County from any claim whatsoever arising out of the aforesaid Work. When the Contractor has completed the Work in compliance with the terms of the Contract Documents, he shall notify County in writing that the Project is ready for final inspection.

D.05 PAYMENT (Continued)

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

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

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

D.06 CONTRACT CONTINGENCY WORK

This Bid item entails a monetary allowance which is used at County's discretion to handle unexpected conditions as required to satisfactorily complete the Project in accordance with the plans and Specifications. 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. Vendor shall enter the amount for Contract Contingency based on the percentage of their Total Base Bid. The total Contract Award will include the Contract Contingency funds.

Appropriate uses of Contract Contingency funds include increases to existing Bid item quantities that do not change the initial Scope of Work, which may be directed by staff; modification items not originally bid which were unforeseen yet necessary during the construction 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 funds include anything that changes the initial Scope of Work, including the Contract Price and Contract Time, and adding Bid items not previously contemplated that change the initial Scope of Work.

D.07 RETAINAGE

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

D.08 PROGRESS REQUIREMENTS

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

D.09 WARRANTY AND GUARANTEE PROVISIONS

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

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

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

D.10 MATERIALS AND WORKMANSHIP

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

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

D.11 PROJECT CLOSE-OUT

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

D.11 PROJECT CLOSE-OUT (Continued)

When County determines the Work is acceptable in accordance with this Invitation for Bid, the Contractor shall provide the close out submittals, including but not necessarily limited to the following:

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

D.12 ROYALTIES AND PATENTS

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

D.13 AUTHORIZED PRODUCT REPRESENTATION

The Bidder, by virtue of submitting the name and Specifications of a manufacturer's product, will be required to furnish the named manufacturer's product. Failure to perform accordingly may, in County's sole discretion, be deemed a Material Breach of the resulting Contract, and shall constitute grounds for County's immediate termination of the resulting Contract.

D.14 REGULATIONS

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

D.15 CANCELLATION

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

D.16 INDEMNIFICATION

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

D.17 SUBCONTRACTORS, SUPPLIERS AND OTHERS

The identity of Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) may be requested by County for each Bid item from any of the Bidders; and the Bidder shall respond within five (5) days after the date of such request. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, persons or organization if requested by County. If County, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, County may, before the Notice of Intent to Award is given, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Contract Price or Contract Time.

If apparent Successful Bidder declines to make any such substitution, County may Award the resulting Contract to the next lowest qualified Bidder that proposes to use acceptable Subcontractors, Suppliers, and other persons who County does not make written objection to. Contractor shall not be required to employ any Subcontractor, Supplier, other person or organization who Contractor has reasonable objection to.

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

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

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

D.18 MANUALS, SCHEMATICS, HANDBOOKS (IF APPLICABLE)

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

D.19 INSURANCE

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

a. **Workers' Compensation/Employers' Liability**

Part One - There shall be no maximum limit (other than as limited by the applicable statute) for liability imposed by Florida Workers' Compensation Act or any other coverage required by the resulting Contract Documents which are customarily insured under Part One of the standard Workers' Compensation Policy.

Part Two - The minimum amount of coverage required by the resulting Contract Documents which are customarily insured under Part Two of the standard Workers' Compensation Policy shall be:

(Each Accident)	<u>\$100,000</u>
(Disease-Policy Limit)	<u>\$500,000</u>
(Disease-Each Employee)	<u>\$100,000</u>

b. **Commercial General Liability**

The limits are to be applicable only to Work performed under the resulting Contract and shall be those that would be provided with the attachment of the Amendment of Limits of Insurance (Designated Project or Premises) endorsement (ISO Form CG 25 03) a Commercial General Liability Policy with the following minimum limits.

General Aggregate:

Products/Completed Operations Aggregate	<u>\$2,000,000</u>
Personal and Advertising Injury	<u>\$1,000,000</u>
Each Occurrence	<u>\$1,000,000</u>
Fire Damage (Any One Fire)	<u>\$Nil</u>
Medical Expense (Any One Person)	<u>\$Nil</u>

ADDITIONAL INSURED: Manatee County, a political subdivision of the State of Florida, shall be specifically named as additional insured on the Commercial General Liability Policy.

D.19 INSURANCE (Continued)

c. Business Auto Policy

Each Occurrence Bodily Injury and Property Damage Liability Combined	<u>\$300,000</u>
Annual Aggregate (if applicable)	<u>\$1,000,000</u>

ADDITIONAL INSURED: Manatee County, a political subdivision of the State of Florida, shall be specifically named as additional insured on the Business Auto Policy.

d. Property Insurance

If the resulting Contract includes construction of or additions to above ground buildings or structures, Contractor shall provide "**Builder's Risk**" insurance with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s).

e. Installation Floater

If the resulting Contract does not include construction of or additions to above ground building or structures, **but does involve** the installation of machinery or equipment, Contractor shall provide an "**Installation Floater**" with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s).

f. Certificates of Insurance and Copies of Policies

Certificates of Insurance in triplicate evidencing the insurance coverage specified herein shall be filed with the Purchasing Official before operations are begun. The required certificates of insurance shall name the types of policy, policy number, date of expiration, amount of coverage, companies affording coverage, and also shall refer specifically to the Bid number and title of the Project. All insurance policies required herein shall be issued by companies that are authorized to do business under the laws of the State of Florida and hold an A.M. Best rating of A- or better. Insurance, as specified herein, shall remain in force and effect for the duration of the Project including any warranty periods.

g. Complete Policies: The entire and complete insurance policies required herein shall be provided to County on request.

Nothing herein shall in any manner create any liability of County in connection with any claim against the Contractor for labor, services, or materials, or of Subcontractors; and nothing herein shall limit the liability of the Contractor or Contractor's Sureties to County or to any Workers, Suppliers, material men or employees in relation to the resulting Contract.

D.19 INSURANCE (Continued)

- h. By way of its submission of a Bid hereto, Bidder:
1. Represents that Bidder maintains, and will maintain during the term of any Contract arising from this solicitation, insurance coverage from responsible companies duly authorized to do business in the State of Florida and deemed acceptable to County, as set forth in this solicitation; and
 2. Agrees that, insurance should not be cancelled without thirty (30) days notice to County and must be endorsed to provide same. Failure of Bidder to obtain and maintain proper amounts of insurance at all times as called for herein shall constitute a Material Breach of the resulting Contract, which may result in immediate termination.
- i. Certification Requirements – In order for the certificate of insurance to be accepted it **must** comply with the following:
1. The certificate holder shall be:
**Manatee County Board of Commissioners,
A political subdivision of the State of Florida
P.O. Box 1000
Bradenton, FL 34206-1000
IFB# 14-0131CD, Rehabilitation of Headworks and Internal Recycle Pumps
at the Southeast Water Reclamation Facility**
 2. Certificate shall be mailed to:
**Manatee County Purchasing Division
1112 Manatee Avenue West, Suite 803
Bradenton, FL 34205
Attn: Chris Daley, CPPB, Contract Specialist**

D.20 BID BOND/CERTIFIED CHECK

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

D.21 PERFORMANCE AND PAYMENT BONDS

The Successful Bidder shall furnish Surety bonds using the Public Construction Bond form prescribed in Florida Statutes § 255.05, which is provided herein, as security for faithful performance of the Contract awarded as a result of this Bid and for the payment of all persons performing labor and/or furnishing material in connection therewith. Failure to provide the required bonds on the prescribed form may result in Successful Bidder being deemed nonresponsive. Bonds must be in the form prescribed in Florida Statutes § 255.05, and must not contain notice, demand or other terms and conditions, including informal pre-claim meetings, not provided for in Florida Statutes § 255.05.

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

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

Furnishing Performance and Payment Bonds shall be requisite to execution of a Contract with County. Said Performance and Payment Bonds will remain in force for the duration of the Contract with the premiums paid by the Contractor. Failure of the Successful Bidder to execute such Contract and to supply the required bonds shall be just cause for cancellation of the Award. County may then contract with another acceptable Bidder or re-advertise this Invitation for Bid. If another Bidder is accepted, and notice given within ninety (90) days after the opening of the Bids, this acceptance shall bind the Bidder as though they were originally the Successful Bidder.

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

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

D.22 NO DAMAGES FOR DELAY

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

D.23 NO INTEREST

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

D.24 CONSTRUCTION OF CONTRACT

The resulting Contract and the rights and responsibilities hereunder shall not be construed more strongly against either party, regardless of the extent to which such party may have participated in the preparation hereof.

D.25 BE GREEN

All Contractors are encouraged to use as many **environmentally preferable** "green" products, materials, supplies, etc. as possible in order to promote a safe and healthy environment. **Environmentally preferable are products or services that have a reduced adverse effect on the environment.** Provide detail of your organization's initiative and its ability to meet the goal of environmental sustainability.

END OF SECTION D

SECTION E
GENERAL CONDITIONS

ARTICLE 1. DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 2. PRELIMINARY MATTERS

Computation of Time: When time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or legal holiday, such day will be omitted from the computation.

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

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

- 2.2 A Notice to Proceed may be given at any time within thirty (30) days after the Effective Date of the Contract. The Contract Time will commence at the time specified in such notice. Contractor shall start to perform the Work on the date specified in the Notice to Proceed, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.
- 2.3 If at any time the materials and appliances to be used appear to the County as insufficient or improper for securing the quality of Work required or the required rate of progress, the County may order the Contractor to increase his efficiency or to improve the character of his Work and the Contractor shall conform to such an order. The failure of the County to demand any increase of such efficiency of any improvement shall not release the County from its obligation to secure the quality of Work or the rate of progress necessary to complete the Work within the limits imposed by the Contract. The County may require the Contractor to remove from the Work such employees as the County deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Work is deemed to be contrary to the County's interest.
- 2.4 The County reserves the right to let other Contracts in connection with this Work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and execution of their Work, and promptly connect and coordinate the Work with theirs.

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

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

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

Note: Computed dimensions shall govern over scaled dimensions.

- 3.2 It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for in the Contract Documents. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard Specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of County, Contractor or Engineer, or any of their agents or employees from those set forth in the Contract Documents.
- 3.3 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:
- 3.3.1 A Written Amendment
 - 3.3.2 A Change Order
 - 3.3.3 An Administrative Contract Adjustment (ACA)
 - 3.3.4 A Work Directive Change
- 3.4 In addition, the requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized in one or more of the following ways:
- 3.4.1 Contract Contingency Work – Field Directive
 - 3.4.2 Engineer's approval of a Shop Drawing or sample

ARTICLE 4. CONTRACTOR'S RESPONSIBILITIES

- 4.1 Contractor shall keep on the Work at all times during its progress a competent resident superintendent; who shall be the Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.
- 4.2 Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract

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

- 4.2.1 Contractor shall pay for all additional engineering charges to the County for any overtime Work which may be authorized. Such additional engineering charges shall be a subsidiary obligation of Contractor and no extra payment shall be made by County on account of such overtime Work. At County's option, overtime costs may be deducted from Contractor's monthly payment request or Contractor's Retainage prior to release of final payment.
- 4.3 Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.
- 4.4 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable Supplier except as otherwise provided in the Contract Documents.
- 4.5 Contractor shall be fully responsible to County for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect Contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between County or Engineer and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of County to pay or to see to the payment of any monies due any such Subcontractor, Supplier or other person or organization.
- 4.6 Permits: Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. County shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all

governmental charges and inspection fees necessary for the prosecution of the Work.

- 4.7 During the progress of the Work, Contractor shall keep the premises free from accumulation of waste materials rubbish and other debris resulting from the Work. At the completion of the Work, Contractor shall remove all waste materials, rubbish, and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials and shall leave the site clean and ready for occupancy by County. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents.
- 4.8 Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.
- 4.9 Safety and Protection: Contractor shall comply with the Florida Department of Commerce Safety Regulations and any local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:
- 4.9.1 all employees on the Work and other persons and organizations who may be affected thereby;
- 4.9.2 all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
- 4.9.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.
- 4.9.4 Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for the protection required by public authority or local conditions. Contractor shall provide reasonable maintenance of traffic way for the public and preservation of the County's business, taking into full consideration all local conditions. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed.

- 4.10 Emergencies: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from Engineer or County, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give County prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If County determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a Work Directive Change or Change Order will be issued to document the consequences of the changes or variation.
- 4.11 For substitutes not included with the Bid, but submitted after the Effective Date of the Contract, Contractor shall make written application to Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provisions of such substitute, including costs of redesign and claims of other Contractors affected by the resulting change, all of which will be considered by the Engineer in evaluating the proposed substitute. Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed substitute. In rendering a decision, County/Engineer and Contractor shall have access to any available Float or Slack Time in the construction schedule. In the event that substitute materials or equipment not included as part of the Bid, but proposed after the Effective Date of the Contract, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the County and an appropriate Change Order executed.
- 4.11.1 If a specific means, method, sequence, technique or procedure of construction is indicated in or required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to Engineer if Contractor submits sufficient information to allow Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents.
- 4.11.2 Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Engineer will be the sole judge of acceptability and no substitute will be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved shop drawing. County may require Contractor to furnish at Contractor's expense a special performance guarantee or other Surety with respect to any substitute.

- 4.11.3 Contractor shall reimburse County for the charges of Engineer and Engineer's consultants for evaluating each proposed substitute submitted after the Effective Date of the Contract and all costs resulting from any delays in the Work while the substitute was undergoing review.
- 4.12 The Contractor shall furnish, free of charge, all labor, stakes, surveys, batter boards for structures, grade lines and other materials and supplies and shall set construction stakes and batter boards for establishing lines, position of structures, slopes and other controlling points necessary for the proper prosecution of the construction Work. Where rights-of-way, easements, property lines or any other conditions which make the lay-out of the project or parts of the project critical are involved, the Contractor will employ a competent surveyor who is registered in the State of Florida for lay-out and staking. These stakes and marks shall constitute the field control by and in accord with which the Contractor shall govern and execute the Work. The Contractor will be held responsible for the preservation of all stakes, marks and if for any reason any of the stakes or marks or batter boards become destroyed or disturbed, they will be immediately and accurately replaced by the Contractor.
- 4.13 The Contractor has, by careful examination, satisfied himself as to the nature and location of the Work and all other matters which can in any way affect the Work under this Contract, including, but not limited to details pertaining to boring, as shown on the drawings, are not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the site of the Work, approximately at the locations indicated. The Contractor shall examine boring data, where available, and make his own interpretation of the subsoil investigations and other preliminary data, and shall base his Bid on his own opinion of the conditions likely to be encountered. In no event shall an extension of time be considered for any conditions that existed at the time of bidding, nor shall the Contractor receive extra compensation for completion of the project as intended by the drawings and in keeping with the Contact documents. No verbal agreement or conversation with any officer, agent or employee of the County, before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.
- 4.14 If the Contractor, in the course of the Work, finds that the drawings and/or Contract Documents cannot be followed, he shall immediately inform the County in writing, and the County shall promptly check the accuracy of the information. Any Work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's risk.

ARTICLE 5. COUNTY'S RESPONSIBILITIES

- 5.1 County shall furnish the data required of County under the Contract Documents promptly and shall make payments to the Contractor within a reasonable time after the Work has been accepted by the County. Payment shall be made no more than twenty (20) business days if County is its own Engineer of Record or twenty-five (25) business days if outside agent approval is required after the pay estimate has been approved by the agent for the County. The form of all submittals, notices, Change Orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the County/Engineer. Standard County forms shall be utilized.
- 5.2 The County shall provide the lands upon which the Work under this Contract is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same.
- 5.3 The County shall have the right to take possession of and use any completed portions of the Work, although the time for completing the entire Work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

ARTICLE 6. CHANGES IN THE WORK

- 6.1 Without invalidating the Contract and without notice to any Surety, County may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- 6.2 Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented.
- 6.3 County and Contractor shall execute appropriate Change Orders, or Written Amendments, covering changes in the Work which are ordered by County, or which may be required because of acceptance of defective Work.
- 6.4 At any time Engineer may request a quotation from Contractor for a proposed change in the Work and within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract Price or Contract Time for the proposed change. Engineer shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in

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

ARTICLE 7. CHANGE OF CONTRACT PRICE

- 7.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at his expense without change in the Contract Price.
- 7.2 The Contract Price may only be changed by Change Order or by a Written Amendment. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within ten (10) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event.
- 7.3 The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways, at the County's discretion:
- 7.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, cost will be determined by application of such unit prices to the quantities of the items involved.
- 7.3.2 By mutual acceptance of lump sum.
- 7.3.3 On the basis of the cost of the Work, plus a 15% Contractor's fee for overhead and profit. (Contractor shall submit an itemized cost breakdown together with supporting data.)
- 7.4 Either County or Contractor may make a claim for an adjustment in the Contract Price. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment under the following conditions:
- 7.4.1 If the total cost of a particular item of Unit Price Work amounts to 5% or more of the Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Contract; and

- 7.4.2 If there is no corresponding adjustment with respect to any other item of Work; and
- 7.4.3 If a Contractor believes that it has incurred additional expense as a result thereof; or
- 7.4.4 If County believes that the quantity variation entitles it to an adjustment in the unit price; or
- 7.4.5 If the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

ARTICLE 8. CHANGE OF CONTRACT TIME

- 8.1 Contract Time may only be changed by a Change Order or a Written Amendment. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event.
- 8.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by County or others performing additional Work; or to fires, floods, epidemics, abnormal weather conditions or acts of God.
- 8.3 All time limits stated in the Contract Documents are of the essence.

ARTICLE 9. WARRANTY, TEST/INSPECTION, CORRECTION

- 9.1 Contractor warrants, for a minimum period of three (3) years or as otherwise stated herein, and guarantees to County that all Work will be in accordance with the Contract Documents and will not be defective; that County, representatives of County, and governmental agencies with jurisdictional interests will have access to the Work at reasonable time for their observation, inspecting and testing (Contractor shall give Engineer timely notice of readiness of the Work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by County).
- 9.2 If any Work (including work of others) that is to be inspected, tested, or approved is covered without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice. Neither observations by

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

- 9.3 If the Work is defective, or Contractor fails to supply sufficient skilled workers, or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, County may order Contractor to stop the Work, or any portion thereof and terminate payments to the Contractor until the cause for such order has been eliminated. Contractor shall bear all direct, indirect and consequential costs for satisfactory reconstruction or removal and replacement with non-defective Work, including, but not limited to fees and charges of engineers, architects, attorneys and other professionals and any additional expenses experienced by County due to delays to other Contractors performing additional Work and an appropriate deductive Change Order shall be issued. Contractor shall further bear the responsibility for maintaining schedule and shall not be entitled to an extension of the Contract Time and the recovery of delay damages due to correcting or removing defective Work.
- 9.3.1 If Contractor fails within seven (7) days after written notice to correct defective Work, or fails to perform the Work in accordance with the Contract Documents, or fails to comply with any other provision of the Contract Documents, County may correct and remedy any such deficiency to the extent necessary to complete corrective and remedial action. County may exclude Contractor from all or part of the site, take possession of all or part of the Work, Contractor's tools, construction equipment and machinery at the site or for which County has paid Contractor but which are stored elsewhere. All direct and indirect costs of County in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Engineer and a Change Order will be issued incorporating the necessary revisions.
- 9.3.2 If within three (3) years after the date of completion or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to County and in accordance with County's written instructions, either correct such defective Work or if it has been rejected by County, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instruction, County may have the defective Work corrected or removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor.

ARTICLE 10. SUSPENSION OR TERMINATION OF WORK

- 10.1 County reserves the right to suspend the Work, or any portion thereof, at any time without cause for a period not to exceed ninety (90) days by written notice to Contractor, which will fix the date on which Work will be resumed. Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes an approved claim therefore.
- 10.1.1 If Work is suspended by County for a period that exceeds ninety (90) days; or if Work is suspended by an order of court or other public authority; or if County fails to pay Contractor, then Contractor may, upon seven (7) days written notice to County, terminate the Contract and recover payment for all Work executed.
- 10.1.2 In lieu of terminating the Contract, if the Engineer has failed to act on any Application for Payment or County has failed to make any payment as aforesaid, Contractor may, upon seven (7) days written notice to County, stop the Work until payment of all amounts then due have been received.
- 10.2 County reserves the right, after giving seven (7) days written notice, to terminate this Contract if:
- 10.2.1 Contractor persistently fails to perform the Work in accordance with the Contract Documents;
- 10.2.2 Contractor disregards laws or regulations of any public body having jurisdiction;
- 10.2.3 Contractor commences a voluntary case under any chapter of the Bankruptcy Code or any similar action by filing a petition under any other federal or state law relating to bankruptcy or insolvency;
- 10.2.4 Contractor has a petition filed against them under any chapter of the Bankruptcy Code or similar relief under any other federal or state law;
- 10.3 County may exclude Contractor from the site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the site and use same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the Work all materials and equipment stored at the site or for which County has paid Contractor but which are stored elsewhere, and finish the Work as County may deem expedient.
- 10.3.1 Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the Work, but delivered and suitably stored, less the aggregate of payments previously made.

- 10.3.2 If the direct, indirect and consequential costs of completing the Work exceed the unpaid balance of the Contract Price, Contractor shall pay the difference to County. Such costs incurred by County shall be verified by County and incorporated in a Change Order; but in finishing the Work, County shall not be required to obtain the lowest figure for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of this Contract.
- 10.4 In the event sufficient budgeted funds are not available for a new fiscal year, County shall notify Contractor of such occurrence and Contract shall terminate on the last day of the current fiscal year without penalty or expense to County.
- 10.5 Failure of Contractor to comply with any of the provisions of this Contract shall be considered a Material Breach of Contract and shall be cause for immediate termination of Contract at the discretion of County.
- 10.6 In addition to all other legal remedies available to County, County reserves the right to terminate and obtain from another source, any commodities or services which have not been delivered within the Contract Time as stated in the Contract Documents.

ARTICLE 11. CONTRACT CLAIMS & DISPUTES

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

ARTICLE 12. RESIDENT PROJECT REPRESENTATIVE - DUTIES, RESPONSIBILITIES

- 12.1 The Resident Project Representative is the Engineer's Agent, who will act as directed by and under the supervision of the Engineer, and who will confer with County regarding his actions. Resident Project Representative's dealing in matters pertaining to the on-site Work shall, in general, be only with the County and Contractor and dealings with Subcontractors shall only be through or with the full knowledge of Contractor.
- 12.2 Resident Project Representative will:
- 12.2.1 Review the progress schedule, schedule of shop drawing submissions and Schedule of Values prepared by Contractor and consult with County concerning their acceptability.

- 12.2.2 Attend Preconstruction Conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with County and notify those expected to attend in advance. Attend meetings and maintain and circulate copies of minutes thereof.
- 12.2.3 Serve as County's liaison with Contractor, working principally through Contractor's superintendent and assist him in understanding the intent of the Contract Documents. As requested by Contractor, assist in obtaining additional details or information when required at the job site for proper execution of the Work.
- 12.2.4 Receive and record date of receipt of Shop Drawings and samples, receive samples which are furnished at the site by Contractor and notify Engineer of their availability for examination.
- 12.2.5 Advise Engineer and Contractor or his superintendent immediately of the commencement of any Work requiring a shop drawing or sample submission if the submission has not been approved by the County.
- 12.2.6 Conduct on-site observations of the Work in progress to assist Engineer in determining if the Work is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.
- 12.2.7 Report to County whenever he or she believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspections, tests or approvals required or if Work has been damaged prior to final payment; and advise Contractor when he believes Work should be corrected or rejected or should be uncovered of observation or requires special testing, inspection or approval.
- 12.2.8 Verify that tests, equipment and system start-ups and operating and maintenance instructions are conducted as required by the Contract Documents and in the presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures and start-ups.
- 12.2.9 Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to County.
- 12.2.10 Transmit to Contractor, Engineer's clarifications and interpretations of the Contract Documents.

- 12.2.11 Consider and evaluate Contractor's suggestions or modifications in drawings or Contract Documents and report them with recommendations to County.
- 12.2.12 Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and sample submissions, reproductions of original Contract Documents including all Addenda, Change Orders, field orders, additional drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress reports and other project related documents.
- 12.2.13 Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, Suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to County.
- 12.2.14 Record names, addresses and telephone numbers of all Contractors, Subcontractors and major Suppliers of materials and equipment.
- 12.2.15 Furnish Engineer periodic reports as required of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions.
- 12.2.16 Consult with Engineer in advance of scheduling major tests, inspections or start of important phases of the Work.
- 12.2.17 Report immediately the occurrence of any accident.
- 12.2.18 Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Engineer, noting particularly their relation to the Schedule of Values, Work completed and materials and equipment delivered at the site but not incorporated in the Work.
- 12.2.19 During the course of the Work, verify that certificates, maintenance and operations manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed, and deliver this material to County for his review prior to final acceptance of the Work.
- 12.2.20 Before Engineer issues a certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.

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

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

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

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

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

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

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

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

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

12.3.7 Shall not participate in specialized field or laboratory tests.

ARTICLE 13. APPRENTICES

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

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

END OF SECTION E

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

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

ARTICLE 1. WORK

CONTRACTOR shall furnish all labor, materials, supplies, and other items required to complete the Work for **IFB #14-0131CD- Rehabilitation of Headworks and Internal Recycle Pumps at the Southeast Water Reclamation Facility** in strict accordance with Contract Documents and any duly authorized subsequent Addenda thereto, all of which are made a part hereof.

ARTICLE 2. COMPENSATION

As compensation to CONTRACTOR, COUNTY shall pay and CONTRACTOR will accept as full consideration for the performance of all Work required by **IFB #14-0131CD- Rehabilitation of Headworks and Internal Recycle Pumps at the Southeast Water Reclamation Facility**, subject to additions and deductions as provided therein, the sum of \$xxx.xx for Bid "XX" based on a completion time of XXX calendar days.

ARTICLE 3. LIQUIDATED DAMAGES

Time is of the essence in this CONTRACT. As of the date of this CONTRACT, the damages that will be suffered by COUNTY in the event of CONTRACTOR'S failure to timely complete the Work are impossible to determine. In lieu thereof, it is agreed that if CONTRACTOR fails to achieve Final Completion of the Work within XXX calendar days of issuance of the Notice to Proceed (accounting, however, for any extensions of time

granted pursuant to approved Change Orders), CONTRACTOR shall pay to COUNTY, as liquidated damages (and not as a penalty), the sum of \$2,374 per calendar day for each day beyond XXX days until CONTRACTOR achieves Final Completion. COUNTY shall have the option of withholding said liquidated damages from any pay application(s) thereafter submitted by CONTRACTOR. Alternatively, CONTRACTOR shall immediately pay said sums to COUNTY upon COUNTY'S demand for same.

ARTICLE 4. ENGINEER

The COUNTY of MANATEE, Public Works Department, is responsible as COUNTY and Kimley-Horn and Associates as "ENGINEER," designed this Project and is responsible for technical/engineering reviews and decisions. The ENGINEER is a member of COUNTY'S Project Management team which is collectively responsible for ensuring the Work is completed in accordance with the Contract Documents.

All communications involving this Project will be addressed to: Kent Bontrager, PE, Project Engineer II, Public Works Department and to the Engineer of Record, Wayne E. White, PE, Kimley-Horn and Associates. All invoicing will be addressed to the attention of: Kent Bontrager, PE (address noted below) with invoice copies sent to Wayne E. White, PE, Kimley-Horn and Associates (address noted below).

Manatee County Public Works Dept.
IFB# 14-0131CD
Attention: Kent Bontrager, PE
Project Engineer II
1022 26th Avenue East
Bradenton, Florida 34208
Phone (941) 708-7450 ext. 7331

Kimley-Horn and Associates
IFB# 14-0131CD
Attn: Wayne E. White, PE
Project Manager
655 North Franklin Street, Suite 150
Tampa, Florida 33609
Phone (813) 620-1460

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

ARTICLE 5. CONTRACTOR'S REPRESENTATIONS

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

- 5.1 CONTRACTOR has familiarized itself with the nature and extent of the Bid Documents, Work, site, locality and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
- 5.2 CONTRACTOR has studied carefully all drawings of the physical conditions upon which CONTRACTOR is entitled to rely.
- 5.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies which pertain to the physical conditions at or contiguous to the site or which otherwise may affect the cost, progress, performance or furnishing of the Work as CONTRACTOR considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Bid Documents; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by CONTRACTOR for such purposes.
- 5.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Bid Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. Any additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said Underground Facilities conducted by CONTRACTOR will be done at CONTRACTOR'S expense.

- 5.5 CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Bid.
- 5.6 CONTRACTOR has given COUNTY written notice of all conflicts, errors or discrepancies that have been discovered in the Bid Documents and the written resolution thereof by COUNTY is acceptable to CONTRACTOR.
- 5.7 CONTRACTOR shall schedule and perform the Work subject to COUNTY'S approval and shall hold COUNTY harmless from all liabilities incurred due to CONTRACTOR'S failure to coordinate with COUNTY.

ARTICLE 6. CONTRACT DOCUMENTS

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

- 6.1 This CONTRACT and Bid Document **IFB # 14-0131CD**
- 6.2 Invitation for Bid #14-0131CD, in its entirety
- 6.3 Public Construction Bond Form and Insurance Certificate(s)
- 6.4 Drawings/Plans (not attached)
- 6.5 Addendum number xx to xx inclusive
- 6.6 CONTRACTOR'S Bid Form
- 6.7 Reports
- 6.8 The following, which may be delivered or issued after the Effective Date of the CONTRACT and are not attached hereto: all written Change Orders and other documents amending, modifying, or supplementing the Contract Documents.

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

ARTICLE 7. DISPUTE RESOLUTION

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

ARTICLE 8. NO WAIVER

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

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

ARTICLE 9. NO THIRD-PARTY BENEFICIARIES

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

ARTICLE 10. GOVERNING LAW, JURISDICTION AND VENUE

- 10.1 This CONTRACT and the construction and enforceability thereof shall be interpreted under the laws of the State of Florida.
- 10.2 CONTRACTOR consents and agrees that all legal proceedings related to the subject matter of this CONTRACT shall be governed by the laws of and maintained in courts sitting with the State of Florida.
- 10.3 CONTRACTOR consents and agrees that jurisdiction for such proceedings shall lie exclusively with such court and venue in Manatee County, Florida, or if in Federal Court, the Middle District of Florida, Tampa Division.
- 10.4 In the event of any litigation arising under the terms of this CONTRACT, each party shall be responsible for their own attorney's fees, including appellate fees, regardless of the outcome of the litigation.

ARTICLE 11. FORCE MAJEURE

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

ARTICLE 12. MISCELLANEOUS

- 12.1 Terms used in this CONTRACT are defined in Article 1 of Section E, General Conditions.
- 12.2 No assignment by a party hereto of any rights under or interest in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignee from any duty or responsibility under the Contract Documents.
- 12.3 COUNTY and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements, and obligations contained in the Contract Documents.
- 12.4 By accepting Award of this CONTRACT, CONTRACTOR, which shall include its directors, officers and employees, represents that it presently has no interest in and shall acquire no interest in any business or activity which would conflict in any manner with the performance of duties or services required hereunder.

CONTRACT
IFB #14-0131CD

IN WITNESS WHEREOF, the parties hereto have caused this **CONTRACT 14-0131CD** to be duly executed by their authorized representatives.

CONTRACTOR

By: _____

Print Name & Title of Signer

Date: _____

COUNTY OF MANATEE, FLORIDA

By: _____
Melissa M. Wendel, CPPO
Purchasing Official

Date: _____

**MANATEE COUNTY GOVERNMENT
PUBLIC CONSTRUCTION BOND**

Bond No. _____
(Enter bond number)

BY THIS BOND, We _____, located at _____, as
(Name of Contractor) (Address)

Principal and _____, a corporation, whose address is
(Name of Surety)

are bound to Manatee County, a political subdivision of the State of Florida, herein called County, in the sum of \$ _____, for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

WHEREAS, the Contractor has entered into Contract No. 14-0131CD with the County for the project titled Rehabilitation of Headworks and Internal Recycle Pumps at the Southeast Water Reclamation Facility, with conditions and provisions as are further described in the aforementioned Contract, which Contract is by reference made a part hereof for the purposes of explaining this bond.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs Contract No. 14-0131CD, between Principal and County for construction of

Rehabilitation of Headworks and Internal Recycle Pumps at the Southeast Water Reclamation Facility, the Contract being made a part of this bond by reference, at

(Title of Project)

the times and in the manner prescribed in the Contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the Work provided for in the Contract; and

3. Pays County all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that County sustains because of a default by Principal under the Contract; and

4. Performs the guarantee of all Work and materials furnished under the Contract for the time specified in the Contract, then this bond is void; otherwise it remains in full force.

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

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

DATED ON _____.

CONTRACTOR AS PRINCIPAL

SURETY

Company Name

Company Name

Signature

Signature

Print Name & Title

Print Name & Title

(Corporate Seal)

(Corporate Seal)

AGENT or BROKER

Company Name

Address

Telephone

Licensed Florida Insurance Agent? Yes No

License #: _____

State of: _____

County of: _____

City of: _____

BID FORM
(Submit in triplicate)

For: IFB #14-0131CD- Rehabilitation of Headworks and Internal Recycle Pumps at the Southeast Water Reclamation Facility

Total Offer (Bid "A"): _____
Based on a completion time of 365 calendar days
Total Offer (Bid "B"): _____
Based on a completion time of 476 calendar days

Two schedules for completion of the Work shall be considered. Each Bid for completion by the specified stated time shall be offered as a separate "total offer". County has the sole authority to select the Bid based on the completion time which is in the best interest of County. Only one Award shall be made.

We, the undersigned, hereby declare that we have carefully reviewed the Bid Documents and with full knowledge and understanding of the aforementioned herewith submit this Bid, meeting each and every specification, term, and condition contained in the Invitation for Bid package, in its entirety.

We understand that the Invitation for Bid package, in its entirety, including but not limited to, all Specifications, terms, and conditions shall be made a part of any resulting Contract between Manatee County and the Successful Bidder. Failure to comply shall result in Contract default, whereupon, the defaulting Contractor shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by County, and agrees to forfeit his/her Bid Bond.

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

Bidder's Name: _____

Mailing Address: _____

Telephone: () _____ Fax: () _____

Email Address: _____

I, _____ attest that I have read, understand, and agree to the Local Preference policy of Manatee County.

I, _____ on [date(s)] _____ attest that I have visited the Project site(s) to familiarize myself with the full Scope of Work required for the Bid.

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

Authorized Signature(s): _____

Name and Title of Above Signer(s): _____

Date: _____

BID FORM

(Submit in Triplicate)

REHABILITATION OF HEADWORKS AND INTERNAL RECYCLE PUMPS AT THE SOUTHEAST WATER RECLAMATION FACILITY

Bid "A" Based on Completion Time of 365 Calendar Days

ITEM NO.	DESCRIPTION	EST. QTY.	U/M	UNIT PRICE	EXTENDED PRICE
MOBILIZATION/DEMOBILIZATION					
1	MOBILIZATION/ DEMOBILIZATION	1	LS	\$	\$
SUBTOTAL (MOBILIZATION/DEMOBILIZATION ONLY)					
INTERNAL RECYCLE PUMP (IRP) REHABILITATION					
2	IRP REMOVAL AND DISPOSAL OF GRIT MATERIAL	1,400	CY	\$	\$
3	IRP PRESSURE WAH BASIN/ STRUCTURAL INSPECTION	2	LS	\$	\$
4	IRP PIPING, ASSEMBLIES, AND MECHANICAL ADJUSTMENTS	2	LS	\$	\$
5	IRP ELECTRICAL AND INSTRUMENTATION	1	LS	\$	\$
6	IRP ANOXIC/AEROBIC BASIN STRUCTURAL REPAIRS				
a	CONTROL JOINT REPAIR- GROUT INJECTION	400	GAL	\$	\$
b	CONCRETE CRACK REPAIR	2,000	LF	\$	\$
c	CONCRETE SPALLING REPAIR	3,000	CF	\$	\$
7	IRP PUMPS	4	EA	\$	\$
SUBTOTAL (INTERNAL RECYCLE PUMPS REHABILITATION ONLY)					

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate)

REHABILITATION OF HEADWORKS AND INTERNAL RECYCLE PUMPS AT THE SOUTHEAST WATER RECLAMATION FACILITY

Bid "A" Based on Completion Time of 365 Calendar Days

ITEM NO.	DESCRIPTION	EST. QTY.	U/M	UNIT PRICE	EXTENDED PRICE
HEADWORKS REHABILITATION					
8	HEADWORKS CONVEYOR ASSEMBLIES	2	EA	\$	\$
9	HEADWORKS MECHANICAL SCREEN ASSEMBLIES	3	EA	\$	\$
10	HEADWORKS VORTEX GRIT REMOVAL SYSTEM ASSEMBLIES	2	EA	\$	\$
11	HEADWORKS PIPING, ASSEMBLIES AND MECHANICAL ADJUSTMENTS	1	LS	\$	\$
12	HEADWORKS NEW CHANNEL LINER SYSTEM	810	SF	\$	\$
13	HEADWORKS STRUCTURAL DECK REPAIR AND CONCRETE COATING	2,160	SF	\$	\$
14	HEADWORKS ELECTRICAL AND INSTRUMENTATION	1	LS	\$	\$
	SUBTOTAL (HEADWORKS REHABILITATION ONLY)				\$
	TOTAL BASE BID "A" - Based on Completion Time of <u>365</u> Calendar Days				\$
15	CONTRACT CONTINGENCY WORK (USED ONLY WITH COUNTY APPROVAL)		10% OF TOTAL BASE BID		\$
	TOTAL OFFER FOR BID "A" with Contract Contingency - Based on Completion Time of <u>365</u> Calendar Days				\$

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate)

REHABILITATION OF HEADWORKS AND INTERNAL RECYCLE PUMPS AT THE SOUTHEAST WATER RECLAMATION FACILITY

Bid "B" Based on Completion Time of 476 Calendar Days

ITEM NO.	DESCRIPTION	EST. QTY.	U/M	UNIT PRICE	EXTENDED PRICE
MOBILIZATION/DEMOBILIZATION					
1	MOBILIZATION/ DEMOBILIZATION	1	LS	\$	\$
SUBTOTAL (MOBILIZATION/DEMOBILIZATION ONLY)					
INTERNAL RECYCLE PUMP (IRP) REHABILITATION					
2	IRP REMOVAL AND DISPOSAL OF GRIT MATERIAL	1,400	CY	\$	\$
3	IRP PRESSURE WAH BASIN/ STRUCTURAL INSPECTION	2	LS	\$	\$
4	IRP PIPING, ASSEMBLIES, AND MECHANICAL ADJUSTMENTS	2	LS	\$	\$
5	IRP ELECTRICAL AND INSTRUMENTATION	1	LS	\$	\$
6	IRP ANOXIC/AEROBIC BASIN STRUCTURAL REPAIRS				
a	CONTROL JOINT REPAIR- GROUT INJECTION	400	GAL	\$	\$
b	CONCRETE CRACK REPAIR	2,000	LF	\$	\$
c	CONCRETE SPALLING REPAIR	3,000	CF	\$	\$
7	IRP PUMPS	4	EA	\$	\$
SUBTOTAL (INTERNAL RECYCLE PUMPS REHABILITATION ONLY)					

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate)

REHABILITATION OF HEADWORKS AND INTERNAL RECYCLE PUMPS AT THE SOUTHEAST WATER RECLAMATION FACILITY

Bid "B" Based on Completion Time of 476 Calendar Days

ITEM NO.	DESCRIPTION	EST. QTY.	U/M	UNIT PRICE	EXTENDED PRICE
HEADWORKS REHABILITATION					
8	HEADWORKS CONVEYOR ASSEMBLIES	2	EA	\$	\$
9	HEADWORKS MECHANICAL SCREEN ASSEMBLIES	3	EA	\$	\$
10	HEADWORKS VORTEX GRIT REMOVAL SYSTEM ASSEMBLIES	2	EA	\$	\$
11	HEADWORKS PIPING, ASSEMBLIES AND MECHANICAL ADJUSTMENTS	1	LS	\$	\$
12	HEADWORKS NEW CHANNEL LINER SYSTEM	810	SF	\$	\$
13	HEADWORKS STRUCTURAL DECK REPAIR AND CONCRETE COATING	2,160	SF	\$	\$
14	HEADWORKS ELECTRICAL AND INSTRUMENTATION	1	LS	\$	\$
	SUBTOTAL (HEADWORKS REHABILITATION ONLY)				\$
	TOTAL BASE BID "B" - Based on Completion Time of <u>476</u> Calendar Days				\$
15	CONTRACT CONTINGENCY WORK (USED ONLY WITH COUNTY APPROVAL)		10% OF TOTAL BASE BID		\$
	TOTAL OFFER FOR BID "B" with Contract Contingency - Based on Completion Time of <u>476</u> Calendar Days				\$

Bidder Name: _____

Authorized Signature: _____

MAILING LABEL

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

MAILING LABEL TO AFFIX TO OUTSIDE OF SEALED BID PACKAGE:

SEALED BID - DO NOT OPEN

CONTRACTOR: _____

SEALED BID NO: 14-0131CD

**BID TITLE: Rehabilitation of Headworks and Internal Recycle
Pumps at the Southeast Water Reclamation Facility**

DUE DATE/TIME: _____ @ _____

FORM A
CONTRACTOR'S QUESTIONNAIRE
(Submit in Triplicate)

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

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID

1. Contact Information:

License #: _____

License Issued to: _____

Date License Received (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? _____

BIDDER: _____

6. Attach a list of projects where this specific type of Work was performed.
7. Describe and give the date and County of the last three government or private work of similar scope you've completed which are similar in cost, type, size, and nature as this Project. Include contact name and phone number. Provide the budget, actual cost, size and summary of work for each project. Attach additional pages as necessary. (Note: If listing a Manatee County reference, contact person should not be directly associated with this Project.

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

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

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

BIDDER: _____

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

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

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

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

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

Surety's Name: _____
Address: _____

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

Agent's Name: _____
Address: _____

Phone: _____
Email: _____

BIDDER: _____

FORM B
PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

**SWORN STATEMENT PURSUANT TO ARTICLE V,
MANATEE COUNTY PURCHASING ORDINANCE**

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

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

_____ [Print individual's name and title]

_____ for _____ [print name of entity submitting sworn statement]

whose business address is _____

and (if applicable) its Federal Employer Identification Number (FEIN) is _____. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement:

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

- (1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or
- (2) been convicted of an agreement or collusion among Bidders or prospective Bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or
- (3) been convicted of a violation of an environmental law that, in the sole opinion of County's Purchasing Official, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or
- (4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or
- (5) where an officer, official, agent or employee of a business entity has been convicted of or has admitted guilt to any of the crimes set forth above on behalf of such an entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common Board of Directors. For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests among family members, shared organization of a business entity following the ineligibility of a business entity under this Article, or using substantially the same management, ownership or principles as the ineligible entity.

(Continued)

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

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

[Signature]

STATE OF FLORIDA
COUNTY OF _____

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

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

Notary Public Signature My commission expires _____

[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.

FORM C
SWORN STATEMENT
THE FLORIDA TRENCH SAFETY ACT

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

1. This Sworn Statement is submitted with IFB No. 14-0131CD
2. This Sworn Statement is submitted by _____ whose business address is _____ and, if applicable, its Federal Employer Identification Number (FEIN) is _____. If the entity has no FEIN, include the Social Security Number of _____ the individual signing this sworn statement _____.
3. Name of individual signing this Sworn Statement is: _____, Whose relationship to the above entity is: _____.
4. The Trench Safety Standards that will be in effect during the construction of this Project shall include, but are not limited to: Laws of Florida, Chapters 90-96, TRENCH SAFETY ACT, and OSHA RULES AND REGULATIONS 29 CFR 1926.650 Subpart P, effective October 1, 1990.
5. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless County and Engineer, and any of their agents or employees from any claims arising from the failure to comply with said standard.
6. The undersigned has appropriated the following costs for compliance with the applicable standards:

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

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

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

 (AUTHORIZED SIGNATURE / TITLE)

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

(Impress official seal)

Notary Public, State of Florida: _____

My commission expires: _____



R. B. "Chips" Shore

CLERK OF THE CIRCUIT COURT AND COMPTROLLER OF MANATEE COUNTY

1115 Manatee Avenue West, Bradenton, Florida 34205 - Phone (941) 749-1800 – Fax (941) 741-4082
P.O. Box 25400, Bradenton, Florida 34206 - www.manateeclerk.com

E PAYABLES APPLICATION

Company
name _____

Contact
person _____

Phone
number _____

Email
Address _____

FINANCE USE ONLY

Open orders: YES or NO

PEID _____

CREATE DATE _____

CONFIRMED WITH _____

Name and phone number

IFAS _____

BANK _____

INITIALS _____

Return completed form to:
Via email to:
lori.bryan@manateeclerk.com
Via fax to: (941) 741-4011
Via mail:
PO Box 1000
Bradenton, Fl 34206

Revised: June 26, 2013

"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

CONTRACT DOCUMENTS
TECHNICAL SPECIFICATIONS
FOR
Manatee County
SEWRF Headworks and Internal Recycle Pump Rehabilitation
PROJECT # 6083580 & 6083380

December 2013

PROJECT OWNER:

County of Manatee, Florida
c/o Manatee County Purchasing Division
1112 Manatee Avenue West
Bradenton, Florida 34205
(941) 748-4501

PREPARED BY:

Kimley-Horn and Associates
655 North Franklin Street, Suite 150
Tampa, Florida 33609
(813) 620-1460
CA# 00000696

INFRASTRUCTURE ENGINEERING STANDARD SPECIFICATIONS

DIVISION 1 GENERAL REQUIREMENT

01005	GENERAL REQUIREMENTS
01010	SUMMARY OF WORK
01015	CONTROL OF WORK
01030	SPECIAL PROJECT PROCEDURES
01045	CUTTING AND PATCHING
01050	FIELD ENGINEERING AND SURVEYING
01090	REFERENCE STANDARDS
01150	MEASUREMENT AND PAYMENT
01152	REQUESTS FOR PAYMENT
01153	CHANGE ORDER PROCEDURES
01200	PROJECT MEETINGS
01310	CONSTRUCTION SCHEDULE & PROJECT RESTRAINTS
01340	SHOP DRAWINGS, PROJECT DATA AND SAMPLES
01370	SCHEDULE OF VALUES
01380	CONSTRUCTION PHOTOGRAPHS
01410	TESTING AND TESTING LABORATORY SERVICES
01510	TEMPORARY AND PERMANENT UTILITIES
01580	PROJECT IDENTIFICATION AND SIGNS
01600	MATERIAL AND EQUIPMENT
01620	STORAGE AND PROTECTION
01670	EQUIPMENT ALIGNMENT
01700	CONTRACT CLOSEOUT
01710	CLEANING
01720	PROJECT RECORD DOCUMENTS
01730	OPERATING AND MAINTENANCE DATA
01740	WARRANTIES AND BONDS

DIVISION 2 SITE WORK

02050	DEMOLITION
02064	MODIFICATIONS TO EXISTING STRUCTURES, PIPING AND EQUIPMENT
02100	SITE PREPARATION
02200	EARTHWORK
02260	FINISH GRADING
02276	TEMPORARY EROSION AND SEDIMENTATION CONTROL
02485	SEEDING AND SODDING
02575	PAVEMENT REPAIR AND RESTORATION
02999	MISCELLANEOUS WORK AND CLEANUP

DIVISION 3 CONCRETE

03200 CONCRETE REINFORCEMENT
03300 CAST-IN-PLACE CONCRETE
03350 CONCRETE FINISHES

DIVISION 5 METALS

05500 MISCELLANEOUS METAL

DIVISION 9 PAINTING

09865 SURFACE PREPARATION AND SHOP PRIME PAINTING
09900 PAINTING
09902 PIPE AND EQUIPMENT PAINTING
09930 PROTECTIVE EPOXY/POLYURETHANE TOPPING SYSTEM FOR
 CONCRETE SURFACES
09931 MASTIC EMBEDDED PLASTIC LINING FOR REHABILITATION OF CONCRETE
 SEWER STRUCTURES

DIVISION 11 EQUIPMENT

11315 MECHANICALLY CLEANED FINE BAR SCREENS
11316 SHAFTLESS SCREW CONVEYOR
11322 VORTEX GRIT REMOVAL SYSTEM
11386 HORIZONTAL AXIAL FLOW PROPELLER PUMP

DIVISION 13 CONTROLS AND INSTRUMENTATION

13300 CONTROLS AND INSTRUMENTATION GENERAL PROVISIONS

DIVISION 15 MECHANICAL

15050 PIPE AND PIPE FITTINGS – GENERAL STATEMENT
15062 DUCTILE IRON PIPE AND FITTINGS
15066 PLASTIC PIPE (GRAVITY SEWER)
15067 PLASTIC PIPE FOR PRESSURE SERVICE
15100 VALVES AND APPURTENANCES
15141 PIPE SUPPORT SYSTEMS

DIVISION 16 ELECTRICAL

16050 ELECTRICAL GENERAL PROVISIONS
16108 MISCELLANEOUS EQUIPMENT
16110 CONDUITS AND FITTINGS
16120 WIRES AND CABLES
16150 MOTORS
16152 INVERTER DUTY MOTORS
16160 PANELBOARDS
16370 VARIABLE FREQUENCY DRIVES
16450 GROUNDING
16950 TESTS AND INSPECTIONS

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 Engineer, 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 Engineer. 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 or not 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 Engineer. 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 Owner 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 Owner 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 Owner, 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 Owner, 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 Owner 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 Engineer.

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 Engineer, 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 Engineer 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 Engineer, 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 Engineer, should such errors or omissions be discovered. All schedules are given for the convenience of the Engineer 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

The names of proposed manufacturers, material men, suppliers and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for approval. Such approval must be obtained before shop drawings will be checked. No manufacturer will be approved for any materials to be furnished under this Contract unless he shall be of good reputation and have a plant of ample capacity. He shall, upon the request of the Engineer, be required to submit evidence that he has

manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the Engineer, that the manufacturer or subcontractor deal directly with the Engineer. 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 Engineer 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 Engineer 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 neophrene 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 Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner 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 Owner 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 Engineer 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 Engineer 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 Owner.

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 Owner formally takes over the operation thereof.

B. Costs

All inspection and testing of materials furnished under this Contract will be performed by the Owner 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 Owner for compliance. The Contractor shall reimburse the Owner 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 Engineer, 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 Engineer 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 Engineer 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 Engineer 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 Owner. 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 Engineer 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 Owner, 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 Owner 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 Owner 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 Engineer 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 Engineer, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced.

The Engineer 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 Owner/Engineer. 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 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 Engineer, 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 Engineer. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be given to the Engineer.

Prior to the beginning of any excavations, the Contractor shall advise the Owner 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 Owner may order the Contractor, for the convenience of the Owner, to remove trees along the line or trench excavation. If so ordered, the Owner 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 Engineer. 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 Engineer 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 Engineer, 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 Engineer which results from his construction operations.

B. Protection of Wetland Areas

1. 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 insofar as is possible. Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in the Special Provisions.

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.

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:
1. Removal and replacement of the mechanical bar screen units, conveyors, grit removal systems, and associated equipment. Removal and relocation of the existing electrical and control systems in the Headworks structure to the MCC Building No.2. Installation of a PVC channel liner and structural repairs to the eastern concrete channel. Repair and resurfacing of the existing concrete deck with specified coating and any other additional work requirements covered in these contract documents.
 2. Removal and replacement of the internal recycle pumps and motors, piping, valves, and electrical and control equipment. Cleaning and structural repair of the oxidation ditch basins. Disposal of the grit material and any additional requirements covered in these contract documents
- 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 Owner.
- 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. Headwork's Shutdown:
1. See recommended Phasing Plan, Sheet G-0.5 of construction plans.
- B. Anoxic/aeration Basins Shutdown:
1. Only one oxidation ditch can be out of service for rehabilitation at a time.
 2. Contractor shall complete all work on the northern basin before beginning construction on the southern basin. Work includes, cleaning and removal of existing grit material, concrete and steel repairs, replacement of valves, piping, pumps and motors, and startup and testing.
 3. Engineer will visit the site after each oxidation ditch has been emptied and cleaned

to evaluate the condition of the tanks and make recommendations for repairs, including design of minor repairs such as cracking and spalding of concrete.

4. Contractor shall coordinate with plant staff on sequence of anoxic/aeration basin shutdown requirements.

C. All work done under this Contract shall be done with a minimum of inconvenience to the users of the system or facility.

D. The Contractor shall, if necessary and feasible, construct the work in stages to accommodate the Owner's use of the premises during the construction period; coordinate the construction schedule and operations with the Owner's Representative.

E. 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.

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. Owner's Use.
3. Public Use.

B. Coordinate use of work site under direction of Owner'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 Owner or separate contractor.

E. Obtain and pay for the use of additional storage of work areas needed for Contractor operations.

1.05 OWNER 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 Owner, 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 Owner 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 Owner has the option of not accepting the entire work as a whole until it is completed, tested and approved by the Owner.

1.06 PARTIAL OWNER OCCUPANCY

The Contractor shall schedule his operations for completion of portions of the Work, as

designated, for the Owner'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 Engineer 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 Engineer 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 Engineer 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 Engineer 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 Engineer 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 Engineer 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 Engineer, permanent relocation of a utility owned by the Owner is required, he 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 Owner will notify the utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner 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 Engineer.

- 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 Engineer as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be regarded 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 Engineer. 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 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.

1.10 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 Engineer well in advance of the interruption of any flow.

1.11 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.

1.12 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 Engineer.

1.13 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 Engineer. 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 Engineer. 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 Owner.

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 Owner 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 Engineer. The costs for obtaining all permits shall be borne by the Contractor.

Manatee County Building Permit has already been obtained by the County and is ready for pickup by the contractor at Building and Development Services. The Permit fee has also already been paid.

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 Owner/Engineer. 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 Owner. The termination point for each contract shall be as shown on the Contract Drawings.

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 Engineer.

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.
- 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 Engineer 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 Engineer.
- 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 should not exceed 75% of the max deflection and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated in the Drawings. However, when in the opinion of the Engineer 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 Engineer and Owner a Hurricane Preparedness Plan. The plan should outline the necessary measures which the Contractor proposes to perform at no additional cost to the Owner in case of a hurricane warning.
- B. In the event of inclement weather, or whenever Engineer 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 Engineer, 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 Engineer and if so shall be protected for a reasonable time until picked up by the Owner. Any equipment or material not worthy of

salvaging, as directed by the Engineer, 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.

1.10 ADDITIONAL PROVISIONS

- A. Before commencing work on any of the existing pipelines, structures or equipment, the Contractor shall notify the Engineer, in writing, at least 10 calendar days in advance of the date he proposes to commence such work.
- B. The Contractor shall provide, at his own expense, all necessary temporary facilities for access to and for protection of, all existing facilities. The Owner'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 Engineer.

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 Owner 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 Owner 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 Owner.
- 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 Owner 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 Owner 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 Owner.
- B. The Contractor shall prepare and submit a fuel storage / spill abatement plan prior to start of construction if required.

1.15 EXISTING FACILITIES - PLAN OF OPERATION

- A. The functions of the existing wastewater treatment facility include screening, grit removal, aeration, secondary clarification, sludge recycle, sludge wasting, filtration, chlorine disinfection prior to discharge to the MARS System, sludge digestion and sludge dewatering facilities. These functions must be maintained and shall be maintained by the contractor throughout the construction period unless otherwise specified herein, such that there is no deterioration in the quality of the treated effluent. At no time will an overflow of wastewater of a quality less than that which meets the County's discharge permit and which is not disinfected as required by State regulations, be allowed as a result of the Contractor's operations. Construction operations shall be scheduled and undertaken so that treatment of the wastewater is continuously maintained, as specified above, throughout the life of the project. The existing limitations for the facility must be met during the construction period.
- B. All electrical work shall be scheduled to allow continuous electrical operation of the existing facilities with a minimum of required outages. Any power outage or any work which required interruption of the plant flow shall be scheduled during a normally dry weather period of the year and at those times of the day and/or night when sewage flows are low. In such cases, the Contractor shall submit a written request at least seven days prior to the scheduled work or outage and obtain the written permission of the Owner. Such permission shall give consideration to recent weather conditions and plant flow patterns, as well as projected weather forecasts for the area, and the Contractor's preparedness to perform the work. The Contractor shall coordinate with the electric utility, as required, regarding the scheduling of the power outages.

C. The Contractor shall prepare a detailed construction sequence to maintain continuous treatment to allow the facility to meet the required effluent limitations. Continuous treatment shall be defined, at a minimum, as consisting of the following unit processes:

- Screening
- Grit Removal
- Aeration & Mixing of Existing Oxidation Ditches
- Secondary Clarification
- Sludge Recycle
- Sludge Wasting
- Filtration of Plant Water
- Disinfection
- Effluent Pumping and Flow Measurement
- Plant Water System
- Aerobic Digestion
- Sludge Dewatering
- Odor Control

This plan shall require approval by the Engineer before any of the existing facilities are modified. In this plan he shall successfully demonstrate to the Engineer that the continuity and degree (quality) of treatment will not be adversely affected.

- 1) In development of his detailed construction sequence, the contractor shall give particular consideration to the following:

One anoxic/aerobic basin shall remain on line at all times. The Contractor shall provide two weeks advance notice of taking a basin off line or placing a basin on line. The maximum duration a basin shall be off line is three months.

Contractor shall coordinate with the Wastewater Treatment Plant personnel, two weeks in advance, all power interruptions.

All other work including new construction and demolition not mentioned in the above schedule may be performed concurrently with any stage of the work as long as the performance of such work will in no way jeopardize the continuity and quality of treatment of wastewater. The Contractor shall coordinate his work closely with the ongoing functions of the existing treatment facility, chemical and other deliveries and with the work of all subcontractors.

D. As part of the construction sequence, the Contractor may find that temporary pumping facilities and temporary piping will be required for wastewater or other process streams. These facilities or other means that the Contractor elects shall be subject to the review and approval of the Engineer and shall be provided by the Contractor to maintain continuous process operations. The Contractor shall prepare a detailed construction sequence to maintain continuous treatment to allow the facility to meet the required effluent limitations. Continuous treatment shall be defined, at a minimum, as consisting of the processes listed in section 1.15C of this specification.

- E. Any process equipment, utility, etc. necessary to maintain treatment must be maintained. The primary goal is to maintain continuous treatment to the required levels.
- F. The Owner's personnel shall be responsible for the day-to-day operations including meter reading, process monitoring, and establishing control system modifications to ensure compliance with the effluent limits. Maintenance of temporary process equipment including routine corrective repairs and maintenance shall be performed by the Contractor as part of the base bid price. Operational changes (valves, etc.) shall be performed by the Owner or the Owner's representative.
- G. A minimum 10-ft road must be maintained for traffic within the plant at all times during work that is parallel to the road. Road closures required for utility crossings of the road shall be scheduled two weeks in advanced. Detour signs shall be provided to reroute traffic.
- H. Additional Requirements
 - 1) Anoxic/Aerobic Basins:

The Contractor shall clean the anoxic/aerobic basins in accordance with the Bid Item of Technical Specification 01150-Measurement and Payment.

Subsequent to the cleaning of the anoxic/aerobic basins, the Contractor shall allow the Engineer to perform a structural integrity review of the basins. The Contractor shall coordinate this task two weeks in advance with the Engineer.

The Contractor shall hire the services of an independent testing company to test the power and control wire from Electrical Building No.1 to each of the internal recycle pumps.
 - 2) Headworks Facility:

See recommended Phasing Plan, Sheet G-0.5 of construction plans.
- I. The Contractor shall make whatever provisions are necessary to protect and maintain the continued operation of the existing facilities. Such provisions shall include, but not be limited to the following.
 - 1) Protection of the structural integrity of the existing oxidation ditches and headworks facility adjacent to work shall be provided as necessary and required for the successful rehabilitation and modification.
 - 2) Installation of suitable temporary piping to replace those which must be demolished as part of the construction or as otherwise required to maintain continuous treatment.
 - 3) Access to each of the buildings or process structures.
- J. In addition to the master schedule, prior to commencing alteration work on any existing facility, The Contractor shall submit to the Engineer, a proposed method and schedule of construction in the immediate area, taking into account the precautions and requirements

specified herein. Such work shall not commence until approval is obtained with the Engineer and interruptions of normal plant operations reviewed with the Owner. In general, temporary isolation of existing plant components for construction operations shall be carefully coordinated beforehand with the Owner and Engineer so that treatment of wastewater can continue. All work shall be closely coordinated with the Owner's operating personnel so that they can adjust their normal operating procedures to any temporary conditions imposed upon them. No temporary isolation of plant components will be permitted until the Contractor has on hand all materials, labor, tools and equipment necessary to accomplish the work in that isolated area. Such work shall begin immediately and be expedited to satisfactory completion as soon as particular area or plant component has been isolated.

- K. The Contractor shall assist the Owner in maintaining any process equipment, utility, etc., necessary to maintain continuous treatment. Any such equipment that must be relocated, either temporarily or permanently, or any process equipment, utilities, etc., that must be installed, either temporarily or permanently, to maintain wastewater treatment shall be the responsibility of the General Contractor. The Contractor shall include the cost of all temporary facilities required to maintain treatment, meeting secondary standards, during the construction period in his bid prices. The cost shall include the cost of all labor, tools, equipment and materials necessary.
- L. The Contractor shall coordinate the Staging Area with the Owner, plant, and landfill staff. There will be multiple projects under construction at the facility and it will be the Contractor's responsibility to provide a secure area for the storage and staging of equipment, including but not limited to fencing, gates, and any additional items that may be necessary to secure the area.

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 Engineer. Do not proceed with work until Engineer 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 field surveying service required for the project.
- B. The Contractor shall furnish and set all necessary stakes to establish the lines and grades as shown on the Contract Drawings and layout each portion of the Work of the Contract.

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 Engineer.

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 Engineer.

Report to Engineer 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 th 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 Owner/Engineer 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

Where payment for items is shown to be paid for on a lump sum basis, no separate payment will be made for any item of work required to complete the lump sum items. Lump sum contracts shall be complete, tested and fully operable prior to request for final payment.

Contractor may be required to provide a break-down of the lump sum totals.

1.07

UNIT PRICE ITEM

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.

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 Owner until as-built (record) drawings have been submitted and approved by the Engineer.

1. Shop Drawings, Working Drawings.
2. Clearing, grubbing and grading except as hereinafter specified.
3. Trench excavation, including necessary pavement removal and rock removal, except as otherwise specified.
4. Dewatering and disposal of surplus water.
5. Structural fill, backfill, and grading.
6. Replacement of unpaved roadways, and shrubbery plots.
7. Cleanup and miscellaneous work.
8. Foundation and borrow materials, except as hereinafter specified.
9. Testing and placing system in operation.
10. Any material and equipment required to be installed and utilized for the tests.
11. Pipe, structures, pavement replacement, asphalt and shell driveways and/or appurtenances included within the limits of lump sum work, unless otherwise shown.
12. Maintaining the existing quality of service during construction.
13. Maintaining or detouring of traffic.
14. Appurtenant work as required for a complete and operable system.
15. Seeding and hydromulching.
16. As-built Record Drawings.
17. Project Sign

BID ITEM NO.1 - MOBILIZATION/ DEMOBILIZATION

Measurement and payment for the Mobilization Bid Item shall include full compensation for the required 100 percent (100%) Performance Bond, 100 Percent (100%) Payment Bond, all required insurance for the project, and any permits not already obtained by the County. This may include those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site and for the establishment of temporary offices, safety equipment and first aid supplies, and sanitary and other facilities/utilities. The mobilization pay item also includes demobilization of all equipment, personnel, supplies and incidentals from the project site upon final completion. Payment for mobilization shall not exceed 10 percent (10%) of the total Contract cost unless the Contractor can prove to the County that his actual mobilization cost exceeds 10 percent (10%). The basis of payment for all work associated with Mobilization shall be paid for under the Lump Sum Pay Item and in accordance with the following schedule:

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

BID ITEM NO.2 - IRP REMOVAL AND DISPOSAL OF GRIT MATERIAL

Payment for all work included under this Bid Item shall represent full compensation in accordance with the unit price bid per cubic yard for the removal and disposal of grit volume contained in the designated tanks as defined in the contract document. Contractor shall be responsible to remove, dewater, haul, and dispose of any accumulated grit remaining in the basins after they have been drained. The contractor shall coordinate with the Owner to drain the basins at its desired rate to the extent reasonably possible using the existing basin drains or other methods. Grit material shall be considered what is remaining in the basins after the basin has been drained and biosolids have been removed to the extent reasonably possible using conventional methods. Contractor shall also be responsible to dispose of the centrate produced from its dewatering efforts. This may be disposed of at the plant at a rate acceptable to the County. It is anticipated that this range would be 150 gpm or less.

Measurement for the removal and disposal of grit material shall be by the cubic yard of accumulated grit removed as measured in the disposal truck by the Engineer to the nearest whole cubic yard.

BID ITEM NO. 3 - IRP PRESSURE WASH BASIN/ STRUCTURAL INSPECTION

Payment for all work included under this Bid Item shall represent full compensation in accordance with two (2) lump sum price bids for the pressure wash and inspection of equipment associated with each anoxic/aerobic basin. Following the removal of the grit material, the basin walls, floors and ceilings shall be pressure washed to allow the engineer to perform a visual inspection of the basins' structural integrity. The Contractor shall provide one scissor lift w/ wheels, two ladders of sufficient length, and the required OSHA safety equipment to provide a means for the inspector to enter and exit the basins and to perform his inspection as part of this bid item.

Measurement for periodic payments of this lump sum bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO. 4 - IRP PIPING, ASSEMBLIES, AND MECHANICAL ADJUSTMENTS

Payment for all work included under this Bid Item shall represent full compensation in accordance with two (2) lump sum price bids for all piping, assemblies and any mechanical adjustments associated with each anoxic/aerobic basin. This item includes demolition of existing piping and appurtenances and modification of existing concrete pipe supports. This items also includes proposed all piping, pipe supports, pipe appurtenances, link seals, fittings, valves, restraints, connections to existing pipe penetrations, any mechanical

adjustments needed, priming and coating of all pipe, appurtenances, and equipment, and all other materials and equipment necessary for a complete and fully operable system, including testing and start-up, all as shown in the Contract Documents ready for approval.

Measurement for periodic payments of this lump sum bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO.5 - IRP ELECTRICAL AND INSTRUMENTATION

Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the Internal Recycle Pump Electrical and Instrumentation work including new conduit and wiring; new flow meters; new variable frequency drives (VFDs); modification of existing MCC (motor control center), modifications to existing SCADA Panel No. 2, testing of power and control wiring to each of the internal recycle pumps; testing of power and control wiring to each of the flow meters; and all other materials and equipment necessary for a complete and fully operable system, including testing and start-up, all as shown on the Contract Documents, ready for approval by the Engineer and acceptance by the Owner.

Measurement for periodic payments of this lump sum bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO.6 - IRP ANOXIC/AEROBIC BASIN STRUCTURAL REPAIRS

This payment item is for the structural repairs to be determined by Owner after basins have been dewatered and structurally inspected. Work requires authorization from the owner prior to work being performed. This item is not to cover work outlined in the plans and/or specifications for work incidental to the completion of the project as outlined herein, and shall only be used when directed by owner.

Payment for all work included under this Bid Item shall represent full compensation in accordance with three unit price bids per quantity and work shown below to repair anoxic/aerobic basins as defined in the contract document.

- Unit Price per Gallon of Injection Material to repair control joints in basin walls.
- Unit Price per Linear Feet to repair concrete cracking with basins.
- Unit Price per Cubic Feet to repair concrete spalling and exposed steel within basins.

Payment shall be made based on written authorization of the additional work. The authorization shall reflect the actual amounts agreed to by the Contractor and the Owner.

All work performed under Bid Item No. 6 shall be submitted to the Engineer and Owner for review and approval. However, no work shall be performed without written authorization to proceed.

BID ITEM NO. 7 - IRP PUMPS

Payment for all work included under this Bid Item shall be made at the applicable Contract unit price bid per each of the four (4) axial flow propeller pump, including suction/discharge elbow, packing box, mechanical seal, propeller, sweep liner, pump shaft, shaft sleeve, shaft coupling, bearing frame, oil seals, base plate, cleanout, variable speed electric motor and back pull-out assembly. Line item also includes the demolition and removal of existing pumps and modification of concrete pedestal as well as installation and laser alignment of each pump, and all other materials and equipment necessary for a complete and fully operable system, including testing and start-up, all as shown on the Contract Documents, ready for approval by the Engineer and acceptance by the Owner

Measurement for periodic payments of this unit price bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO. 8 - HEADWORKS CONVEYOR ASSEMBLIES

Payment for all work included under this Bid Item shall represent full compensation in accordance with the unit price bid for the removal and replacement of two screening conveyors, and construction of associated piping and valves; and all other materials and equipment necessary for a complete and fully operable system, including testing and start-up, all as shown on the Contract Documents, ready for approval by the Engineer and acceptance by the Owner.

Measurement for periodic payments of this unit price bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO. 9 - HEADWORKS MECHANICAL SCREEN ASSEMBLIES

Payment for all work included under this Bid Item shall represent full compensation in accordance with the unit price bid for the removal and replacement of three (3) Mechanical Screens, and all other materials and equipment necessary for a complete and fully operable system, including testing and start-up, all as shown on the Contract Documents, ready for approval by the Engineer and acceptance by the Owner.

Measurement for periodic payments of this unit price bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO.10 - HEADWORKS VORTEX GRIT REMOVAL SYSTEM ASSEMBLIES

Payment for all work included under this Bid Item shall represent full compensation in accordance with the unit price bid for the removal and replacement of the existing two (2) Vortex Grit Removal Systems consisting of two (2) Grit Pumps, two (2) Grit Classifiers, and two (2) Cyclone Units; construction of associated piping and valves; and all other materials and equipment necessary for a complete and fully operable system, including testing and

start-up, all as shown on the Contract Documents, ready for approval by the Engineer and acceptance by the Owner.

Measurement for periodic payments of this unit price bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO. 11 - HEADWORKS PIPING, ASSEMBLIES, AND MECHANICAL ADJUSTMENTS

Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for all temporary bypassing equipment, piping, valves, assemblies, and mechanical adjustments. This item includes pipe support assemblies, fittings, valves, piping, restraints, stripping, trenching, backfilling, compaction, re sodding, removal and resurface of asphalt pavement, connections to existing pipe penetrations, pressure washing of the top deck, priming and coating of all pipe, appurtenances, and equipment, and any mechanical adjustments needed.

Measurement for periodic payments of this lump sum bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

BID ITEM NO. 12 - HEADWORKS NEW CHANNEL LINER SYSTEM

Payment for all work under this Bid Item shall represent full compensation in accordance with the unit price bid per square foot of replacement of the concrete channel liner.

Measurement for the new liner system shall be per actual square foot as shown on the Contract Drawings or as ordered by the Engineer in writing.

BID ITEM NO. 13 - HEADWORKS STRUCTURAL DECK REPAIR AND CONCRETE COATING

Payment for all work under this Bid Item shall represent full compensation in accordance with the unit price bid per square foot of Structural Deck Repair and Concrete Coating.

Measurement for the structural deck repairs and concrete coating shall be per actual square foot as shown in the Contract Documents or as ordered by the Engineer in writing.

BID ITEM NO. 14 - HEADWORKS ELECTRICAL AND INSTRUMENTATION

Payment for all work included under this Bid Item shall represent full compensation in accordance with the lump sum price bid for the Electrical and Instrumentation work including demolition of existing MCC's (motor control centers), panelboards, transformer, manual transfer switch and other miscellaneous electrical equipment; new conduit and wiring with any stripping, trenching, compaction, backfill and re sodding required; new MCC's (motor control centers), new panelboards, new transformer, new manual transfer switch and other miscellaneous electric equipment; removal and replacement of classifier and bar screen control panels, modifications to existing SCADA Panel No. 2, new conduit, ductbank, pull

boxes, junction boxes and wiring; testing of power and control wiring to each of the new components; and all other materials and equipment necessary for a complete and fully operable system, including testing and start-up, all as shown on the Contract Documents, ready for approval by the Engineer and acceptance by the Owner.

Measurement for periodic payments of this lump sum bid item will be in accordance with the approved Schedule of Values, to be supplied by the Contractor in accordance with the Contract Documents.

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 Owner and Contractor.

1.02 FORMAT AND DATA REQUIRED

- A. Submit payment requests in the form provided by the Owner with itemized data typed in accordance with the Bid Form.
- B. Provide construction photographs in accordance with Contract Documents.

1.03 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or Engineer 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: Change in contract scope, price or time that must be approved and executed by the Project Representative before it becomes effective.
- B. Administrative Contract Adjustment: Minor change order under 10% of project cost or 20% time, does not have to be Board approved.
- C. Field Directive: Change to contract quantity that does not require a change of price or time extension.

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 Engineer 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 DIRECTIVE

- A. In lieu of a Change Order, the Project Manager may issue a Field Directive for the Contractor to proceed with additional work within the original intent of the Project.
- B. Field Directive 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 Directive 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 Engineer/Owner 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 Owner'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 Owner, 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 Owner for approval. The Owner 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. Owner's definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as approved by the Owner.
 - 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 Owner and Contractor.

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

- A. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.
- B. Engineer will determine the allowable cost of such work, as provided in General Conditions and Supplementary Conditions.
- C. Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
- D. Owner and Contractor will sign and date the Change Order to indicate their agreement therewith.

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 Owner or Engineer 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. Owner's Engineer.
 - 2. Owner'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. Owner'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 Owner 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 Owner. 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 Owner. Such permission, however, may be revoked at any time by the Owner 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 Engineer to review Contractor's planning, scheduling, management and execution of the

work; to assist Engineer 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 Owner 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.
- 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 Engineer to review all submittals as set forth in the Contract Documents; items of work required of Owner 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 Owner.
- 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 Engineer, 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.

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 Engineer. 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 Engineer 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 Owner, 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.
- G. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

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 Engineer and Contractor at a monthly schedule meeting and Contractor will address Engineer'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 Engineer 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. Engineer shall have 10 calendar days after receipt of the submittal to respond. Upon receipt of Engineer's comments, Contractor shall make the necessary revisions and submit the revised schedule within 10 calendar days. The resubmittal, if concurred with by Owner, 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 Engineer. 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 Engineer.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PROJECT DATA AND SAMPLES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the Engineer 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 Owner and Engineer. This log should include the following items:
1. Submittal description and number assigned.
 2. Date to Engineer.
 3. Date returned to Contractor (from Engineer).
 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 Engineer 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 Engineer 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 Engineer 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 Engineer, with No Exceptions Taken or Approved As Noted.
- E. The Contractor shall submit to the Engineer 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 Engineer 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.
- 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 Engineer of the necessary Shop Drawings.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS AND WORKING DRAWINGS

- A. The Engineer'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.
- 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 Engineer, 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 Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting any exception.
- D. When reviewed by the Engineer, 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.
- 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 Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.

- 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 Engineer.
- G. The Engineer 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 Engineer's actual payroll cost.
- H. When the Shop and Working Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- 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 Engineer 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 Engineer 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 Engineer 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 Engineer where required by the Contract Documents or requested by the Engineer and shall be submitted at least thirty (30) days (unless otherwise specified by the Engineer) 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 Engineer, 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 Owner and Engineer shall not have responsibility therefor.

1.06 SAMPLES

- A. The Contractor shall furnish, for the review of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer 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 Engineer.

- 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 Engineer. 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 Engineer 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 Engineer 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 Engineer, 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.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Schedule of Values will be considered for approval by Engineer 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. Follow the bid sheets included in this Contract Documents as the format for listing component items for pipe lines.
- 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 Owner and Engineer 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 Engineer 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 Engineer on digital video disks (DVD) for the permanent and exclusive use of the Engineer 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 Engineer. In addition, no progress payments shall be made until the preconstruction video recordings are accepted by the Engineer.

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. Owner 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. Owner 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 Engineer 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 Owner 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 Owner 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 Engineer.
- H. If the test results indicate the material or equipment complies with the Contract Documents, the Owner 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 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. One 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 Owner.
 - 4. Prime Contractor.
- B. Graphic design, style of lettering and colors: As approved by the Owner and Engineer.
- C. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the Owner.

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.

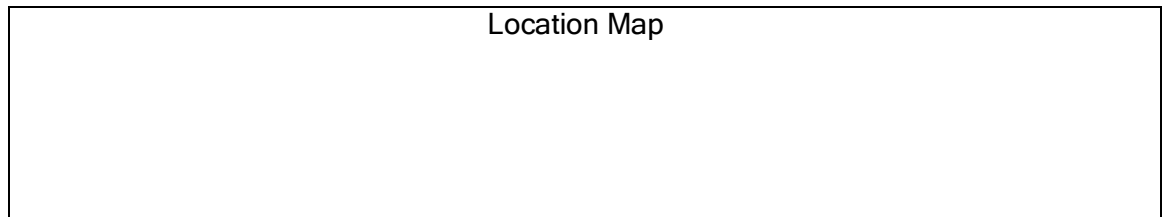
1.05 PUBLIC NOTIFICATION

- 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:

- | | |
|---|--|
| <ul style="list-style-type: none"> A. Contractor
Contractor Address
Contractor Phone (Site Phone) B. Project Inspector
Inspector Phone Number | <ul style="list-style-type: none"> Project Manager
PM Address
PM Phone No. & Ext. |
|---|--|

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 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 Engineer.
 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 Engineer. 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 Engineer 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 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 Engineer. 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 Engineer.
 - 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 Engineer 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 - 01670 EQUIPMENT ALIGNMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Summary of Work: This specification section covers furnishing all labor, materials, and equipment for the alignment of shaft coupled machines to eliminate premature machine failure due to misalignment. This section provides general information and should not be relied on solely for the alignment requirements. The CONTRACTOR shall submit detailed descriptions of the alignment methods proposed for the equipment specified. The focus of the details in regard to the alignment requirements should be specified in the section that pertains to the equipment.

1.02 DEFINITIONS

The following definitions apply to this specification:

ACCESSIBLE: The ability to reach and adjust the aligning feature. Consideration should be given to confined space restrictions, removing guards, bushing plates, hydraulic lines, lubrication lines, electric lines etc.

ALIGNMENT TARGET SPECIFICATIONS: Desired intentional offset and angularity at coupling center to compensate for thermal growth and/or dynamic loads. Most properly specified as an OFFSET, and an angle in two perpendicular planes, horizontal and vertical.

ANGULAR ERROR: A misalignment condition characterized by the angular error between the desired centerline and the actual centerline. This misalignment condition may exist in planes both horizontal and vertical to the axis of rotation.

ANGULARITY: The angle between the rotational centerlines of two shafts. Angularity is a "slope" expressed in terms of a rise (millimeters or thousandths of an inch) over a run (meter or inches).

AXIAL PLAY, AXIAL FLOAT, END FLOAT: Shaft axial movement along its centerline caused by axial forces, thermal expansion or contraction, and permitted by journal bearings, sleeve bearings and/or looseness.

BASE PLATE: The surface often made of steel plate or cast iron, to which the feet of a machine are attached.

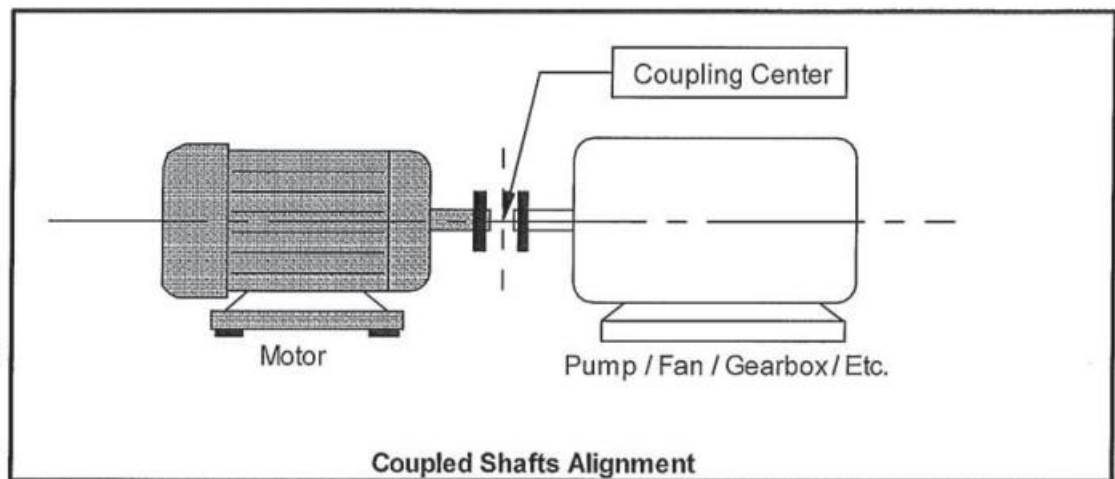
CO-LINEAR: Co-linear means two lines that are positioned as if they were one line. Co-linear as used in alignment means two or more centerlines of rotation with no offset or angularity between them. Two or more lines are co-linear when there is no offset or angularity between them (i.e. they follow the same path).

COPLANAR: The condition of two or more surfaces having all elements in one plane.

COUPLING POINT: The phrase "COUPLING POINT" in the definition of SHAFT

ALIGNMENT is an acknowledgment that vibration due to misalignment originates at the point of power transmission, the coupling. The shafts are being aligned and the coupling center is just the measuring point.

COUPLED SHAFTS ALIGNMENT: Coupled shaft alignment is the positioning of two or more machines so that the rotational centerlines of their shafts are co-linear at the coupling center under operating conditions.



ECCENTRICITY: The distance of the axis from the geometric center. The axis could be the shaft axis or the rotating center defined by the bearings.

FULL BEARING FITTING SPACE BLOCK: A single spacer block used for aligning the machine tool in the vertical plane.

FLATNESS: The condition of a surface having all elements in one plane. As used in this specification, a flat is a small surface flush with or cut into a BASE PLATE, machined flat, and co-planar with the other flats in the base plate. The flats support the Shims and/or feet of the machine to be installed. A pad is a small block of metal that serves to elevate the feet of the machine above the surface of the base plate. Pads are commonly used to compensate for differences in machine center line heights, and for increased corrosion resistance by raising the machine feet out of any possible standing fluids. Pads and flats have holes drilled and tapped in their centers to accept hold down bolts.

HORIZONTAL: Parallel to the mounting surface.

JACKBOLTS, JACKSCREWS, PUSH/PULL BLOCKS: Positioning bolts on the machine base which are located at, each foot of the machine and are used to adjust the position of the machines. Bolts mounted on the machine base or foundation, optimally at the machine foot locations, which provides exact control in positioning the machine.

LEVEL: Parallel to a reference plane or a reference line established by a laser.

MACHINE: The total entity made up of individual machine components such as motors, pumps, spindles, fixtures, etc. Also reference MACHINE COMPONENT.

MACHINE BASE: The structure that supports the machine or machine components under consideration.

MACHINE COMPONENT: An individual unit such as a motor, pump, spindle, fixture, etc. often referred to as a machine in its own context.

MACHINE DEPENDENT: A condition which is dependent on the machining operation and the design requirement of the part being machined.

OFFSET: The distance (in thousands of an inch or in millimeters) between two reference centerlines such as a spindle center line and a part characteristic centerline or the rotational centerlines of two parallel shafts.

OUT-OF-ROUNDNESS: Deviation from a perfect circle.

PITCH: An angular misalignment in the vertical plane.

POSITION ERROR (CENTERLINE/OFFSET MISALIGNMENT): A misalignment condition that exist when the spindle/shaft centerline is parallel but not in line with (not coincidental) with the desired alignment centerline.

PUSH-PULL BLOCKS: Side push-pull adjustment blocks used for aligning machine tool in horizontal plane.

QUALIFYING LEVEL POINTS: Qualified leveling points are locations which have their heights defined and must be in same plane. That plane must be parallel to the mounting surfaces of the slide assembly.

REPEATABILITY: The consistency of readings and results between consecutive sets of measurements.

RUN-OUT: The composite deviation of a circular part during one full rotation of 360 degrees. Run-out includes out-of-roundness, eccentricity and offset.

SHAFT ALIGNMENT: Positioning two or more machines (e.g. a motor driving a hydraulic pump(s), etc.) so that the rotational centerlines of their shafts are collinear at the coupling center under operation conditions

SPINDLE ALIGNMENT: The geometric relationship between the spindle axis or rotation and a reference datum.

SOFT FOOT: A condition that exists when the bottom of all of the feet of the machinery components are not on the same plane (can be compared to a chair with one short leg). Soft foot is present if the machine frame distorts when a foot bolt is loosened or tightened. It must be corrected before the machine is actually aligned.

PARALLEL SOFT FOOT: A parallel gap between the machine foot and its support surface.
ANGULAR SOFT FOOT: An angled gap between the machine foot and its support surface.

INDUCED SOFT FOOT: A type of soft foot that is caused by external forces, (pipe strain, coupling strain, etc.) acting on a machine independent of the foot to base plate connection.

“SQUISHY” SOFT FOOT: A type of soft foot characterized by material (shims, paint, rust, grease, oil, dirt, etc.) acting like a spring between the underside of the machine foot and the base plate contact area.

SPACER BLOCKS: See FULL BEARING FITTING SPACER BLOCK.

STRESS FREE CONDITION: The condition that exists when there are no forces acting on the structure of a machine, machine component, or machine base that would cause distortion in the structure such as bending, twist, etc.

THERMAL EFFECTS (GROWTH OR SHRINKAGE): This term is used to describe displacement of shaft axes due to machinery temperature changes (or dynamic loading effects) during start-up.

TOLERANCE, DEADBAND, WINDOW, OR ENVELOPE: An area where all misalignment forces sum to a negligible amount and no further improvement in alignment will reduce significantly the vibration of the machine or improve efficiency.

TOLERANCE VALUES: Maximum allowable deviation from the desired values, whether such values are zero or non-zero.

TRACKING/TRACKING ERROR: An angular MISALIGNMENT condition between spindle centerline and the machine way centerline. This condition may be present in both parallel and perpendicular to the way centerline.

VERTICAL: Perpendicular to the horizontal plane.

YAW MISALIGNMENT: An angular misalignment in the horizontal plane.

PART 2 EQUIPMENT AND MATERIALS

2.01 GENERAL REQUIREMENTS:

The alignment specialist shall employ the standard practices and use the necessary instruments to achieve the required alignment. Vibration shall not be used as a criterion to judge alignment. The alignment shall be judged with static measurement instruments fixture to shafts and judged in accordance with the allowable tolerance limits shown below.

- A. Measurement System: The measurement system shall be repeatable to within 0.002 inch when exercised through a complete cycle. The measurement system shall be checked for repeatability at the start of each alignment task after the system is in place on the machine to insure the set-up is rigid and satisfies the repeatability requirements. The measurement system shall have a resolution of 1 mil or less. A laser alignment system shall be

implemented.

- a. The Laser Alignment System used for Coupled Shafts Alignment shall use either a combined laser emitter and laser target detector unit or separate units for its laser emitter and laser target detector.
- B. Gravity Sag: The alignment specialist shall compensate for gravity sags of the measuring fixtures of greater than 0.002 inch.
- C. External Strain:
 1. Piping: Pipe flanges shall be mated with no more than 200 pounds force applied to the flange bolts.
 2. Fluids Handling Machinery: Flanged connection to the machine shall be checked for residual pipe strain. With measuring devices positioned at each end of the machine, the machine anchor bolts shall be loosened. Movement indicated on the measuring devices greater than 0.0025 inch indicates unacceptable external strain on machine.
- D. Axial Spacing: For machines with plain bearings, the axial spacing shall be set with machine pushed against the thrust bearing similar to the operating condition. For electric motors with thrust bearings, the axial spacing shall be set with the armature positioned at the motor magnetic center.
- E. Bases and Foundations: The bottoms of the machine feet shall rest on the base or foundation with 90 percent contact of the footprint. A 0.003 inch thick shim shall not penetrate under any foot with all hold-down bolts loose. The measuring device shall be positioned to measure the vertical rise at each foot as the hold-down bolt is loosened. All other bolts shall remain tight. A rise of less than 0.002 inch shall be considered acceptable. A rise of 0.002 inch or more shall be corrected with shims. The test shall be repeated at all feet until a less than 0.002 inch rise is measured at each foot.
 1. Shims: All shims shall be pre-stamped stainless steel.
- F. Shaft Run-Out: The exposed shaft of each machine shall be measured for run-out. The total indicated reading (T.I.R.) shall be no more than 0.001 inch.
- G. Thermal Growth: The alignment technician shall estimate and correct for any change, thermal or mechanical, from cold alignment conditions to hot running conditions. Thermal growth calculations shall be made for any temperature change greater than 100 F degrees.
- H. Machine Adjustments: Machines shall be adjusted by small precise movements. Excessive force that could cause damage shall be avoided. Jackscrews are the preferred method of adjustment.
 1. Bolt-bound Conditions: The following adjustment methods may be used for machines that are restrained and without a means of adjustment.
 - a. Undercutting the bolt diameter to remove threads.
 - b. Reducing bolt size one nominal fractional size.
 - c. Enlarging hole if structural integrity is not compromised.

PART 3 EXECUTION (NOT USED)

END OF SECTION

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.
- B. Within a reasonable time after receipt of such notice, the Owner and Engineer 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 Engineer determines that the work is not substantially complete:
1. The Engineer 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 Engineer.
 3. The Engineer shall reinspect the work.
- E. When the Engineer finds that the work is substantially complete:
1. The Engineer shall prepare and deliver to the Owner 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 Owner as provided in Conditions of the Contract. When the Engineer considers the work substantially complete, he will execute and deliver to the Owner 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 Owner's representative and are operational.
 5. The work is completed and ready for final inspection.
- B. The Engineer shall make an inspection to verify the status of completion after receipt of such certification.
- C. If the Engineer determines that the work is incomplete or defective:
1. The Engineer 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 Engineer that the work is complete.
 3. The Engineer shall reinspect the work.
- D. Upon finding the work to be acceptable under the Contract Documents, the Engineer 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 Owner for the Engineer's fees.

1.04 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

- 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).

1.05 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer.
- 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 Owner 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 GENERAL

1.01 REQUIREMENTS INCLUDED

Contractor shall maintain at the site for the Owner one record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Engineer's field directives or written instructions.
6. Approved shop drawings, working drawings and samples.
7. Field test records.
8. Construction photographs.

1.02 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 Engineer.

1.03 MARKING DEVICES

Provide felt tip marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
- C. Do not conceal any work until required information is recorded.
- D. 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 Directive 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 ± 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 ± 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 Owner/Engineer.

E. 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 directive or by change order.

- F. Shop Drawings (after final review and approval):
 - 1. Five sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

1.05 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 Engineer. 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 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. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.
- E. 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 Owner 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 2 STANDARDS

2.01 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 Engineer.

- B. Drawings shall meet the criteria of paragraph 1.04 D above.

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 Owner's maintenance and operation of products furnished under Contract.
- B. Prepare operating and maintenance data as specified in this and as referenced in other pertinent sections of Specifications.
- C. Instruct Owner's personnel in maintenance of products and equipment and systems.
- D. 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 Owner'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 manufacture'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 Owner's personnel.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction on Owner'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 (2) 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 OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner'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 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 Engineer 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 Owner'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 Owner 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

1.01 DESCRIPTION OF WORK

- A. This Section includes demolition, debris removal and items to be salvaged as indicated on the Drawings and as specified herein.
- B. Demolition items consist of, but are not limited to the following:
 - 1. Removal of: Aeration/Anoxic Basin internal recycle pumps, mechanical bar screen units, cyclone units, grit classifiers, vortex grit removal system equipment and associated piping, conveyor system and associated piping, pipes, valves, electrical and control panels, concrete, asphalt, grates, sidewalk, various sizes and lengths of yard piping, material and debris in aeration/anoxic basins and other items as shown on the drawings and as specified herein.
- C. Items to be salvaged and turned over to the Owner shall be identified by the Owner during the preconstruction meeting.

1.02 QUALITY ASSURANCE

- A. Accomplish all demolition work so there is no injury to any persons and no damage to adjacent structures or property. All demolition methods shall be in full compliance with municipal, county, state, and federal ordinances. Demolition work shall comply with the requirements of the Occupational Safety and Health Administration (OSHA).
- B. The Contractor shall comply with all municipal, county, state and federal ordinances regarding the disposal of rubble, scrap metal, and refuse.
- C. Demolition procedures shall provide for safe conduct of the work, protection of property which is to remain undisturbed, and coordination with other work in progress.

1.03 JOB CONDITIONS

- A. It shall be the responsibility of the Contractor to visit the site and inspect the nature and condition of the items to be removed and salvaged before submitting his bid.
- B. Dust Control: Control the amount of dust resulting from demolition to prevent the spread of dust to occupied portions of buildings and to avoid creation of a nuisance in the surrounding area. Do not use water when it will result in, or create, hazardous or objectionable conditions such as flooding and pollution.
- C. Protection of Existing Work: Protect existing work. Work damaged by the Contractor shall be repaired to match existing work.
- D. No interference with plant operations: Demolition work shall be scheduled and conducted so there is no interference with normal plant operations or deliveries.

PART 2 PRODUCTS

2.01 REPAIR AND REPLACEMENT MATERIALS

- A. Materials used in the repair or replacement of existing work to remain shall be identical or equal to the materials used in existing work when new.

PART 3 EXECUTION

3.01 STRUCTURES AND BUILDINGS

- A. Remove all parts of existing structures to be demolished to a minimum depth of 3-ft below grade unless otherwise shown on the drawings. Structures left below grade shall be punctured to allow water to pass through and prevent flotation.

3.02 EQUIPMENT

- A. Completely remove equipment which is designated to be removed.
- B. Remove concrete equipment bases if the existing bases are not to be used for new equipment.
- C. Completely remove isolated equipment bases.

3.03 PIPING

- A. Completely remove piping, conduit, and wiring in structures and buildings which are to be demolished, partially demolished, and where otherwise designated to be removed as shown on the Drawings. When not indicated on the Drawings, the removal of said piping, conduit and wiring shall be a minimum of 5-feet from the outside of the structure or building. The Contractor shall schedule underground pipe removal and new pipe installation in order to minimize disruption of the existing piping system and reduce bypass pumping.
- B. Underground piping, conduit, and wiring which are to be abandoned and do not interfere with new work may be left in place, unless otherwise shown on the Drawings. Plug and seal ends of underground piping to be abandoned. Grout fill abandoned pipes in accordance with plans. Do not leave abandoned branches of piping and wiring "live". Isolate abandoned branches by closing branch valve at main or by disconnecting branch at main. Plug, cap, and seal active branch at isolating valve or point of disconnection.
- C. Properly disconnect, seal and plug utility services to structures and buildings which are completely demolished. Properly disconnect, seal, and plug utility lines within structures and buildings which are partially demolished.

3.04 DISPOSAL

- A. Equipment, piping, and materials which are designated to remain the property of the Owner shall be moved to a location within the project site designated by the Owner.

- B. All removed equipment, piping, and materials not specifically designated to remain the property of the Owner shall become the property of the Contractor and shall be removed from the site.
- C. Do not allow debris and rubbish to accumulate on the site. Remove debris and rubbish from the site.
- D. If the Contractor uses Manatee County Sanitary Land fill for disposal, the Contractor shall be required to pay a tipping fee when crossing the landfill weighting scales.

3.05 FILLING

- A. Backfill excavations resulting from demolition.
- B. Backfill excavations which will not be beneath new structures, buildings, piping, or other new work as specified in this paragraph.
- C. Backfill excavations more than three feet deep or more than five cubic yards in volume as specified in Section 02200 - Earthwork.
- D. Place and compact backfill in other excavations to produce an adequate foundation for grassing.

3.06 CLEAN-UP

- A. Clean-up in areas where other work is to be done following demolition shall be as specified in the applicable Sections.
- B. Clean-up the job site in areas where no other work is to be done under this Contract following demolition. Remove all debris and rubbish, temporary facilities, and equipment. Level surface irregularities to eliminate depressions. Leave the work in a neat and presentable condition.

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 (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall cut, repair, reuse, excavate, demolish or otherwise remove parts of the existing structures or appurtenances, as indicated on the Contract Drawings, herein specified, or necessary to permit completion of the work under this Contract. The Contractor shall 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. The Contractor shall dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the work. Where called for or required, the contractor shall cut existing pipelines for the purpose of making connections thereto. Anchor bolts for equipment and structural steel removed shall be cut off one inch below the concrete surface. Surface shall be finished as specified in the Contract Documents.
- C. 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 anchorage, if required, is part of the installation shall also be installed as directed by the Engineer.
- D. No existing structure, equipment, or appurtenance shall be shifted, cut, removed, or otherwise altered except with the express approval of and to the extent approved by the Engineer.
- E. When removing materials or portions of existing utility pipelines and/or structures or when making openings in walls and partitions, the Contractor shall 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 permitted, line drilling will be required in cutting existing concrete.
- F. Materials and equipment removed in the course of making alterations and additions shall remain the property of the Owner, except that items not salvageable, as determined by the

Owner, shall become the property of the Contractor to be disposed of by him off the work site at his own place of disposal. Operating equipment shall be thoroughly cleaned, lubricated, and greased for protection during prolonged storage.

- G. All alterations to existing utility pipes and structures shall be done at such time and in such manner as to comply with the approved time schedule. So far as possible 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 delay.
- H. All workmanship and new materials involved in constructing the alterations shall conform to the General Specifications for the classes of work insofar as such specifications are applicable.
- 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 Specifications covering the new work. When not covered, the work shall be carried on in the manner and to the extent directed by the Resident Project Representative.
- J. Surfaces of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.
- K. Non-shrink grout shall be used for setting wall castings, sleeves, leveling pump bases, doweling anchors into existing concrete and elsewhere as shown.
- L. Where necessary or required for the purpose of making connections, the Contractor shall cut existing pipelines in a manner to provide an approved joint. Where required, he shall use flanges, or provide Dresser Couplings, all as required.
- M. The Contractor shall provide flumes, hoses, piping 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 under this Contract.
- N. Care shall be taken not to damage any part of existing buildings or foundations or outside structures.

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 Manatee County representative must be present for all tie-ins for a visual inspection.

3.03 IN-PLACE GROUTING OF EXISTING PIPE

- A. Where water and wastewater utility pipes are to be abandoned in place, they shall be filled with a sand/cement grout as specified herein. When such pipes are constructed with asbestos cement materials, the abandonment activities shall be performed by a licensed asbestos abatement contractor as specified in these Specifications.

- B. Grout shall be injected within the pipe sections indicated on the Drawings. The ends of these sections shall be capped and/or plugged. The grouting program shall consist of pumping sand-cement grout with suitable chemical additives at pressures necessary to fill the pipe sections shown on the Drawings to prevent the potential for future collapse.
- C. The pump used for grouting should be a continuous flow, positive displacement model with a pugmill type mixing vat having a minimum shaft speed of 60 rpm and incorporated as an integral part of the equipment. Alternate equipment may be used subject to the approval of the Engineer. The rate of pumping shall not exceed six (6) cubic feet per minute. The pumping pressures shall be in the range of 100 to 150 psi.
- D. The Contractor shall provide standpipes and/or additional means of visual inspection as required by the Engineer to determine if adequate grout material has filled the entire pipe section(s). The Contractor shall make necessary provisions for the Owner's representative to monitor all grouting operations.
- E. All pipe to be abandoned shall be capped or plugged with a fitting or material that will prevent soil or other material from entering the pipe. All caps and plugs shall be subject to approval by the Engineer.

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 Owner 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 Engineer. 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 Owner 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 Owner within a five mile radius of the construction site. Should Owner not choose to receive any or all excess topsoil materials, the Contractor shall dispose of said material at no additional cost to Owner.

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 Engineer 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 Engineer 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 Engineer.

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 02200

EARTHWORK

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section includes digging of excavations for structures, piping and roadways; backfilling around structures and piping; shaping and contouring the ground surface to conform to established grades and elevations; compacting of earth or rock materials to specified densities; bracing, sheeting and shoring; dewatering; removal of surplus excavated materials; and related work as shown on the Drawings and as specified herein.

1.02 DEFINITIONS

- A. Excavation: Removal of earth and rock to form cavities for the construction of foundations and structures and to form trenches for the installation of piping or conduits.
- B. Cavity: Formed by the removal of earth and rock.
- C. Earth: Unconsolidated material in the crust of the earth derived by weathering and erosion. Earth includes:
1. Materials of both inorganic and organic origin.
 2. Boulders less than 1/3 cubic yard in volume, gravel, sand, silt, and clay
 3. Materials which can be excavated with a backhoe, trenching machine, drag line, clam shell, bulldozer, highlift, or similar excavating equipment without the use of explosives, rockrippers, rock hammers, or jack hammers
- D. Rock: A natural aggregate of mineral particles connected by strong and permanent cohesive forces. Rock includes:
1. Limestone, sandstone, dolomite, granite, marble, and lava
 2. Boulders 1/3 cubic yard or more in volume
 3. Materials which cannot be excavated by equipment which is used to remove earth overburden without the use of explosives, rock rippers, rock hammers, or jack hammers
- E. Undercutting: Excavation of rock and unsuitable earth below the bottom of a foundation, structure, pipe or conduit to be constructed or installed.
- F. Subgrade: Undisturbed bottom of an excavation.
- G. Bedding: Earth placed in trench to support pipe and conduit.
- H. Backfill and Fill: Earth placed around structures from the bottom of an excavation to finished grade, or to the sub base of pavement. Earth placed in a trench from the top of bedding to finished grade, or to sub base of pavement.
- I. Structural Compact Fill: Required to establish the finished grade should consist of clean cohesion less fill comprising the SP to SP-SM unified soil classification or ASSHTO A-3

Classification. Each lift, which should not exceed 12 inches, should be uniformly compacted to not less than 95% of the modified proctor maximum density.

- J. Topsoil: Earth containing sufficient organic materials to support the growth of grass.

1.03 JOB CONDITIONS

- A. Carefully maintain bench marks, monuments and other reference points, and if disturbed or destroyed, replace as directed.
- B. Should the Contractor encounter unusual subsurface and/or latent conditions at the site, he shall immediately give notice to the Owner and Engineer of such conditions before they are disturbed.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation and landfill work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service: The Owner will retain a Soils Engineer to perform soil testing and inspection service for quality control testing of earthwork operations. Tests revealing satisfactory results will be paid for by the Owner. The cost of tests revealing unsatisfactory results will be deducted from monies due to the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Earth for Fill and Backfill: Earth used for fill or backfill shall be of such gradation and moisture content that it will compact to the specified density and remain stable.
- B. Pipe Bedding: Pipe bedding material for Type A-2 trenches shall be No. 57 crushed stone with gradation as noted in Table 1 of Section 901 of the FDOT Standard Specifications.
- C. Pipe Cover Material: Pipe cover material shall consist of durable particles ranging in size from fine to coarse (No. 200 to 1-inch) in size, in a substantially uniform combination. Unwashed bank run sand and crushed bank-run gravel will be considered generally acceptable. Bedding material may be used for cover material.
- D. Special Backfill: Special backfill shall be the following soils, classified by the Unified Soil Classification System, ASTM D-2487:

Group Symbols	Typical Name
GW	Well-graded gravels and gravel-sand mixtures, little or no fines
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
SW	Well-graded sands and gravelly sands, little or no fines
SP	Poorly graded sands and gravelly sands, little or no fines

- E. Suitable Backfill: Suitable backfill shall be the following soils, classified by the Unified Soil Classification System, ASTM D-2487:

Group Symbols	Typical Name
GW	Well-graded gravels and gravel-sand mixtures, little or no fines
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well-graded sands and gravelly sands, little or no fines
SP	Poorly graded sands and gravelly sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

- F. Unsuitable Materials: Materials which are unsuitable for backfill include stones greater than 6-inches in their largest dimension, pavement, rubbish, debris, wood, metal, plastic, and the following soils, classified by the Unified Soil Classification System, ASTM D-2487:

Group Symbols	Typical Name
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
CH	Inorganic clays of high plasticity, fat clays
OH	Organic clays of medium to high plasticity
PT	Peat, muck, and other highly organic soils

- G. Structural Compact Fill: Preparation of the subgrade prior to pond backfilling will necessitate removal and replacement of pond bottom silts as well as the very loose silty soils on the flanks of the pond (see the Geotechnical Report for further requirements). The entire tank footprint, plus a margin of at least 5 feet outside the foundation perimeter should be striped down to the existing pond bottom elevation including over-excavation of any accumulated sediments, followed by proof-rolling with heavy vibratory compaction equipment. The contractor should anticipate the excavation would extend to approximate EL +15 feet. Compaction should consist of no less than ten (10) complete coverages throughout the entire tank area plus a margin of not less than 5 feet beyond the tank perimeters. The perimeter foundation area for the tank structures should be densified at the bottom of footing elevation. Compaction should continue so as to develop a uniform density of not less than 95% of the modified proctor maximum dry density per ASTM D-1557. Compaction tests should be conducted at intervals of no less than 1 test for each 2500 square feet and each 50 foot of foundation perimeter at a depth of 1 foot and at the compacted subgrade elevation.

PART 3 EXECUTION

3.01 PROTECTION OF EXISTING FACILITIES

- A. Support and protect all poles, fences, utility pipes, wire, conduits, buildings and structures.

- B. Proceed with caution during excavation so the exact location of underground utilities and structures, both known and unknown, may be determined. Contractor shall be responsible for the repair of utilities and structures when broken or otherwise damaged.
- C. Wherever water, or other pipes or conduits cross the excavation, the Contractor shall support said pipes and conduits without damage to them and without interrupting this Contract. The manner of supporting such pipes, or similar items, shall be subject to the approval of the Engineer.
- D. When utilities that have to be removed or relocated are encountered within the areas of operations, the Contractor shall notify the Owner in ample time for the necessary measure to be taken to prevent interruption of the service.
- E. The Contractor shall so conduct the work that no equipment, material, or debris will be placed or allowed to fall upon private property in the vicinity of the work, unless he shall have first obtained the property Owner's written consent to do so and shall have shown said written consent to the Owner.
- F. All excavated material shall be piled in a manner that will not obstruct driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Drainage ways shall be kept clear or other satisfactory provisions made for drainage.
- G. Natural watercourses shall not be obstructed, except where specifically permitted for the construction of outfall and subaqueous crossings.

3.02 CLEARING

- A. Before excavating, clear and remove logs, stumps, brush, vegetation, rubbish, and other perishable matter from the project site.
- B. Do not remove or damage trees that do not interfere with the finished work. Completely remove trees required to be removed, including stumps and roots. Replace trees removed unnecessarily. Properly treat damaged trees which can be saved.

3.03 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil and vegetation from the areas to be excavated. Clean topsoil may be stockpiled for reuse; the Contractor shall coordinate with the Owner for location of excavated stockpiled materials.

3.04 EXCAVATING

- A. Make excavations to elevations and dimensions necessary to permit bracing, sheeting, erection of forms, inspection of foundation and installation of piping or conduits. Excavate trenches to the required alignment, depth and width. Excavate trenches in advance of pipe and conduit installation only as far as necessary to provide proper alignment and grade. Plan trenching operations to cause a minimum of danger to adjacent property and a minimum of inconvenience to the public.

- B. The width of trenches at the top of the pipe shall be ample to permit the pipe to be laid and joined properly and to allow the backfill to be placed and compacted as specified. Maximum trench width shall be such that design loadings on pipe will not be exceeded. Trenches shall be of such extra width, when required, to permit the placement of supports, sheeting, bracing, and appurtenances.
- C. Depth of trenches shall be such as to allow installation of pipelines at the grades or elevations shown.
- D. Trees, boulders, and other surface encumbrances, located so as to create a hazard to anyone involved in the excavation work or who is in the vicinity of the work at any time during operations, shall be removed or made safe before excavating is begun.
- E. Contractor shall be responsible for the determination of the angle of repose of the soil in which the excavating is to be done. Excavate all slopes to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.
- F. Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing or other equally effective means. Give special attention to slopes which may be adversely affected by weather or moisture content.
- G. Flatten the excavation sides when an excavation has water conditions, silty materials, loose boulders, and areas where erosion and slide planes appear.
- H. Shore or otherwise support sides of excavations in hard or compact soil when the excavation is more than five feet in depth. In lieu of shoring, the sides of the excavation above the five-foot level may be sloped to preclude collapse, but shall not be steeper than a one-foot rise to each 1/2-foot horizontal.
- I. Use diversion ditches, dikes, or other suitable means to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Do not allow water to accumulate in an excavation. If possible, the grade should be away from the excavation.
- J. Excavations shall be inspected by a competent Contractor's representative after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.
- K. Do not store excavated or other material nearer than four feet from the edge of any excavation. Store and retain materials as to prevent materials from falling or sliding back into the excavation. Install substantial stop log or barricades when mobile equipment is utilized or allowed adjacent to excavations.

3.05

DEWATERING

- A. Keep excavations free from water until foundations, structures, and piping are completed and will safely with stand forces generated by water. Provide sufficient dewatering equipment and make proper arrangements for the disposal of water from dewatering operation. Dewatering shall not damage property, create nuisances, or interfere with other work. Do not use sanitary sewers for the disposal of water from dewatering operations.

3.06 SHEETING

- A. The Contractor has the option of sheeting excavations.
- B. Supporting systems, such as piling, cribbing, shoring, and bracing shall be designed by a qualified Contractor's representative and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, securely anchor the tie rods well back of the angle of repose. When tight sheeting or sheet piling is used, assume full loading due to groundwater table, unless prevented by weep holes or drains or other means. Provide additional stringers, ties, and bracing to allow for any necessary temporary removal of individual supports.
- C. Materials used for sheeting, sheet piling, cribbing, bracing, shoring and underpinning shall be in good, serviceable condition. Timbers shall be sound, free from large or loose knots, and of proper dimensions.
- D. Take special precautions in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation or a fill, particularly when the separation is less than the depth of the excavation. Pay particular attention to joints and seams of material comprising a face and to the slope of such seams and joints.
- E. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above or near an excavation, sheet-pile, shore, and brace the side of the excavation as necessary to resist the extra pressure due to such superimposed loads.
- F. If the stability of adjoining buildings or walls is endangered by excavations, provide shoring, bracing, or under pinning as necessary to ensure the safety of adjoining buildings or walls. Such shoring, bracing or under pinning shall be inspected daily or more often, as conditions warrant, by a competent Contractor's representative and the protection effectively maintained.
- G. The Contractor shall be held responsible for the sufficiency of all sheeting and bracing used, and for all damage to persons or property resulting from the improper quality, strength, placing, maintaining, or removing of the same. This includes damage to trees, sidewalks, and other property on the project site as well as on the private grounds.
- H. Drive sheeting ahead of excavation. Do not remove sheeting until the excavation backfill has reached within two feet of the top of the excavation, except that the lower course of sheeting may be removed from a double sheeted excavation. When sheeting is drawn, completely fill all cavities remaining in or adjoining the excavation. When sheeting is left in place, completely fill all cavities behind such sheeting.

3.07 ROCK REMOVAL

- A. Rock, boulders or other hard, lumpy or unyielding materials encountered in trench bottoms shall be removed to a depth at least 12-inches below the bottom of any pipes to be installed. All rock and other hard foundation material under structures shall be freed of all loose material, cleaned, and cut to a firm surface; either level, stepped vertically and

horizontally or serrated, as may be directed. All seams shall be cleaned out and filled with concrete or mortar.

- B. Blasting of rock or other hard to remove materials will not be permitted on this project.

3.08 SUBGRADES

- A. Do not construct foundations, footings, slabs, or piping on loose soil, mud, or other unstable or unsuitable soil.
- B. Fill excess cuts under foundations, footings, and slabs with concrete.
- C. Fill excess cuts under piping with compacted bedding as specified in this Section.

3.09 FOUNDATION SOILS REMOVAL AND COMPACTION

- A. In areas where buildings, structure foundations, and precast concrete tanks are located just below the surface, the site shall be proof rolled using a large vibratory roller (Dynapac CA-25 or equivalent). Proof rolling shall consist of at least ten overlapping passes. Water shall be added in order to achieve moisture content near optimum to facilitate compaction. Purpose of the proof rolling is to detect any areas of unstable or unsuitable soils as well as to density the near-surface soils. Materials which yield excessively during the proof rolling shall be undercut and replaced with well-compacted structural fill.
- B. The Owner will retain a Soils Engineer to be present during proof rolling operations to observe the proof rolling and recommend the nature and extent of any remedial work.
- C. In areas where foundations and pre stressed concrete tanks are located, preparation of the subgrade prior to pond backfilling will necessitate removal and replacement of pond bottom silts as well as the very loose silty soils on the flanks of the pond (see the Geotechnical Report for further requirements). The entire tank footprint, plus a margin of at least 5 feet outside the foundation perimeter should be striped down to the existing pond bottom elevation including over-excavation of any accumulated sediments, followed by proof-rolling with heavy vibratory compaction equipment. The contractor should anticipate the excavation would extend to approximate EL +15 feet. Compaction should consist of no less than ten (10) complete coverages throughout the entire tank area plus a margin of not less than 5 feet beyond the tank perimeters. The perimeter foundation area for the tank structures should be densified at the bottom of footing elevation. Compaction should continue so as to develop a uniform density of not less than 95% of the modified proctor maximum dry density per ASTM D-1557. Compaction tests should be conducted at intervals of no less than 1 test for each 2500 square feet and each 50 foot of foundation perimeter at a depth of 1 foot and at the compacted subgrade elevation.
- D. Any fill required to achieve finished grade in structural areas or used as structural compact fill shall be inorganic, non-plastic granular soil containing less than 10% material passing a No. 200 sieve. Fill shall be placed in level lifts not to exceed 12-inches loose thickness and compacted to a minimum of 95% of the modified Proctor maximum dry density as determined by ASTM Specification D-1557. In-place density tests will be performed on each lift to verify that the specified degree of compacting has been achieved.

3.10 BACKFILLING FOUNDATION AND STRUCTURE EXCAVATIONS

- A. Remove debris and other unstable or unsuitable materials from excavations before backfilling is started.
- B. Backfill excavations in areas to be paved with Special Backfill. Place Special Backfill in 12-inch lifts. Compact each lift of backfill to not less than 100% of the maximum dry density as determined in accordance with AASHTO T99, Method A. Compaction shall be by hand tamping or approved mechanical tamping devices, or in larger excavations by approved rollers. Do not compact backfill by puddling, unless permitted by the Engineer.
- C. Backfill excavations not requiring Special Backfill with Suitable Material. Place backfill and fill materials in lifts no greater than 12-inches in loose depth. Place backfill and fill materials in lifts no greater than four inches in loose depth where hand tampers are used. Backfill and fill shall be within 2% of optimum moisture content. For soils containing less than 5% material passing a No. 200 sieve, moisture content may be increased to within 3% of optimum. Compact backfill and fill to not less than 95% of the maximum dry density. Compact backfill and fill for restoration of dirt driveways shall be not less than 100% of the maximum dry density for last lift. Tests for determination of maximum dry density shall meet the requirements of ASTM D698 Method C. Use compaction equipment which is suited to the soil being compacted.
- D. If suitable, use stored excavated material for backfill and fill. Provide additional material, if required, to complete backfill and fill. Additional backfill and fill material shall be provided at no additional cost to the Owner.
- E. Do not use the following materials for backfill:
 - 1. Unsuitable materials
 - 2. Materials which are too wet or too dry to be compacted to the densities specified in this Section
- F. Place the backfill and fill in a manner which will not overload foundations or structures. Place backfill and fill evenly on all sides of foundations and structures. Do not use equipment that will overload foundations or structures during filling or backfilling.
- G. Do all cutting, filling, and grading necessary to bring the entire area around foundations and outside of structures to the following subgrade levels:
 - 1. To the underside of the respective surfacing for walks and pavement
 - 2. To finished grade for lawns and planted areas within the project site.

3.11 BACKFILLING PIPING TRENCHES

- A. Do not backfill trenches and excavations until all utilities have been inspected by the Owner's representative and until all underground utilities and piping systems are installed in accordance with the requirements of the specifications and the drawings.
- B. Remove debris and other unsuitable materials from excavations before backfilling is started.

- C. Place and tamp bedding and backfilling in a manner which will not damage pipe coating, wrapping, or encasement.
- D. Bedding procedures shall be as specified in the particular Section for the applicable pipe material.
- E. If bedding does not cover the pipe, place pipe cover material from the top of bedding to 12-inches over the pipe. Compact pipe cover material to the density required to allow backfill over the pipe cover material to be compacted to the density specified.
- F. Do not use the following materials for backfilling:
 - 1. Unsuitable Materials
 - 2. Materials which are too wet or too dry to be compacted to the densities specified in this Section.
- G. If suitable, use stored excavated material for backfill and fill. Provide additional material, if required, to complete backfill and fill. Additional backfill and fill material shall be provided at no additional cost to the Owner. Backfill excavations in areas to be paved with Special Backfill. Place Special Backfill in 12-inch lifts. Compact each lift of backfill to not less than 100% of the maximum dry density as determined in accordance with AASHTO T99, Method A. Compaction shall be by hand tamping or approved mechanical tamping devices, or in larger excavations by approved rollers. Backfill and fill materials shall be within 2% of optimum moisture content. Do not compact backfill by puddling, unless permitted by the Engineer.
- H. Backfill trenches not requiring Special Backfill with Suitable Material. Place backfill and fill materials in lifts no greater than 12-inches in loose depth and compact to produce an adequate foundation for seeding. The top 4-inches of backfill shall not contain stones or other objects larger than 1-inch in maximum dimension. Mound backfill above finish grade to allow for settlement. Fill and restore any settlement of the backfill. Grade area to be restored to finish grade after settlement of backfill and immediately before restoration of vegetated areas.

3.12 SHELL BASE

- A. Construction of a base course composed of shell shall be as specified in Section 250 of the FDOT Standard Specifications.

3.13 FINISH GRADING

- A. Shape the surface of all earthwork to conform to the lines, grades, contours and cross-sections shown on the drawings. Hand dressing may be required in certain areas or in confined areas where equipment operation is restricted.
- B. In final shaping of the surface of the earthwork a tolerance of 0.1 foot above or below the plan elevation will be allowed with the following exceptions:
 - 1. Earthwork shall be shaped to slope away from all buildings and structures.

2. Earthwork shall be shaped to match adjacent pavement, curb, sidewalks, and similar appurtenances.
3. Ditch bottoms and swales shall be shaped so that no water will be impounded except in areas designated for impoundment.

3.14 CLEANUP AND MAINTENANCE

- A. Cleanup the job site as grading is completed. Remove excess earth, rock, bedding, materials, and backfill materials. Remove unused piping materials, structure components, and appurtenances. Restore items moved, damaged, or destroyed during construction.
- B. Maintain the job site until the work has been completed and accepted. Fill excavations which settle when settlement is visible. Restore items damaged by construction or improper restorations. Keep dust conditions to a minimum.

3.15 STORAGE AND REMOVAL OF EXCAVATED MATERIAL

- A. Suitable excavated material required for filling and backfilling operations may be stockpiled on the jobsite.
- B. Remove unsuitable materials from the job site as unsuitable materials are excavated. Remove surplus suitable materials from the job site as excavations are backfilled.
- C. Excavated suitable surplus materials shall remain the Owner's property and shall be stockpiled at the location(s) designated by the Owner.

3.16 DUST CONTROL

- A. The Contractor shall take all steps possible to prevent and reduce dust arising from the construction activity. The Contractor shall have adequate water trucks on the site at all times and water, as necessary, the areas where dust may arise. He shall cooperate fully with the Owner's Representative and water immediately when instructed to do so.

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.

1.02 PROTECTION

The Contractor shall prevent damage to existing fencing, trees, landscaping, natural features, bench marks, pavement and utility lines. Damage shall be corrected at no cost to the Owner.

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 Engineer.
- B. The Contractor shall cut out areas to sub-grade elevation to stabilize base material for paving and sidewalks.
- 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 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 Engineer. 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 reseeded 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 Engineer.
- 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 Engineer.
- D. The Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

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 Engineer.
- B. Seed and sod.

2.02 SEDIMENTATION CONTROL

- A. Bales - clean, seed free cereal hay type.
- B. Netting - fabricated of material acceptable to the Engineer.

- 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 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 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 Owner.

1.02 RELATED WORK NOT INCLUDED

Excavation, filling and grading required to 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 Owner 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 where pipelines are laid shall be sodded. All sodding and grassing shall be installed in accordance with these Specifications or as directed by the Engineer.

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 Engineer 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 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 Owner. 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 Engineer.
- 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 Engineer shall approve the finish grade of all areas to be seeded or sodded prior to seed or sod application.
- C. 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 Owner shall be repaired by the Contractor as directed by the Engineer.

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 Engineer.

- B. Maintain landscape work for a period of 90 days immediately following complete installation of work or until Owner 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 Owner.

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 02575

PAVEMENT REPAIR AND RESTORATION

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, 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 of the pavement to be removed/replaced as part of this project.
- B. The Contractor shall repair in a manner satisfactory to the County, 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 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 99% 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 or 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 Owner.

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. Dirt roads and drives shall have the required depth of backfill material as shown on the Contract Drawings.

- C. The width of all 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.

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 02999

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section includes items and operations which are not specified in detail as separate items, but may be sufficiently described as to the kind and extent of work involved. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to complete all work under this Section.
- B. The work of this Section may include, but is not limited to the following:
1. Restoration of roads, sidewalks, driveways, curbing and gutters, fences, guardrails, lawns, shrubbery and any other existing items damaged or destroyed.
 2. Crossing utilities.
 3. Relocation of existing water, reclaim water, or sewer lines less than four inches diameter, water and sanitary sewer services, low pressure gas lines, telephone lines, electric lines, cable TV lines as shown on the Contract Drawings.
 4. Restoring easements (servitudes) and rights-of-way.
 5. Clean up.
 6. Incidental work (project photographs, testing, shop drawings, traffic control, record drawings, etc.).
 7. Excavation and Embankment - As defined in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (1991 Edition or latest revision).
 8. Stormwater and erosion control devices.

1.02 SUBMITTAL OF LUMP SUM BREAKDOWN

Contractor shall submit to the Owner, a breakdown of the lump sum bid for Miscellaneous Work and Cleanup Item in the Proposal within 10 days after date of Notice to Proceed.

1.03 WORK SPECIFIED UNDER OTHER SECTIONS

All work shall be completed in a workmanlike manner by competent workmen in full compliance with all applicable sections of the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

Materials required for this Section shall equal or exceed materials that are to be restored. The Contractor may remove and replace or reuse existing materials with the exception of paving.

PART 3 EXECUTION

3.01 RESTORING OF SIDEWALKS, ROADS, CURBING, FENCES AND GUARDRAILS

- A. The Contractor shall protect existing sidewalks & curbing. If necessary, sidewalks & curbing shall be removed from joint to joint and replaced after backfilling. Curbing damaged during construction because of the Contractor's negligence or convenience, shall be replaced with sidewalks & curbing of equal quality and dimension at no cost to the Owner.
- B. At the locations necessary for the Contractor to remove, store and replace existing fences and guardrails during construction, the sections removed shall be only at the direction of the Owner. If any section of fence is damaged due to the Contractor's negligence, it shall be replaced at no cost to the Owner with fencing equal to or better than that damaged and the work shall be satisfactory to the Owner.
- C. Guardrails in the vicinity of the work shall be protected from damage by the Contractor. Damaged guardrails shall be replaced in a condition equal to those existing
- D. Road crossings shall be restored in accordance with the Contract Documents and current FDOT Standards. Compensation for road restoration shall be included under the Road Restoration Bid Item if specified or under Miscellaneous Cleanup if it is not specified.

3.02 CROSSING UTILITIES

This item shall include any extra work required in crossing culverts, water courses, drains, water mains and other utilities, including all sheeting and bracing, extra excavation and backfill, or any other work required or implied for the proposed crossing, whether or not shown on the Drawings.

3.03 RELOCATIONS OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES AND CABLE TV LINES

The Contractor shall notify the proper utility involved when relocation of these utility lines is required. The Contractor shall coordinate all relocation work by the utility so that construction shall not be hindered.

3.04 RESTORING THE EASEMENTS AND RIGHTS-OF-WAY

The Contractor shall be responsible for all damage to private property due to his operations. He shall protect from injury all walls, fences, cultivated shrubbery, pavement, underground facilities, including water, sewer and reclaimed water lines and services, or other utilities which may be encountered along the easement. If removal and replacement is required, it shall be done in a workmanlike manner, at his expense, so that the replacement are equivalent to that which existed prior to construction.

3.05

STORMWATER AND EROSION CONTROL DEVICES

The Contractor shall be responsible for, provide, and install all stormwater and erosion control devices necessary to insure satisfactory compliance with the Florida Department of Environmental Protection Stormwater, Erosion, and Sedimentation Control Inspector's Manual.

END OF SECTION

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.
- D. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

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 Engineer.
- 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 Engineer.
- 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: ± 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:
 - i. Members 8 in. deep or less: $\pm 1/4$ in.
 - ii. 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 Engineer.
 3. Do not heat, bend, or cut bars without concurrence of Engineer.
- 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 Engineer, 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 Engineer.
- 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 Engineer.
- 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 Owner/Engineer 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 Owner/Engineer 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 Engineer to inspect concrete surfaces immediately upon removal of forms. Patch imperfections as directed. All patching procedures shall be submitted to and approved by the Engineer 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 Engineer 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

- A. Submit to the Engineer as provided in the Contract Documents, the proposed chemical hardener manufacturer's surface preparation and application procedures.
- B. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

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 Owner. Submit the proposed new finishes and their construction methods to the Engineer 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 Owner/Engineer.
- 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 Engineer.
- 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 Engineer if the base slab concrete exhibits adequate fattiness

- and homogeneity.
2. In lieu of power steel troweling, small areas as defined by the Engineer 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 Engineer.
- B. Surfaces which, in the opinion of the Owner/Engineer, are unsatisfactory shall be refinished or reworked until approved by the Owner/Engineer.

END OF SECTION

SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment and incidentals required and install covers, grates, frames and other miscellaneous metals as shown on the Drawings and specified herein. The miscellaneous metal items include but are not limited to the following:
1. All metal frames, ladders, stairs, stair rails, floor opening frames including gratings and supports.
 2. Prefabricated access hatches and frames.
 3. Anchors and anchor bolts except those specified to be furnished with all equipment.
 4. Railings, posts and supports both interior and exterior.
 5. Cast iron frames, covers, grates, drain leaders and drains.
 6. Bridge crane track supports.
 7. Stair nosings, steel plates, overhead steel door frames, angle frames, plates and channels.
 8. Exterior H.V.A.C. hoods.
 9. Pump guide rail system.

1.02 COORDINATION

- A. The work in this Section shall be completely coordinated with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.
- B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.03 SHOP DRAWINGS AND SAMPLES

- A. Detail drawings, as provided for in the Contract Documents, showing sizes of members, method of assembly, anchorage, and connection to other members shall be submitted to the Engineer for approval before fabrication.
- B. Samples shall be submitted at the request of the Owner/Engineer for concurrent review with Shop Drawings.
- C. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

1.04 FIELD MEASUREMENTS

- A. Field measurements shall be taken at the site to verify or supplement indicated

dimensions and to insure proper fitting of all items.

1.05 REFERENCED SPECIFICATIONS

A. Unless otherwise specified, materials shall conform to the following:

Structural Steel	ASTM A36
Welded & Seamless Steel Pipe	ASTM A53
Gray Iron Castings	ASTM A48, Class 30
Galvanizing, general	ASTM A123
Galvanizing, hardware	ASTM A153
Galvanizing, assemblies	ASTM A386
Aluminum (Extruded Shapes)	6061-T6 (Alum. alloy)
Aluminum (Extruded Pipe)	6061-T6 (Alum. alloy)
Aluminum Bar Structural	6061-T6 (Alum. alloy)
Bolts and Nuts	ASTM, A307
Stainless Steel Bolts, Fasteners	AISI, Type 316
Stainless Steel Plate and Sheet, Wire	AISI, Type 316
Welding Rods for Steel	AWS Spec. for Arc Welding

PART 2 PRODUCTS

2.01 ANCHORS, BOLTS AND FASTENING DEVICES

- A. Anchors, bolts, etc., shall be furnished as necessary for installation of the work of this Section.
- B. Compound masonry anchors shall be of the type shown or required and shall be equal to Star Slug in compounded masonry anchors manufactured by Star Expansion Industries, equal by Phillips Drill Co., Rawlplug, or equal. Anchors shall be minimum "two unit" type.
- C. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Stainless steel shall be attached to concrete or masonry by means of stainless steel machine bolts and iron or steel shall be attached with steel machine bolts unless otherwise specifically noted.
- D. For structural purposes, unless otherwise noted, expansion bolts shall be Wej-it "Ankr-Tite", Phillips Drill Co. "Wedge Anchors", or Hilti "Kwik-Bolt". When length of bolt is not called for on the Drawings, the length of bolt provided shall be sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the reinforcing steel within the concrete. Material shall be as noted on the Drawings. If not listed, all materials shall be stainless steel.

2.02 ALUMINUM ITEMS

- A. Aluminum gratings shall be of serrated I-Bar Aluminum Alloy 6061-T6, fabricated to the depths and thicknesses shown on the Drawings and shall be Reliance Steel Products Company, I-Lok Type 7/8 R4 Aluminum Grating; IKG Industries, "Galok" Aluminum I-Bar Grating Type S194-I, or equal. All openings 2 inches and greater in diameter shall be banded with a bar of the same depth and thickness as the main bearing bars of the

grating, or furnished with continuous cross bridges. Each cut bar shall be welded to the band if banding is utilized. The ends of all grating sections shall be likewise banded. Clamps and bolts used for attaching grating to supporting members shall be stainless steel. All grating shall be clamped unless noted otherwise. Clamps shall be as recommended by the manufacturer.

- B. Stair treads shall be as specified above for grating and shall have abrasive nonslip nosing.
- C. Aluminum nosing at concrete stairs shall be an extrusion of 4-inch minimum width with abrasive filled and shall be Wooster Products, Inc., Alumogrit Treads, Type 116; equal by Barry Pattern and Foundry Co.; Andco; or equal. Embedded anchors shall be furnished with a minimum of three anchors per tread.
- D. Aluminum ladders shall be fabricated to the dimensions and details and installed as shown on the Drawings. Treads to be of cast aluminum by Dixie Metals, Inc. of Fort Lauderdale, Florida or equal.
- E. Aluminum Handrails, Mechanically Fastened Type:
 - 1. All aluminum mechanically fastened type pipe handrails and guardrails shall be clear anodized aluminum finish and installed as specified herein and indicated on the Drawings. Handrails shall be made of nominal 1-1/2 inches inside diameter pipe (Schedule 40) fabricated or seamless 6063-T6 alloy. The supplier of the handrail system shall supply all necessary fittings, rackets, transition, corner and connector pieces, toeboards, protective gaskets, etc., for a complete job at the locations, indicated on the Drawings. All mounting hardware including bolts, studs, nuts, etc., shall be stainless steel Type 316. Bends shall be smooth and accurate to the details shown. Railings shall be the "Rigid Rail System" as manufactured by Reynolds Aluminum of Reynolds Metal Company as Reynolds II pipe railing system or the "Connectorail System" as manufactured by Julius Blum & Co., Inc., Carlstadt, New Jersey. The handrail systems shall comply with all OSHA and D Section 1208.2 of the Standard Building Code.
 - 2. Spacing of posts where posts are required shall be as noted on shop drawings, but in all cases, shall be uniform and shall not exceed the requirements of OSHA and Section 1208.2 of the Standard Building Code. Shorter spacing may be used where required to maintain the maximum spacing. The fabricator of the aluminum handrail and guardrail system shall be responsible for the design and preparation of shop drawings and design calculations (signed and sealed by Florida Registered Engineer) to meet OSHA requirements and Section 1208.2 of Standard Building Code.
 - 3. All railings shall be erected in line and plumb. Field splicing and expansion compensation shall be accomplished using internal splice sleeves. Make provisions for removable railing sections as detailed and where shown on the Drawings.
 - 4. Where handrail or guardrail posts are set in concrete as per the manufacturer's requirements the posts shall be set into aluminum sheeves cast in the concrete and firmly cemented with 1651 epoxy resin by E-Bond Epoxies, Oakland Park, Florida, Moulded Reinforced Plastics, Inc., Fort Lauderdale, Florida or equal. Collars shall be placed on the posts and fastened in place, as shown and as detailed on approved shop drawings.

5. Where handrail is supported from structural members, it shall be done by the use of approved sockets, flanges, brackets, or other approved means which will provide neat and substantial support for the pipe railing.
 6. All railing shall be properly protected by paper, or by an approved coating or by both against scratching, splashes or mortar, paint, or other defacements during transportation and erection and until adjacent work by other trades has been completed.
- F. Toeboards: Contractor shall furnish and install aluminum toeboards conforming to latest OSHA requirements on all railings and other locations where indicated on the Drawings.
1. Toeboards shall consist of an extruded 6063-T6 aluminum shape bolted by means of a pipe clamp to the railing posts without requiring any drilling or welding of the toeboard to the railing posts as manufactured by Reynolds Aluminum, Julies Blum & Company, Thompson Fabricating Company or equal. Toeboards shall have pitched top and tear drop bottom to prevent accumulation of dirt, or other material.
 2. All fastening hardware shall be Type 316 stainless steel.
- G. Kickplates, if required, shall be fabricated and installed as shown on the Drawings.
- H. Aluminum safety gate shall be fabricated of extruded aluminum.
- I. Prefabricated checkerplate aluminum floor hatches shall be Type "JD", or "KD" as manufactured by Bilco Co., Babcock-Davis Associates, Inc.; Type "AM" Inland-Ryerson Construction Products Co., Milcor Division; or equal, sized as shown. Hatches with either dimension over 3 feet-6 inches shall be double leaf type. Hatches shall be designed for a live load of 300 pounds per square foot. Hatches shall be watertight.
- J. Ship ladders shall be of all aluminum construction as detailed. Treads shall have abrasive nosing as manufactured by Reliance Steel Products Co., IKG Industries, or equal.
- K. Checkplate aluminum cover plates shall be fabricated to the details shown and installed at the locations shown.
- L. Structural aluminum angle and channel door frames shall be provided as shown on the Drawings and shall be anodized. Frames shall be fabricated with not less than three anchors on each jamb.
- M. Miscellaneous aluminum shapes and plates shall be fabricated as shown. Angle frames for hatches, beams, grates, etc., shall be furnished complete with welded strap anchors attached. Furnish all miscellaneous aluminum shown, but not otherwise detailed. Structural shapes and extruded items shall conform to the detail dimensions on the Plans within the tolerances published by the American Aluminum Association.

2.03 STEEL ITEMS

- A. Sleeves shall be steel or cast iron pipe in walls and floors with end joints as shown on the Drawings. All pipe sleeves shall have center anchor around circumference as shown.
- B. Miscellaneous steel pipe for sleeves and lifting attachments and other uses as required

shall be Schedule 40 pipe fabricated according to the details as shown on the Drawings.

- C. Miscellaneous steel shall be fabricated and installed in accordance with the Drawings and shall include: beams, angles, support brackets, closure angles in roof at edge of T-beams; base plates to support ends of T-beams; door frames; splice plates, anchor bolts; lintels and any other miscellaneous steel called for on the Drawings and not otherwise specified.

2.04 CAST IRON ITEMS

- A. Outside pipe clean-out frames and covers shall be heavy duty, R-6013-R-6099 series as manufactured by Neenah Foundry Co., or equal. All outside pipe clean-outs shall be 6-inch diameter.
- B. Frames and covers for valve vaults and manholes shall be of a good quality, strong, tough even grained cast iron except as otherwise specified below. Castings shall be as manufactured by the U. S. Foundry, Neenah Foundry, Mechanics Iron Foundry, or equal. Covers to have letters "WATER", "SEWER" or "DRAIN", as applicable, embossed on top.

PART 3 EXECUTION

3.01 FABRICATION

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.
- B. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connection to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.
- C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.
- D. Welding of parts shall be in accordance with the Standard Code of Arc and Gas Welding in Building Construction of the AWS and shall only be done where shown, specified, or permitted by the Owner. All welding shall be done only by welders certified as to their ability to perform welding in accordance with the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.
- E. Welding of aluminum work shall be on the unexposed side as much as possible in order to prevent pitting or discoloration.
- F. All aluminum finish exposed surfaces, except as specified below, shall have manufacturer's standard mill finish. Aluminum handrails shall be given an anodic oxide treatment in accordance with the Aluminum Association Specification AA-C22-A41. A coating of methacrylate lacquer shall be applied to all aluminum shipment from the factory.

- G. Castings shall be of good quality, strong, tough, even-grained, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field by the Owner/Engineer. All finished surfaces shown on the Drawings and/or specified shall be machined to a true plane surface and shall be true and seat at all points without rocking. Allowances shall be made in the patterns so that the thickness specified or shown shall not be reduced in obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions shown. The Contractor shall provide facilities for weighing castings in the presence of the Owner/Engineer showing true weights, certified by the supplier.
- H. All steel finish work shall be thoroughly cleaned, in accordance with the Contract Documents, of all loose mill scale, rust, and foreign matter before shipment and shall be given one shop coat of primer compatible with finish coats specified in Painting Section after fabrication but before shipping. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces. Abrasions in the field shall be touched up with primer immediately after erection. Final painting is specified in the Contract Documents.
- I. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Following all manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the bath until their temperature becomes the same as the bath. Coating shall be not less than 2 oz. per sq. ft. of surface.

3.02 INSTALLATION

- A. Install all furnished items imbedded in concrete or other masonry. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.
- B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation or provide a 1/32-inch neoprene gasket between the steel surface and the concrete or masonry.
- C. Where aluminum is embedded in concrete, apply a heavy coat of approved bitumastic troweling mastic in accordance with the manufacturer's instructions prior to installation.
- D. Where aluminum contacts masonry or concrete, provide a 1/32-inch neoprene gasket between the aluminum and the concrete or masonry.
- E. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer and provide a 1/32-inch neoprene gasket between the aluminum and the dissimilar metal.
- F. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to

the wood.

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 Engineer 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 Engineer.
- C. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

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 Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT 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 Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT 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 Owner/Engineer 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 Engineer. 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 Engineer 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 Engineer 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 Owner/Engineer 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 Owner/Engineer.

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.
- D. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

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 Owner 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 Engineer and Contractor. The gauges may be used by the Contractor and returned each day to the Engineer. Engineer 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 Engineer. 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. 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 Engineer 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 Engineer. 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 Engineer.
- C. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Engineer, 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 Steel Structures Painting Council's Surface Preparation Specification, 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 contaminants, 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. 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.
- L. 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.

- M. Weld flux, weld spatter and excessive rust scale shall be removed by Power Tool Cleaning as per these Specifications.
- N. All weld seams, sharp protrusions and edges shall be ground smooth prior to surface preparation or application of any coatings.
- O. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the Engineer.
- P. 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.
- Q. 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 Engineer'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 unmutated labels attached. Packages shall not be opened until they are inspected by the Engineer 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 Owner/Engineer and removed from the job site on a schedule determined by the Owner/Engineer. Owner/Engineer 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 deg 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 Engineer.
- 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 Engineer.
- 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 Engineer).
- 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 Engineer, 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 Engineer 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 Engineer, 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 Owner/Engineer 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 Engineer 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 Owner/Engineer will reserve the option of incorporating the services of a qualified 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. 73-1: 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 same color or close to finish color. Specify Series 74 Endura-Shield for gloss finish.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Shop Coat: Series 1 Omnithane Primer	2.5 - 3.5	
2nd Coat: N69-Color Hi-Build Epoxoline	2.0 - 3.0	
3rd Coat: 73-Endura-Shield III	<u>2.0 - 3.0</u>	
	Dry Film Thickness	6.5 - 9.5
	Minimum	7.5 Mils

2. System No. 73-2: High Build Urethane for Marginally Cleaned Surfaces or Topcoating Existing System and over OEM Systems

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 74 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)	1.5 - 2.0	
2nd Coat: 141 Epoxoline	3.0 - 5.0	
3rd Coat: 73-Color Endura-Shield	<u>2.0 - 3.0</u>	
	Dry Film Thickness	6.5 - 10.0
	Minimum	7.5 Mils

3. 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: N69-Color Hi-Build Epoxoline	2.0 - 3.0	
3rd Coat: 73 Endurashield III	<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. 69.1: High Solids Epoxy

This coating will provide maximum protection. It offers chemical and corrosion resistance for long-term protection against salt spray, moisture, corrosive fumes, and chemical attack. Series 69 is a polyamidoamine cured epoxy. Primer coat

must be touched-up before second coat is applied.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Shop Coat:N69-1211 Epoxoline Primer II	3.0 - 5.0		
2nd Coat: N69-Color Hi-Build Epoxoline II	<u>4.0 - 6.0</u>		
		Dry Film Thickness	7.0 - 11.0
		Minimum	9.0 Mils

2. System No.66-2: 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 161 for low temperature cure or quick recoats.

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Shop Coat: N69-1211 Epoxoline Primer	3.0 - 5.0		
2nd Coat: N69-Color Hi-Build Epoxoline	<u>4.0 - 6.0</u>		
		Dry Film Thickness	7.0 - 11.0
		Minimum	9.0 Mils

C. IMMERSION

1. System No. 69-2: High Solids Epoxy (Non-Potable Water)

This system provides maximum protection in immersion service. Scarify the surface before topcoating if the Series N69 has been exterior-exposed for 90 days or longer. If primer coat is damaged, it must be touched-up before second coat is applied.

Surface Preparation: SSPC-SP10 Near-White Blast Cleaning

Shop Coat:N69-1211 Hi-Build Epoxoline II	3.0 - 5.0		
2nd Coat: N69-Color Hi-Build Epoxoline II	<u>6.0 - 8.0</u>		
		Dry Film Thickness	9.0 - 13.0
		Minimum	11.0 Mils

2. System No. N140: High Solids Epoxy (Potable Water)

Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61.

Surface Preparation: SSPC-SP10 Near-White Blast Cleaning

Shop Coat: N140-1255 Pota-Pox II (Beige) 6.0 - 8.0

2nd Coat: N140-WH02 Pota-Pox II (Tank White) 6.0 - 8.0
Dry Film Thickness 12.0 - 16.0
Minimum 14.0 Mils

3. System No. 46-30: Coal Tar-Epoxy (Non-Potable Water Only)

May be applied in a two-coat application. Review critical recoat time if utilized.

Surface Preparation: SSPC-SP10 Near-White Blast Cleaning*

One Coat: 46H-413 Hi-Build Tneme Tar

Minimum Dry Film Thickness 14.0 - 20.0

*SSPC-SP-6 Commercial Blast Cleaning may be used for non-immersion service.

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, 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 - 3.5

B. EXTERIOR EXPOSURE

System No. 141-1: Chembuild

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 and tight rust.

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)

Coating: 141-Color Epoxoline

Dry Film Thickness 3.0 - 5.0

3.15 DUCTILE IRON PIPE

A. EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)

System No.141-3: Epoxy-Polyamide

This system can be applied directly to mill coated steel pipe without sandblasting for use in non-immersion. There may be some bleed through with the 1st coat. Do not apply over glossy varnish type mill coatings.

Surface Preparation: Surface shall be clean and dry.

1st Coat: 141-1211 Epoxoline Primer	3.0 - 4.0		
2nd Coat: 141-Color Hi-Build Epoxoline	4.0 - 6.0		
3rd Coat: (If required)	<u>(4.0 - 6.0)</u>		
		Dry Film Thickness	11.0 - 16.0
		Minimum	11.0 Mils

3.16 GALVANIZED STEEL - PIPE AND MISCELLANEOUS FABRICATIONS

A. EXTERIOR / (NON-IMMERSION)

System No. 73-1: Epoxy/High Build Urethane

Series 66 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 74 Endura-Shield for gloss finish.

Surface Preparation: SSPC-SP1 Solvent Cleaning followed by Hand or Power Sanding to Scarify

1st Coat: N69-Color Hi-Build Epoxoline	2.0 - 4.0		
2nd Coat: 73-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. N69-6: Polyamine Epoxy

Surface Preparation: SSPC-SP1 Solvent Cleaning followed by Hand or Power Sanding to Scarify

1st Coat: N69-Color Hi-Build Epoxoline	2.0 - 4.0		
2nd Coat:N69-Color Hi-Build Epoxoline	<u>2.0 - 4.0</u>		
		Dry Film Thickness	4.0 - 8.0
		Minimum	5.0 Mils

C. IMMERSION (POTABLE WATER)

System No. N140-1: Epoxy-Polyamide (Potable Water)

Series N140 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Substitute Series N140 for low temperature cure of quick recoat.

Surface Preparation: SSPC-SP 7 Brush Off Blast Cleaning

1st Coat: N140-1255 Pota-Pox Primer	3.0 - 5.0		
2nd Coat: N140-00WH Pota-Pox Finish	<u>4.0 - 6.0</u>		
	Dry Film Thickness	7.0 -11.0	
	Minimum	9.0 Mils	

3.17 CHAIN-LINK FENCES

A. GALVANIZED STEEL & NON-FERROUS METAL

System No. 22-1: Oil-Cementitious

Surface Preparation: Surface shall be clean and dry

One Coat: 22-Color Galv-Gard

Dry Film Thickness 3.0 - 4.0

3.18 CONCRETE

A. EXTERIOR - ABOVE GRADE

1. System No. 6-1: Acrylic Emulsion Low Sheen

If semi-gloss finish is desired, use Series 1029 Enduratone as the second coat.

Surface Preparation: Surface must be clean and dry.

1st Coat: 6-Color Tneme-Cryl	2.0 - 3.0		
2nd Coat: 6-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. 46H-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

2. System No. 100-1: Crystalline Waterproofing

This system can be applied to concrete that is still wet or has not developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure. Application shall be per Xypex specification manual.

Surface Preparation: Surface to be clean and roughened by Brush Blasting or Acid Etching.

1st Coat: XYPEX Concentrate at 1.5 lbs/SY

2nd Coat: XYPEX Modified at 1.5 lbs/SY

C. EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)

1. System No. 6-1: 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 7-Color Tneme-Cryl S/G.

Surface Preparation: Surface shall be clean and dry. Allow concrete to cure for 28 days.

1st Coat: 6-Color Tneme-Cryl

2.0 - 3.0

2nd Coat: 6-Color Tneme-Cryl

2.0 - 3.0

Dry Film Thickness 4.0 - 6.0
Minimum 5.0 Mils

2. System No. N69-4: Epoxy-Polyamide
(Interior/Exterior)

Series N69 provides excellent protection from abrasion, moisture, corrosive fumes and chemical contact. For exterior exposures, topcoat with Series 73, or 74 Endura-Tone for gloss and color retention.

Surface Preparation: Surfaces shall be clean and dry. Allow concrete to cure for 28 days. All surfaces must be clean and dry

Fill Voids and Bugholes using Tnemec Series 215 Surfacing Epoxy

1st Coat: N69-Color Hi-Build Epoxoline	3.0 - 5.0		
2nd Coat: N69-Color Hi-Build Epoxoline	<u>4.0 - 6.0</u>		
		Dry Film Thickness	7.0 -11.0
		Minimum	9.0 Mils

D. IMMERSION - POTABLE & NON-POTABLE WATER

1. System No. 446-5: Moisture Cured Urethane (Non-Potable Water)

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

1st Coat: 104-1255 H.S. Epoxy Primer	6.0 - 10.0		
2nd Coat: 104 Color H.S. Epoxy	<u>6.0 - 10.0</u>		
		Dry Film Thickness	12.0 - 20.0
		Minimum	14.0 Mils

2. System No. N140-2 Epoxy-Polyamide (Potable Water)

This system meets American Water Works Association AWWA D 102 Inside System No. 1. Series 20 meets the new requirements of approval for potable water use as established by the National Sanitation Foundation Standard 61. Surface irregularities and bug holes should be filled to a smooth uniform appearance as required with TNEMEC Series 63-1500 Filler and Surfacer. (NSF Standard 61 approved). Substitute Series FC20 for low temperature cure or quick recoats.

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

1st Coat: N140-00WH White Pota-Pox	4.0 - 6.0	
2nd Coat: N140-15BL Tank White Pota-Pox Finish	<u>4.0 - 6.0</u>	
	Dry Film Thickness	8.0 - 12.0
	Minimum	10.0 Mils

E. INTERIOR EXPOSURE (NON-IMMERSION)

1. 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-Tuffcoat for Gloss Finish.

Surface Preparation: Surface must be clean and dry.

One Coat: 113-Color Tneme-Tuffcoat

Dry Film Thickness 4.0 - 6.0

3.19 CONCRETE FLOORS

A. EPOXY FLOOR COATINGS

1. System No. 280-1: High Build Polyamine-Epoxy Floor

Please refer to manufacturer's Installation Guide and Technical Data for proper installation.

Surface Preparation: Abrasive blast cleaning (refer to Installation Guide of manufacturer).

1st Coat: 201 Epoxoprime	6.0 - 8.0
2nd Coat: 280 Tneme-Glaze	6.0 - 8.0
3 rd Coat 290- Color CRU	<u>2.0-3.0 mils DFT</u>

Note: If a non-skid surface is desired, broadcast 30-50 mesh clean dry silica sand into the 2nd coat.

Dry Film Thickness 12.0 - 16.0
Minimum 14.0 Mils

3.20 POROUS MASONRY

A. EXTERIOR/INTERIOR EXPOSURE

1. System No. 6-2: Acrylic Emulsion, Low Sheen

This system will fill the block and provide a sealed surface. For Semi-Gloss Finish,

use 1029-Color Enduratone

Surface Preparation: Surface shall be clean and dry.

1st Coat: 1254 Modified Epoxy Masonry Filler	125 SF Gal
2nd Coat: 6-Color Tneme-Cryl	2.0 - 3.0
3rd Coat: 6-Color Tneme-Cryl	<u>2.0 - 3.0</u>
	*4.0 - 6.0

*Total Dry Film Thickness of Topcoats Only.

2. System No. 66-15: Epoxy-Polyamide (Interior)

Block Filler is a modified epoxy designed for high moisture.

Surface Preparation: Surface shall be clean and dry.

1st Coat: 1254 Epoxy Masonry Filler	125 SF/Gal
2nd Coat: 66-Color Hi-Build Epoxoline	4.0 - 6.0
3rd Coat: 66-Color Hi-Build Epoxoline	<u>4.0 - 6.0</u>
	*8.0 - 12.0

*Total Dry Film Thickness of Topcoats Only.

3. System No. 113-1: 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: 130 Envirofill	100 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. 156-1: Modified Acrylic Elastomer

If texture is needed, use 157 Enviro-Crete TX (medium texture of 159 Enviro-Crete XTX - coarse texture). For application over previously applied coatings, use TNE MEC 151 Elasto-Grip at 1.0 - 2.5 mils DFT.

Surface Preparation: Surfaces must be clean and dry.

1st Coat: 130 Envirofill	100 SF/Gal
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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
			(For 2nd & 3rd Coats)

3.21 GYPSUM WALLBOARD

A. INTERIOR EXPOSURE

1. System No. 113-5: Acrylic-Epoxy

Surface Preparation: Surface must be clean and dry.

1st Coat: 51 PVA 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. 66-22: Hi-Build Epoxoline

Surface Preparation: Surface must be clean and dry.

1st Coat: 51 PVA Sealer	1.0 - 2.0		
2nd Coat: 66-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. 6-1: 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 7-color Tneme-Cryl S/G.

Surface Preparation: Surface must be dry and clean.

1st Coat: 6-Color Tneme-Cryl	2.0 - 3.0		
2nd Coat: 6-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. 1029-4: Acrylic Polymer

Specify Series 2H Hi-Build Tneme-Gloss for High Gloss finish.

Surface Preparation: Surface shall be clean and dry.

1st Coat: 10-99W	2.5 - 3.5		
2nd Coat: 1029	2.0-3.0		
3rd Coat: 1029	<u>2.0-3.0</u>		
		Dry Film Thickness	6.5 - 9.5
		Minimum	6.5 Mils

3.23 PVC PIPE

A. EXTERIOR OR INTERIOR

System No. 66-23: Epoxy-Polyamide

Optional topcoat of Series 72/73Endura-Shield would give long-term color and gloss retention for exterior exposure.

Surface Preparation: Surface shall be clean and dry.

One Coat: 66-Color Hi-Build Epoxoline

Dry Film Thickness -3.0-4.0

3.24 INSULATED PIPE

A. INTERIOR EXPOSURE

System No. 6-1: Acrylic Emulsion, Low Sheen

For semi-gloss finish, use 1029-Color Enduratone

Surface Preparation: Surface shall be clean and dry.

1st Coat: 6-Color Tneme-Cryl	2.0 - 3.0		
2nd Coat: 6-Color Tneme-Cryl	<u>2.0 - 3.0</u>		
		Dry Film Thickness	4.0 - 6.0
		Minimum	5.0 Mils

3.25 SURFACES EXPOSED TO H2S/H2SO4 (SEVERE EXPOSURE/IMMERSION)

A. CEMENTITIOUS SURFACES

System No. 434-1: Epoxy Mortar

This system offers outstanding resistance to Severe Wastewater Conditions including

digesters, grit chambers, influent structures, pretreatment structures, manholes, and lift stations.

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

1 st Coat Tnemec Series 434	1/16"
2 nd Coat Tnemec Series 435	15.0-20.0

System No. 436-1 Fiber-Reinforced Polyamine Epoxy (Spray Applied)

This system spray applied system offers outstanding resistance to Severe Wastewater Conditions. It is ideal for large surface area structures where spray application is an option for the contractor.

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

Apply (1) Coat (multiple passes may be needed) of Tnemec Series 436 Perma-Shield FR at from 100 to 125 mils DFT.

B. FERROUS METAL SURFACES

System No. 435-2: Modified Polyamine Epoxy

Surface Preparation: SSPC-SP-10 Near White Metal Blast Cleaning (3.0 Mil Profile)

1st Coat: 435-5023 Beige	15.0-20.0		
2nd Coat: 435-5020 Gray	<u>15.0-20.0</u>		
		Dry Film Thickness	30.0-40.0
		Minimum	40.0 Mils

3.26 EXTERIOR OF PRESTRESSED CONCRETE TANKS

A. System No. 156-1: New Tanks

Surface Preparation: 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. 156-2: 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 3.0 - 5.0

with a brushed coat of Series 156 Envirocrete

Topcoat: 156-Envirocrete 4.0 - 6.0

Dry Film Thickness (Cracks) 8.0 - 13.5

Dry Film Thickness (Other) 5.0 - 8.5

3.27 SECONDARY CONTAINMENT AREAS

A. System No. 66-4: Epoxy Polyamide

This system will provide excellent resistance to most chemicals including petrochemicals.

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

Primer: 66-Color Hi-Build Epoxoline 4.0 - 6.0

Topcoat: 66-Color Hi-Build Epoxoline 4.0 - 6.0

Dry Film Thickness 8.0 - 12.0

Minimum 10.0 Mils

B. System No. 61-1: Amine Epoxy

This system offers superior chemical resistance to a wide range of chemicals. Use TNEMEC Series 63-1500 between coats as a filler and surfacer wherever it is required.

Surface Preparation: Surfaces shall be clean and dry. Allow new concrete to cure for 28 days. Abrasive Blast Clean per SSPC-SP7 (Brush Off Blast).

Primer: 61-5002 Tneme-Liner (Beige) 8.0 - 12.0

Topcoat: 61-5001 Tneme-Liner (Gray) 8.0 - 12.0

Dry Film Thickness 16.0 - 24.0

C. System 252-1 Mat Reinforced Vinyl Ester

This system offers superior chemical resistance to Sulfuric Acid and Hydrofluosilicic Acid

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

Prime Coat: Tnemec Series 251SC @ 8.0-10.0 mils DFT.

Base Coat: Tnemec Series 252 -Basecoat @ 8.0-12.0 mils DFT.

Mat Reinforcement: Tnemec 239SC Part D – ¾ ounce chopped strand fiberglass mat. Press mat into the (wet) basecoat so that no hollow areas remain. Press firmly into corners. Follow immediately with Saturant Coat.

Saturant Coat: Tnemec 252. Apply while base coat is still wet, @ 8.0-12.0 mils DFT. Make sure that mat is completely wet out and that the mat fibers have turned "translucent".

Topcoat: Tnemec Series 252 with field added colorant @ 8.0 mils DFT. Apply Series 252 after the Saturant coat has cured for 8 hours (@ 75 deg) but no later than 24 hours.

D. System 239-1 Mat Reinforced Novolac Epoxy

This system offers superior chemical resistance to Ferric Sulfate and Sodium Hydroxide

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

Prime Coat: Tnemec Series 239SC @ 6.0-8.0 mils DFT.

Base Coat: Tnemec Series 239SC @ 6.0-12.0 mils DFT

Mat Reinforcement: Tnemec 239SC Part D - ¾ ounce chopped strand fiberglass mat. Press mat into the (wet) basecoat so that no hollow areas remain. Press firmly into corners. Follow immediately with Saturant Coat.

Saturant Coat: Tnemec 239SC. Apply while base coat is still wet, @ 8.0-12.0 mils DFT. Make sure that mat is completely wet out and that the mat fibers have turned "translucent".

Topcoat: Tnemec Series 282 Tneme-Glaze. Apply Series 282 after the Saturant coat has cured for 8 hours (@ 75 deg) but no later than 24 hours.

3.28 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 and dry, and free of cracks, dirt, oils, efflorescence, paint, curing compounds and other contaminants that may affect the penetration of the material.

COATING: BRICK, CONCRETE

Prime-A-Pell Plus Silane / Siloxane

3.29 MANHOLES, WET WELLS AND LIFT STATIONS

A. System No. 434-1: Epoxy Mortar

Surface Preparation: Sweep abrasive blasting to remove laitance, fines, curing compounds, form release oils, open voids and bugholes and produce a surface profile equal to ICRI CSP 5.

Resurface all concrete and fill all voids and bugholes using Tnemec Series 218 @ 1/16"

1 st Coat Tnemec Series 434	1/16"
2 nd Coat Tnemec Series 435	15.0-20.0

B. System No. 100-1: Crystalline Waterproofing

This system can be applied to concrete that is still wet or has not developed final cure. It can be used where wet surface conditions exist or where there is the potential for water intrusion due to hydrostatic pressure.

Surface Preparation: Surface to be clean and roughened by Brush Blasting or Acid Etching.

1st Coat: XYPEX Concentrate @ 1.5 lbs./SY
2nd Coat: XYPEX Modified @ 1.5 lbs./SY

3.30 CANAL PIPE CROSSINGS

A. System 90-97: Zinc/Urethane/Fluoropolymer

This system offers outstanding long term corrosion protection and resistance to chalking and fading from UV attack for New Pipe or Pipe Requiring Removal of Existing Coatings

Surface Preparation: SSPC-SP6 Commercial Blast Cleaning

Primer: 90-97 Tneme-Zinc	2.5 - 3.5	
2nd Coat: 73-Color Acrylic Polyurethane	2.5-3.5	
3rd Coat: 700 Hydroflon	<u>2.0 - 3.0</u>	
		Dry Film Thickness 7.0 - 10.0
		Minimum 8.5 Mils

B. System No. 141-2: High Build, High Gloss Fluoropolymer

This System offers outstanding long term corrosion protection and resistance to chalking and fading from UV attack for Marginally Cleaned Surfaces or Topcoating Over Sound Existing Systems

Surface Preparation: High Pressure Water Blast (min. 3500 psi) or Solvent Clean (SSPC-SP1) and Spot Hand and 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.

1st Coat: 141-Color Epoxoline	3.0 - 4.0
2nd Coat: 73-Color Endurashield	2.0 - 3.0
3rd Coat 700 Hydroflon	<u>2.0 - 3.0</u>
	Minimum Dry Film Thickness 5.0

C. Ductile Iron Pipe (Above grade)

A test patch is always recommended to insure proper adhesion to existing coatings without lifting of existing coatings.

Surface Preparation: Clean and dry. (Do not solvent clean.)

1st Coat: TNEMEC Series 66*	3.0 - 5.0
2nd Coat: TNEMEC Series 66	<u>3.0 - 5.0</u>
	Minimum Dry Film Thickness 6.0 - 10.0

*Allow the black asphaltic coating to "bleed" through the first coat. After the first coat is cured, apply second coat.

3.31 PROJECT DESIGNER SYSTEMS REFERENCE GUIDE

A. STEEL

EXTERIOR (NON-IMMERSION)

- A.1 System No. 73-1: Epoxy/High Build Urethane
- A.2 System No. 73-2: High Build Urethane
- A.3 System 90-97: Zinc/Epoxy/Urethane

INTERIOR EXPOSURE (NON-IMMERSION)

- B.1 System No. 69-1: High Solids Epoxy
- B.2 System No. 66-2: High Build Epoxy

IMMERSION

- C.1 System No. 69-2: High Solids Epoxy (Non-Potable)
- C.2 System No. N140: High Solids Epoxy (Potable Water)
- C.3 System No. 46-30: High Build Coat Tar Epoxy (Non-Potable Only)

- B. OVERHEAD METAL DECKING, JOIST (INTERIOR EXPOSURE)
System No. 115-1: Uni-Bond

- C. OVERHEAD METAL DECKING, JOINT (EXTERIOR EXPOSURE)
System No. 141-1: Chembuild

- D. MILL COATED STEEL PIPE
System No. 141-3: Epoxy Polyamide

- E. GALVANIZED STEEL-PIPE AND MISCELLANEOUS FABRICATORS
System No. 73-1: Epoxy/High Build Urethane

- F. GALVANIZED STEEL-INTERIOR EXPOSURE (NON-IMMERSION) AND ALUMINUM IN CONTACT WITH CONCRETE
System No. N69-6: Polyamine Epoxy

- G. GALVANIZED STEEL - IMMERSION (POTABLE WATER)
System No. N140-1: Epoxy Polyamide (Potable Water)

- H. CONCRETE

EXTERIOR-ABOVE GRADE

- A.1 System No. 6-1: Acrylic Emulsion Low Sheen
- A.2 System No. 156-1: Modified Acrylic Elastomer

EXTERIOR-BELOW GRADE

- B.2 System No. 46H-31: Coal Tar Epoxy
- B.3 System No. 100-1: Crystalline Waterproofing

EXTERIOR/INTERIOR EXPOSURE (NON-IMMERSION)

- C.1 System No. 6-1: Acrylic Emulsion Low Sheen
- C.2 System No. N694: Epoxy-Polyamine

IMMERSION (POTABLE & NON-POTABLE)

- D.1 System No. 446-5: MCU (Non-Potable)
- D.2 System No. N140-2: Epoxy Polyamine (Potable)

INTERIOR EXPOSURE (NON-IMMERSION)

- E.1 System No. 113-1: Acrylic Epoxy Semi-Gloss

I. CONCRETE FLOORS

- A.1 System No. 281-1: High Build Polyamide-Epoxy Flooring

J. POROUS MASONRY - EXTERIOR/INTERIOR EXPOSURE

- A.1 System No. 6-2: Acrylic Emulsion, Low Sheen
- A.2 System No. 66-15: Epoxy-Polyamide (Interior)
- A.3 System No. 113-1: Acrylic Epoxy Semi-Gloss (Interior Only)
- A.4 System No. 156-1: Modified Acrylic Elastomer

K. GYPSUM WALLBOARD

- A.1 System No. 113-5: Acrylic Epoxy
- A.2 System No. 66-22: Hi-Build Epoxoline
- A.3 System No. 6-1: Acrylic Emulsion, Low Sheen

L. WOOD EXTERIOR/INTERIOR EXPOSURE

- A.1 System No. 1029-4: Acrylic Polymer Semi-Gloss

M. PVC PIPE EXTERIOR/INTERIOR EXPOSURE

- A.1 System No. 66-23: Epoxy-Polyamide

N. INSULATED PIPE-INTERIOR EXPOSURE

- A.1 System No. 6-1: Acrylic Emulsion, Low Sheen

O. HIGH HEAT SURFACES-FERROUS METAL

P. SURFACES EXPOSED TO H₂S/H₂SO₄ (SEVERE EXPOSURE/IMMERSION)

- A.1 System No. 434-1 Epoxy Mortar
- A.2 System No. 436-1 Fiber-Reinforced Epoxy
- B.1 System No. 435-2 Modified Polyamine Epoxy

Q. EXTERIOR OF PRESTRESSED CONCRETE TANKS

- A. System 156-1: New Tanks
 - B. System 156-2: System 156-2 Existing Tanks (Previously Painted)
- R. SECONDARY CONTAINMENT AREAS
- A. System No. 64-4: Epoxy Polyamide
 - B. System No. 61-1: Amine Epoxy
 - C. System No252-1 Mat Reinforced Vinyl Ester
 - D. System 239-1 Mat Reinforced Polyamine Epoxy
- S. CLEAR WATER REPELLENT FOR CONCRETE, MASONRY AND BRICK
- A. Silane/Siloxane Sealer (Min. 42% Solids)
- T. MANHOLES, WET WELLS & LIFT STATIONS
- A. System No. 434-1: Epoxy Mortar
 - B. System No. 100-1: Crystalline Waterproofing
- U. CANAL PIPE CROSSINGS
- A. System No. 90-97: Zinc/Urethane/Fluoropolymer
 - B. System No. 141-2: High Build/High Gloss Fluoropolymer
 - C. Ductile Iron Pipe Above Grade: Series 66 High Build Epoxy

3.32 COATING SCHEDULE - HEADWORKS AND RECYCLE PUMP REHABILITATION

Service Category	Description
<p>Concrete</p> <p>-Headwork's top of deck</p> <p>-Anoxic/Aerobic Basin</p>	<p>Coat per Specification # 09930</p> <ul style="list-style-type: none"> - Extensive resurfacing and coating - See #09930 for special coating requirements <p>Coat per Specification # 09900</p> <ul style="list-style-type: none"> - Section 3.18-A - Exterior - Above Grade - Tnemec System No. 156-1

<p>Piping/Fittings</p> <p>-Ductile Iron - above ground</p> <p>-Ductile Iron - below ground</p> <p>-PVC</p>	<p>Coat per Specification # 15062</p> <ul style="list-style-type: none"> - See #15062 for special coating requirements - Koppers No. 621 rust inhibitive primer <p>Coat and Line per Specification #15062</p> <ul style="list-style-type: none"> - See #15062 for special coating requirements - Coal tar enamel per ANSI/AWWA C151/A21.51 <p>Coat per Specification # 09900</p> <ul style="list-style-type: none"> - Section 3.23-A - PVC - Exterior or Interior - Tnemec System No. 66-23
<p>Equipment</p> <p>-Internal Recycle Pumps</p> <p>Equipment</p> <p>-Bar Screen</p> <p>-Conveyor</p> <p>-Vortex Grit Removal System</p>	<p>Coat per Specification # 09900</p> <ul style="list-style-type: none"> - Section 3.13-A - Steel - Exterior Exposure (Non-Immersion) - Tnemec System No. 73-1 <p>Coat per Specification # 11315</p> <ul style="list-style-type: none"> - See # 11315 for special coating requirements <p>Factory Applied per Specification # 11316</p> <ul style="list-style-type: none"> - See # 11316 for special coating requirements <p>Coat per Specification # 11322</p> <ul style="list-style-type: none"> - See # 11322 for special coating requirements

END OF SECTION

SECTION 09902

PIPE AND EQUIPMENT PAINTING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section includes pipe painting and identification as required for this project.

1.02 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

PART 2 PRODUCTS

2.01 PAINTING AND IDENTIFICATION

- A. Exposed piping (except stainless steel) shall be painted. Metal, ductile Iron, and plastic pipe shall be coated per Specification 09900 - Painting.
- B. General Notes and Guidelines:
 - 1. All color numbers and names herein refer Tnemec to master color card. Colors of specified equal manufacturers may be substituted with approval of the Engineer.
 - 2. Pipe lines, equipment, or other items which are not listed here shall be assigned a color by the Engineer and shall be treated as an integral part of the Contract.
 - 3. When color coding is specified or directed by the Engineer, it shall consist of color code painting and identification of all exposed conduits, through lines and pipelines for the transport of gases, liquids, or semi-liquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and any operating accessories which are integral to a whole functional mechanical pipe and electrical conduit systems.
 - 4. Description on titles (Abbreviated Code on Pipe/Equipment) to be lettered on pipes or equipment will be black or white to contrast with color of pipes and equipment and shall be stenciled applied, as approved by the Engineer.
 - 5. All moving parts, drive assemblies, and covers for moving parts which are

potential hazards shall be Safety Orange 04SF.

6. All safety equipment shall be painted in accordance with OSHA standards.
7. All inline equipment and appurtenances not assigned another color shall be painted the same base color as the piping. The pipe system shall be painted with the pipe color up to but not including the flanges attached to pumps and mechanical equipment assigned another color.
8. All pipe hangers and pipe support floor standards shall be painted.
9. All conduits shall be painted to match its background surface.
10. Building surface colors shall be painted as scheduled in the Finish Schedule or as selected by the Engineer.
11. Doors and frames shall be painted as scheduled in The Finish Schedule or as selected by the Engineer.
12. Wood casework, frames, doors, etc. shall be finished with urethane as specified except as specifically noted otherwise.

2.02 PAINT COLOR CODE SCHEDULE

- A. In situations where two colors do not have sufficient contrast to easily differentiate between them, a six-inch band of contrasting color should be painted on one of the pipes at approximately 30-inch intervals. The name of the liquid or gas should also be painted (stenciled) on the pipe in a contrasting color. In some cases, it may be advantageous to paint arrows indicating the direction of flow.

COLOR OF PIPE AND
EQUIPMENT

DESCRIPTION OF TITLE TO BE LETTERED ON PIPES AND EQUIPMENT	TITLE LETTERS	COLOR NAME	COLOR NUMBER
<u>EQUIPMENT</u>			
CONVEYORS, SLUDGE HOPPERS, & RELATED EQUIP.	WHITE	SAFETY ORANGE	04SF
BAR SCREENS	WHITE	SAFETY ORANGE	04SF
GRIT COLLECTOR HOUSING AND SCREW CONVEYORS	WHITE	SAFETY ORANGE	04SF
SUMP PUMPS	WHITE	LIGHT GRAY	A0385
BRIDGE CRANES, MONORAILS AND TRACK	WHITE	SAFETY ORANGE	04SF
BLOWERS	BLACK	CYPRESS GREEN	G0383
SLUICE GATE OPERATORS	WHITE	SAFETY ORANGE	04SF
SCUM PUMPS	WHITE	APRIL GREEN	J8187
PNEUMATIC EJECTORS	WHITE	APRIL GREEN	J8187
AIR COMPRESSORS	WHITE	PALM GREEN	G3102
WASTE SLUDGE PUMPS	WHITE	TAN BARK	J6512
AIR FILTER HOUSINGS	WHITE	CYPRESS GREEN	G0383
SODIUM HYPCHLORITE PUMPS	BLACK	SAFETY YELLOW	02SF
EFFLUENT REUSE PUMPS	WHITE	PANTONE PURPLE	522-C
FILTER AND EFFLUENT SAMPLE PUMPS	WHITE	AQUAMARINE	G0427
FLASH MIXERS	WHITE	SAFETY ORANGE	04SF
FLOBBULATOR DRIVES	WHITE	SAFETY ORANGE	04SF
CLARIFIER BRIDGES AND PUMPS	WHITE	SAFETY ORANGE	04SF
ODOR CONTROL SYSTEM AND BLOWERS	BLACK	EGG SHELL	J6963
DESCRIPTION OF TITLE TO BE LETTERED ON PIPES AND EQUIPMENT	TITLE LETTERS	COLOR NAME	COLOR NUMBER

ALUM FEED SYSTEM	BLACK	SAFETY ORANGE	04SF
POLYMER FEED SYSTEM	BLACK	ORIENTAL YELLOW	D0852
POLYMER TANKS AND MIXERS	BLACK	ORIENTAL YELLOW	D0852
POLYMER PUMPS	BLACK	ORIENTAL YELLOW	D0852
GRIT SCREW CONVEYOR	WHITE	SAFETY ORANGE	04SF
SLUDGE PUMPS	WHITE	ANTIQUE BROWN	L9398
CONDUIT	WHITE	CYPRESS GREEN	G0383
CONDUIT TRAYS	WHITE	CYPRESS GREEN	G0383
FANS	WHITE	EGG SHELL	J6963
<u>PIPES</u>			
RAW WASTEWATER PIPE	WHITE	LIGHT GRAY	A0385
S. STEEL AIR PIPE APPURTENANCES	BLACK	SILVER	MATCH S. STEEL
SCUM PIPE	WHITE	APRIL GREEN	J8187
WASTE SLUDGE PIPE	WHITE	TAN BARK	J6512
SUMP PUMP PIPE	WHITE	LIGHT GRAY	A0385
CHLORINE PIPE AND HEADER	BLACK	SAFETY YELLOW	02SF
EFFLUENT REUSE PIPE	WHITE	PANTONE PURPLE	R3910
CHLORINE SAMPLE PIPE	BLACK	SAFETY YELLOW	02SF
POLYMER PIPE	BLACK	ORIENTAL YELLOW	D0852
THICKENED WASTE SLUDGE PIPE	WHITE	ANTIQUE BROWN	L9398
COLD WATER	BLACK	AZURE	J8162
HOT WATER	BLACK	AZURE	J8162
SOIL PIPES	WHITE	LIGHT GRAY	A0385
FUEL PIPE	WHITE	SAFETY RED	06SF
DESCRIPTION OF TITLE TO BE LETTERED ON PIPES AND EQUIPMENT	TITLE LETTERS	COLOR NAME AND NUMBER	

WASTE AND VENT PIPES
(INTERIOR)

WHITE

MATCH BACKGROUND

2.02 PAINTING OF EXISTING STRUCTURES, PIPING, VALVING AND EQUIPMENT

- A. Touch up existing structures and equipment where finish has been damaged by new construction.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 09930

PROTECTIVE EPOXY/POLYURETHANE TOPPING SYSTEM FOR CONCRETE SURFACES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. An approved applicator (APPLICATOR) shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install a protective lining system for concrete surfaces.
2. Where not otherwise shown, the extent of the protective lining shall be located 1) interior or exterior surfaces of structures such as floors, top of decks and tops of walls as shown on drawings and/or noted in written specifications.
3. Types of protective lining system components for the corrosion protection work required, including surface treatment of prepared surfaces prior to coating application, shall include, but are not necessarily limited to, the following:
 - a. Epoxy formulation high build filler compound
 - b. Epoxy primer
 - c. Corrosion-resistant epoxy monolithic coating with aggregate optional aggregate broadcast
 - d. Aliphatic polyurethane sealer coat for UV resistance and color stability
 - e. Miscellaneous materials

B. Coordination:

1. Coordinate surface preparation of substrates to avoid later difficulty or delay in performing the Work of this Section.
2. Review installation procedures under other Sections and coordinate the installation of items that must be installed prior to application of the protective lining system.
3. Coordinate the setting of wall and floor penetrations and installation of piping and equipment or other items interfacing with the recommended execution procedures of the protective lining manufacturer.
4. Remove all chemicals, films, laitance, compounds and other materials from substrates to receive the Work of this Section, as may be required by the protective lining manufacturer at no additional expense to OWNER.
5. All substrate surface preparation and lining application is to be completed by manufacturer's approved APPLICATOR.

C. Related Sections:

1. Section 03300, Cast-In-Place Concrete.
2. Section 09900, Painting.

1.02 QUALITY ASSURANCE

A. Applicator Qualifications:

1. Engage a single surface preparation and coating installation applicator specialist (APPLICATOR) with specific experience in the application of the type of protective lining system specified, and who is approved by the PROTECTIVE LINING MANUFACTURER and agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER for approval.
 2. The APPLICATOR shall be trained and approved by the protective lining materials manufacturer.
- B. Performance Criteria: The surfaces to receive the protective lining system shall be capable of withstanding, under intermittent exposure, municipal wastewater and the compounds, gases and vapors associated with municipal wastewater.
- C. Source Quality Control: Provide each component of protective lining system produced by a single manufacturer, including recommended underlayment, fillers, repair products, base coat and top coat materials.
- D. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified as defined in Part 2 - Products.
- E. Statement of Application: Upon completion of the Work under this Section submit a statement to ENGINEER, signed by the protective lining system APPLICATOR stating that the installed protective lining system complies with the requirements of the specifications, and that the installation and materials comply with the manufacturer's printed recommendations related to the condition of installation and use.
- F. Protective lining system components specified are as manufactured by Sauereisen, Pittsburgh, PA (412) 963-0303. Request for material substitutions to the specified products shall be made in writing to the ENGINEER 15 days prior the bid date and no product substitutions or requests for such will be reviewed or accepted after this date. In accordance with these requirements bids must be based on ENGINEER approved products only.

1.03 SUBMITTALS

- A. Samples: Not required
- B. Shop Drawings: Submit for approval the following:
1. Copies of manufacturer's technical data sheets complete with installation instructions for protective lining system required.
 2. Maintenance Manual: Copies of manufacturer's written instructions for recommended maintenance practices. Include the following information:
 - a. Product name and number.
 - b. Name, address and telephone number of manufacturer and local distributor or representative.
 - c. Detailed procedures for routine maintenance and cleaning.
 - d. Detailed procedures for repairs.
 3. Test Reports: Verification from protective lining system manufacturer that all testing for physical properties has been performed in strict accordance with

referenced ASTM standards.

- C. Certificates: Submit manufacturer's certifications that materials have been approved for the installation conditions shown on the Drawings and as specified herein. Submit manufacturer's Materials Warranty certificate.
- D. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials:
 - 1. Deliver material in manufacturer's original unopened and undamaged packages.
 - 2. Clearly identify manufacturer, brand name, contents and stock number on each package.
 - 3. Packages showing indications of damage that may affect condition of contents are not acceptable.
- B. Storage of Materials
 - 1. Store in original packaging under protective cover and protect from damage.
 - 2. Store all materials at temperatures recommended by manufacturer.
 - 3. Stack containers in accordance with manufacturer's recommendations.
- C. Handling of Materials: Handle materials in such a manner as to prevent damage to products or finishes.

1.05 JOB CONDITIONS

- A. Environmental Requirements: Maintain substrate temperature and air temperature before, during and after installation in accordance with protective lining manufacturer's written recommendations and instructions.
- B. Provide adequate ventilation during application and curing periods.

1.06 WARRANTY

- A. The PROTECTIVE LINING MANUFACTURER shall warranty its products as free from material defects for a minimum period of one (1) year. Provide associated Warranty Certificate.
- B. APPLICATOR shall warranty the installed protective lining system as free from material and workmanship defects for a minimum period of three (1) year.

PART 2 PRODUCTS

2.01 MATERIALS

A. The protective topping system shall be a multi-component protective topping system, including:

1. Epoxy filler compound when needed and recommended by the Applicator to fill small voids and bug holes and provide a properly prepared surface for the epoxy topping
2. One coat of brush, roll or sprayable grade epoxy primer
3. One coat of brush, roll or sprayable grade epoxy coating at a minimum of 20 mils
4. Clean aggregate broadcast for anti-skid as determined by the ENGINEER
5. Sealer coat of aliphatic polyurethane
6. The applicator shall supply all accessory components such as sealers, infiltration control products or other compounds or products as recommended by the PROTECTIVE LINING MANUFACTURER for maximum protective lining adherence to substrate and long-term service performance.

B. Products:

1. Epoxy Filler Compound:

<u>Properties</u>	<u>Sauereisen Filler Compound No.209HB</u>
Color	Off White
Compressive Strength	>5,000 psi
Density (ASTM C-905)	47.3 pcf
Tensile Strength (ASTM C-307)	1645 psi(7 days)
Bond Strength to Concrete (ASTM D-4541)	Concrete Failure
Working Time	30 min @ 70°F
Topcoat	24 - 72 hours
Thickness	1/16"

Filler Compound shall be an epoxy formulation specifically designed to resurface and fill small voids, irregularities and air pockets in concrete surfaces. The filler compound shall provide a uniform surface for the application of epoxy monolithic protective topping. The Filler Compound shall be confirmed by the manufacturer as compatible with the protective topping.

2. Epoxy Primer:

<u>Properties</u>	<u>Conoweld No. 501 Primer</u>
Application time:	
Working time at 70oF	20 minutes
Initial set at 70°F	6 hours
Components	2 part
Thickness	5 - 10 mils
Bond strength to concrete (ASTM C-478)	Concrete failure
Percent solids	100%

3. Epoxy Base Coat:	
<u>Properties</u>	<u>No. 201 ConoGlaze Epoxy</u>
Application time (ASTM C-308 modified)	
Working time at 70°F	30 minutes
Components	2
Thickness	Minimum 10 mils
Bond strength to concrete (ASTM D-4541)	Concrete failure
Maximum service temperature (Dry)	150°F (65°C)

4. Polyurethane Sealer Coat	
<u>Properties</u>	<u>Aliphatic Polyurethane No. 310</u>
Bond strength to concrete	(Concrete failure)300 psi (21.1. kg/cm ²)
Color	Grey or Clear
Cure time	Foot traffic 24 hours
Chemical service and ultimate cure	72 hours
Hardness at 77°F (Shore A)	70-80
Maximum service temperature	150°F (65°C)
Mixing ratio, by volume	1:1
Pot life	40 minutes
Tensile elongation	100%
Tensile strength	600psi (42.2 kg/ cm ²)
Viscosity (mixed)	2,200 cps
Water absorption	0.5 max %
Weight per gallon (mixed)	9.72 lbs (4.32 kg)

- C. Product and Manufacturer: Provide one of the following:
1. Sauereisen, Pittsburgh, PA (412) 963-0303.
 2. Or equal in accordance with section 1.02 F of this specification.

PART 3 EXECUTION

3.01 INSPECTION

- A. The APPLICATOR shall examine the areas and conditions under which protective lining Work is to be performed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.
- B. Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the APPLICATOR and the ENGINEER and will produce a finished product meeting the requirements of the Specifications. All defects resulting from such accepted conditions shall be corrected by APPLICATOR at his own expense.

3.02 SURFACE PREPARATION

- A. Existing Concrete Application - Existing concrete structures to receive protective topping system must be capable of withstanding imposed loads. All oil, grease and chemical contaminants must be removed from the surface of the concrete. All surfaces must be firm, free of damaged or contaminated concrete, laitance, form release agents, and standing water and they must be structurally sound as determined by ENGINEER. Suitable surface preparation methods include shot blasting, abrasive Blasting, or hydro-blasting. Surface preparation procedures shall be in accordance with ICRI Guideline No. 03732. Surface preparation requirement is to expose aggregate and obtain a uniform surface texture resembling an ICRI CSP # 4-6 comparators.
- B. Allow any new concrete/concrete block (including mortar joints) to cure for 28 days before protective lining system is installed, unless otherwise recommended by the APPLICATOR or protective lining systems manufacturer.
- C. Concrete/concrete block surfaces that have been resurfaced must be allowed to cure in accordance with protective lining manufacturer's recommendations prior to application of protective epoxy topping system.
- D. Level or grind concrete substrates to protective lining system manufacturer's recommended tolerances to produce a uniform surface profile, including removal of all sharp edges, ridges or depressions.
- E. Consult protective lining system manufacturer regarding all questions and/or recommendations in reference to moisture problems or questions.

3.04 APPLICATION

- A. Protective lining systems shall be installed when ambient air and surface temperatures are between 50° and 85°F. Store lining materials within the 60° to 85°F range for 48 hours prior to use. Application and storage temperatures outside of this range will require written instruction from the protective lining manufacturer.
- B. Application in direct sunlight and/or with rising surface temperatures is not recommended, as this may result in blistering of the materials due to expansion of entrapped air or moisture (out-gassing) in the concrete/concrete block substrates. In such cases, it will be necessary to postpone the application until later in the day when the temperature of the substrate is falling. Concrete surfaces that have been in direct sunlight must be shaded for at least 24 hours prior to application and remain shaded until the initial set has taken place. Consult protective lining system manufacturer for application schedule guidelines specific to temperature conditions and possible sealer application recommendations to reduce out-gassing.
- C. Resurfacing/Epoxy Filler Compound Application - Epoxy filler compound shall be used in accordance with sections 1.1.A.3 and 2.1.A.1 of this specification and in accordance with protective lining manufacturer's recommendations to provide a crack, void and bug hole free uniform surface for epoxy topping application.

- D. Protective Epoxy/Polyurethane Topping - Protective epoxy/polyurethane topping shall be applied and cured on the properly prepared surface in accordance with protective lining system manufacturer's written guidelines as outlined in product technical data sheets.
1. Epoxy topping shall be applied to a total minimum thickness of 20 mils over specified primer (applied over completed and cured resurfacing material and the application method and equipment shall be approved by the APPLICATOR and shall be in accordance with the PROTECTIVE LINING MANUFACTURER'S recommendations
 2. Anti-skid aggregate broadcast, if required, shall be broadcast into wet epoxy topping to achieve desired anti-skid properties and all excess aggregate shall be removed by vacuum or sweeping the following day
 3. Aliphatic polyurethane sealer coat shall be applied to cured epoxy topping at thickness required to seal topping, including covering of aggregate broadcast if used
- E. Expansion and construction joints shall be formed and filled as recommended by the PROTECTIVE LINING MANUFACTURER.

3.04 ADJUSTMENTS AND CLEANING

- A. At the completion of the Work, APPLICATOR shall remove all materials and debris associated with the Work of this Section.
- B. Clean all surfaces not designated to receive protective topping. Restore all other work in a manner acceptable to ENGINEER.
- C. All finished protective topping Work shall be protected from damage until Final Acceptance of the Work. Protective lining damaged in any manner shall be repaired or replaced at the discretion of ENGINEER at no additional cost to OWNER.
- D. Clean all protective topping as recommended by the manufacturer to provide finished Work acceptable to OWNER, just prior to Final Acceptance.

END OF SECTION

SECTION 09931

MASTIC EMBEDDED PLASTIC LINING FOR REHABILITATION OF CONCRETE SEWER STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section sets forth the requirements for the epoxy mastic and PVC protective lining system. The protective lining system shall fully adhere to the prepared interior surfaces of the structure in accordance with the limits shown on the Contract Drawings. All work, for and in connection with the installation of the lining and the field sealing and welding of joints, shall be done in strict conformity with all applicable specifications, instructions and recommendations of the lining manufacturer.

1.02 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for Work performed under this Section. Cost is incidental to work or rehabilitation of large diameter sewers, precast concrete manholes, or cast-in-place wastewater-containing structures.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.
- B. Prior to submittal of shop drawings, manufacturer shall approve proposed panel layout and proposed details. The Contractor shall submit the following for approval; confirmation of training by the manufacture for each applicator installing the lining system, a materials list for the lining system including material safety data sheets and laboratory test data, a complete description of the concrete surface preparation procedure including equipment and setup, and a complete description of the lining system including written instructions for application, inspection and testing, and the size of the PVC liner sheets to be used. The manufacturer of the lining shall furnish an affidavit attesting to the successful use of its PVC lining material in similar service for a minimum period of 50 years in sewage conditions recognized as corrosive or otherwise detrimental to concrete.
- C. Provide sufficient details to permit placement of liner. Do not begin fabrication of liner until after shop drawings and submitted materials have been reviewed and accepted by Project Manager.

1.05 INSTALLER QUALIFICATIONS

- A. The work shall be performed by a contractor or subcontractor who is trained by the manufacturer of the protective lining system specified. Each applicator who will be applying the protective lining system shall also be certified. All specified materials shall be

installed in strict accordance with the manufacturer's application or installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Liner shall be the Arrow-Lock Sheet Lining System as manufactured by Ameron Protective Linings Brea CA or approved equal.

2.02 MATERIALS

- A. Materials for the protective lining system shall include a primer, two-component epoxy mastic and extruded PVC liners with locking extensions. Primer for use prior to application of intermediate layer shall be Arrow-Lock Mastic Primer No. 5101. Mastic for intermediate layer shall be Arrow-Lock Mastic, No. 9912 2:1 epoxy gel mastic.
- B. The material used in the liner, welding strips, joint strips and other accessory items, shall be a combination of polyvinyl chloride resin, pigments and plasticizers, specially compounded to remain flexible. Polyvinyl chloride resin shall constitute not less than 99 percent, by weight, of the resin used in the formulation. Copolymer resins will not be permitted. Recycled materials are not permitted for use in the composition.
- C. All plastic liner plate sheets, welding strips, joint strips and other accessory items, shall have the following physical properties when tested at 77°F± 5° (25°C±3°).

Property	Initial	(Par. 2.4)
Tensile Strength	2200 psi min. (15 MPa min.)	2100 psi min. 14.5 MPa min.)
Elongation at break	200% min.	200% min.
Shore durometer, Type D (with resPect to initial test result)	1-sec. 50-60 10-sec. 35-50	±5 ±5
Weight change		1.5%

2.03 MATERIAL TESTS

- A. Tensile specimens shall be prepared and tested in accordance with ASTM D412 using Die B. Weight change specimens shall be 1-inch (25-mm) by 3-inch (75-mm) samples. Specimens for testing of initial physical properties may be taken from liner plate sheet and welding strip at any time prior to final acceptance of the work.
- B. Liner plate locking extensions embedded in mastic shall withstand a test pull of at least 20 pounds per linear inch (3.58 kg/cm), applied perpendicularly to the concrete surface for a period of one minute, without rupture of the locking extensions or withdrawal from the intermediate mastic layer or delamination of the mastic from the concrete substrate. This test shall be made at a temperature of 70°-80°F (21° -27°C) inclusive and not before mastic has cured at least 7 days.

- C. All plastic liner sheets, including locking extensions, all joint, corner and welding strips shall be free of cracks, cleavages or other defects adversely affecting the protective characteristics of the material. The engineer may authorize the repair of such defects by approved methods.
- D. The PVC lining shall have good impact resistance, shall be flexible and shall have an elongation sufficient to bridge up to 1/4" (6mm) settling cracks, which may occur in the concrete or in joints after installation without damage to the lining.
- E. The lining shall be repairable at any time during the life of the rehabilitated structure.
- F. Chemical Resistance Test
 - 1. This is to be used as a pre-qualification test and a requalification test when material formulations are changed.
 - 2. After conditioning to constant weight at 110°F (43°C), tensile specimens and weight change specimens shall be exposed to the following solutions for a period of 112 days at 77°F±5° (25°C ±3°).
 - 3. At 28-day intervals, tensile specimens and weight change specimens shall be removed from each of the chemical solutions and tested in accordance with paragraph 2.3.2. If any specimen fails to meet the 112-day requirements before completion, the material will be subject to rejection.

Chemical Solution	Concentration
Sulfuric acid	20%**
Sodium hydroxide	5%
Ammonium hydroxide	5%**
Nitric acid	1%**
Sodium hypochlorite	1%
Ferric chloride	1%
Soap	0.1%
Detergent (linear alkyl benzyl sulfonate or LAS)	0.1%
Bacteriological	BOD not less than 700 ppm.

**Volumetric percentages of concentrated C.P. grade reagents

2.04 MATERIAL DETAILS AND DIMENSIONS

- A. Liner sheets shall be a minimum of 0.065 inch (1.65 mm) in thickness. Locking extensions (arrow-shaped) of the same material as that of the liner shall be integrally extruded with the sheet. Continuous locking extensions shall be approximately 2 inches (51mm) apart and shall be approximately 1/4" (6-mm) high.
- B. Sheets shall have a nominal width of 48 inches (1220 mm) and a length of not more than 96 inches (2440 mm), except that longer lengths may be supplied on special order. Lengths specified shall include a tolerance at a ratio of ±1/4" (6mm) for each 100 inches (2540 mm).

- C. Sheets not used for shop fabrication into larger sheets shall be shop tested for pinholes using an electrical spark tester set between 18,000 and 22,000 volts. Any holes shall be repaired and retested.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Prior to applying Primer, areas of corroded concrete substrate must be cleaned free of such contaminants as dust, oil, dirt and corrosion residues. This shall be accomplished using either sand or water blasting, mechanical abrasion or acid etching. Acceptable PH range for the prepared surface is 7 or greater. Surface profile requirements shall be in accordance with the Liner Manufacturer recommendations. Concrete must be dry prior to the application of primer.
- B. Prepare substrate cracks, areas requiring resurfacing and perform detail treatment per Liner Manufacturer recommendations. Structure must be structurally sound before application of Primer.
- C. Installation of the lining, including preheating of sheets in cold weather and the welding of all joints, shall be done in accordance with the recommendations of the liner manufacturer.
- D. Coverage of the lining shall not be less than the minimum shown on the plans. The lining is normally installed with the locking extensions running vertically in the structure. All cut, torn and seriously abraded areas in the lining shall be patched according to manufacturer's instructions. The contractor shall take all necessary measures to prevent damage to installed lining from equipment and materials used in or taken through the work.
- E. If external ground water is present, de-watering procedures must be continued for a minimum of 24 hours after final installation of mastic, PVC Liner and welding strips.
- F. FIELD JOINTS AT STRUCTURES
 1. Lining at joints shall be free of all mortar and other foreign material and shall be clean and dry before joints are made.
 2. Field joints in the lining shall be of the following described types, used as prescribed:
 3. Type AL-1: The joint shall be made with a separate 4-inch (100 mm) wide joint strip. The spacing between the two lining sheets to be joined shall not exceed 1 inch. A 1-inch (25 mm) weld strip shall be fuse-welded on each side of the (100 mm) wide joint strip in strict accordance with the manufacturer's instructions.
 4. Type AL-2: The joint shall be made with a 1-inch (25mm) wide weld strip. The two lining sheets to be joined shall be overlapped a minimum of 1/2" (12.5 mm). The upstream sheet shall overlap the one downstream (if applicable). The lap shall be heat-sealed into place prior to fuse welding on the 1-inch wide weld strip.
 5. Type AL-3: The joint shall be made with a 1-inch (25mm) wide weld strip. The two lining sheets to be joined shall be aligned with a 1/4 inch (6 mm) maximum gap

between the sheets. The weld strip shall be centered over the gap and hot-air fuse-welded according to the manufacturer's instructions.

6. All welding is to be in strict conformance with the specification of the lining manufacturer. Refer to Arrow-Lock application instructions as provided by the manufacturer.

3.02 TESTING AND REPAIRING DAMAGED SURFACES

- A. After the lining is installed, all surfaces covered with lining, including welds, shall be visually inspected for integrity of welds and lining surfaces. Any loose joints, punctures or tears in lining shall be repaired using method approved by the lining manufacturer.
- B. All welds shall be physically tested by a nondestructive probing method using a blunt instrument such as a putty knife.

END OF SECTION

SECTION 11315

MECHANICALLY CLEANED FINE BAR SCREENS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section includes the furnishing of a front-cleaning, front-return link driven mechanically cleaned bar screen assembly and any auxiliary equipment or accessories to be installed in the location as indicated on the drawings and as specified herein.

Number of units: Three

Equipment designation: FPFS, Full Penetration Fine Screen

Equipment location: Outdoors

- B. All equipment supplied under this section shall be furnished by or through a single Screening System Supplier who shall coordinate with the Contractor, the design, fabrication, delivery, installation and testing of the screening components. The Screening System Supplier shall have the sole responsibility for the coordination and performance of all components of the screenings system with the performance and design criteria specified herein.
- C. The Contractor shall be responsible to coordinate all details of the screening equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. The Contractor shall be responsible for all structural and other alterations in the Work required to accommodate the equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

1.02 RELATED SECTIONS

- A. The following list of related sections is provided for the convenience of the Contractor and is for reference only to support commonly referenced sections that are in-general applicable to all equipment supplied. For complete list of sections see specification index.
1. All sections of Division 1 including but not limited to Submittal Procedures, Shop Drawings, Product Data and Samples, Operating and maintenance information, Protection of Materials and Equipment, Installation, Testing, and Commissioning, Instruction of Operations and Maintenance Personnel, and Spare Parts Maintenance Manuals.
 2. Section 01600 - Material and Equipment
 3. Section 05500 - Miscellaneous Metals
 4. Section 09900 - Painting
 5. Division 16 - Electrical

1.03 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Institute of Steel Construction (AISC)
- E. American Bearing Manufacturers Association (ABMA)
- F. American Gear Manufacturers Association (AGMA)
- G. National Electrical Manufacturers Association (NEMA)
- H. Underwriters Laboratory (UL)

1.04 SUBMITTALS

- A. The equipment manufacturer shall submit the following items:
 - 1. A list of recommended Spare Parts including any Special Tools required for routine maintenance of the equipment is provided in Section 2.05.
 - 2. (3) Sets of O & M Manuals including As-Built Drawings of the Mechanically Cleaned Bar Screen Arrangement, Controls and Accessories shall be provided in digital format after equipment ship for inclusion in the Close-Out Submittal process.
 - 3. For sites that have (3) ft or greater head differential, equipment manufacturer shall provide Structural Certification from licensed Civil engineer.
- B. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

1.05 QUALITY ASSURANCE

- A. The Mechanically Cleaned Bar Screens shall be fully assembled and shop tested at the manufacturing facility prior to shipment. Shop testing shall include a minimum of 4 hours of run time.
- B. To assure quality and performance: All equipment furnished under this Section and related sections shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment and demonstrates, to the satisfaction of the Engineer, that the quality is equal to equipment made by those manufacturers specifically named herein. And the screen manufacturer shall have at least 5 installations of the specified model of mechanically cleaned bar screen equipment that has been in successful operation, at similar installations, for at least five (5) years.
- C. The equipment furnished shall be fabricated, assembled, installed and placed in proper operation condition in full conformity with approved drawings, specifications, engineering data, and/or recommendations furnished by the equipment manufacturer.

1.06

ENGINEER'S PRE-APPROVAL OF ALTERNATIVE EQUIPMENT

- A. Manufacturer of alternate equipment shall submit a pre-approval submittal package to Manatee County Purchasing contact listed in the Bid Documents, for Engineer's approval, no later than deadline for Clarification Requests date listed in the Bid Documents. Only approved alternates listed by addendum will be acceptable. Alternate manufacturer shall submit the following information and supporting documentation:
1. A complete set of drawings with dimensions specific to this project showing the individual barscreens, their interface with the conveyor units, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of each unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
 2. Detailed installation drawings illustrating how the proposed screen fits in the channel and how it will mate to ancillary equipment. The drawings shall include dimensioned plan, and elevational and sectional views of each individual system as well as the overall installation. Drawings shall include details of the seal between the screen and the channel, and details of the anchor bolt locations.
 3. Hydraulic performance data showing the relationship of head loss versus the full range of downstream liquid depths for the maximum flow and the average flow. Data based upon other manufacturer's data will not be accepted. See Section 2.02 - Basin of Design for Hydraulic performance data.
 4. Complete electrical and controls submittals including control schematics, PLC programming logic, detailed cut sheets on electrical components and a P&ID. Details of the control and instrumentation system including complete wiring diagrams per the wiring requirements shown on the drawings for this project.
 5. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drive.
 6. Complete reference list of all current and active installations of same and similar equipment including contact names and phone numbers, showing at least 5 installations of the same type and size as specified.
 7. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.
 8. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental

Protection Management System according to ISO 14001.

9. The preapproval submittal shall be signed and sealed by a registered professional engineer in the State of Florida.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer's Qualifications - Firms regularly engaged in the manufacture of screening equipment and wastewater treatment plant equipment of the type and size required. Manufacturers must have been engaged in the manufacture of similar systems for a minimum of five (5) years and have similar units in satisfactory service.
- B. The Contractor shall provide only products that have a proven reliability record of at least five (5) years in operation. No equipment shall be considered which has an operating history of less than five (5) years.
- C. The Base Bid mechanical barscreens shall be as manufactured by Duperon Corporation, 1200 Leon Scott Court, Saginaw, MI. 800.383.8479. The screens shall be 316 Full Penetration, Fine Screen Model Flex Rake.
- D. Contractors may provide an alternate which must be a pre-approved alternate manufacturer(s), as per 1.06 of this specification. The Base Bid equipment shall be Duperon.

2.02 BASIS OF DESIGN

- A. The mechanically cleaned bar screen shall have a head sprocket only, with no sprockets, bearings, idlers, or similar drive components under water to trap the chain. Equipment featuring reciprocating rake arms or lower bearings/sprockets/tracks below the water is not acceptable.
- B. The mechanically cleaned bar screen shall be designed to run continuously (24/7), without operator. No special provisions to limit run time or intermittent operations shall be employed.
- C. The equipment shall have multiple scrapers on the bar screen at one time cleaning continuously from bottom to top, the entire width of the bar screen. The drive output shaft rotation shall be constant and in one direction in order to reduce maintenance and increase product life. Units which have single raking arms or that require cycle times shall not be allowed. Cleaning mechanisms that utilize shock absorbers, springs or other dampening or hydraulic actuations are unacceptable.
- D. The link system shall have jam evasion capability by flexing around and collecting large objects such as a 2 X 4, bowling ball, grease balls and surges of solids at peak loading times without overloading and shutting down the unit. The

link system shall be such that it bends in one direction only which allows it to become its own lower sprocket and frame and shall have a 1,000 pound lifting capacity.

- E. Designs employing the use of endless moving media or cables and hydraulic cylinders to remove debris from the channel and units utilizing proximity or limit switches for reverse cycles are not acceptable.
- F. Equipment utilizing a greater than ½ HP motor or two or more motors to complete a screen cleaning cycle is not acceptable.
- G. The design shall be such to ensure that all maintenance can be accomplished at the operating floor level or above. No part of the drive system including sprockets shall be located below the water surface at maximum design flow.
- H. The screen shall be capable of passing a maximum of 12.0 MGD of wastewater with a downstream water level of 2.09 ft. based on a nominal unit width of 3.5 ft. The loss of head at the maximum flow of clean water shall not exceed 32 inches of water. The head loss calculation is based on assumption of a clean screen, clean water and steady state flow
- I. Design Conditions:

Site Installation Information:	
Channel Width:	3.50 ft each
Channel Height:	5.00 ft each
Upstream Clearance:	1.29 ft each @ Design High Water Level
Bar Opening Size:	0.25 inch
Angle of Installation:	15 degrees from vertical
Average Flow:	6 MGD Per Channel
Average Water Level Before Screen:	EL: 57.67 ft NGVD 1929
Maximum Flow:	12.00 MGD Per Channel
Maximum Water Level Before Screen:	EL: 58.43 ft NGVD 1929
Maximum Head Differential:	1.00 ft
Equipment Location:	Outdoors
Outdoor Installation:	
Bar Screen Enclosures for Wind Speed:	Designed for 150 mph
Collection and Conveyance	Screening grit material discharges to Conveyor
Debris Bin:	Provide dimensions
Conveyor:	5.00 ft to top of Hopper

2.03 COMPONENTS

- A. Bar screen assembly: Bar screen assembly shall be of stainless steel and designed to withstand 1.00 foot head differential unless noted otherwise in Section 2.02 I Design Conditions. Unless noted otherwise materials of construction shall be 316 Stainless Steel. A stainless steel channel bottom plate

shall be an integral part of the bar screen assembly to fully engage scrapers in the bar screen at the base of the unit and assure that the raking mechanism reaches the bottom of the screen to prevent debris accumulation. The Bar screen assembly shall be shipped in one piece.

1. Screen Bars: Bars shall be 316L stainless steel and be tear-shaped with a Hydraulic Coefficient shape factor of 0.76 and the minimum dimensions of 0.25 inch x 0.75 inch x 0.13 inch. Bars shall be individually replaceable without welding.
 2. Side Fabrication: The screen framework shall be 316 stainless steel bent plate with minimum of 3/16 inch cross section. Horizontal members shall be of stainless steel bent plate or stainless steel pipe. Support members and frame shall adequately support the bar screen based on site specific requirements.
 3. Dead Plate: Dead plate shall be 0.25 inch thick 316 stainless steel. The dead plate shall be flat and true; span the entire width of the unit; and transition from bar screen to discharge point.
 4. Discharge Chute: The discharge chute shall be 11ga. (0.12 inch) 316 stainless steel. The discharge chute shall be bolted to the dead plate and shall be designed to allow debris to be transferred from discharge point into the debris containment.
 5. Link Slides: Link slide assembly shall be provided per manufacturer standard design and shall be constructed of UV Stable UHMW PE rollers and 316 stainless steel supports and components.
- B. Return Guide/Closeouts: Return guide/Closeouts shall be 316 stainless steel and shall assure proper alignment of scrapers as they enter the bar screen and assure that there is no space wider than the clear opening between bars to prevent passage of larger solids than allowed through the screen.
- C. Debris Blade: A 316 stainless steel and UV Stable UHMW-PE debris blade assembly, which does not require a separate drive, shall be installed to assist in removing debris from the scraper on the mechanically cleaned bar screen unit as recommended by the manufacturer.
- D. Screen Enclosure: A 14ga. #4 brushed satin finish 316 SSSL Enclosure shall be installed to cover the screen above the operating deck level. Front Enclosure shall have SSSL316 removable panels for access to equipment. Removable panels shall be 16ga. 316 SSSL and shall be provided with knurled knobs for "no tool required" access. Alignment notches shall be included to support repositioning of removable panels. The top of the Front enclosure shall include a knock out for a customer site option to install a 6-inch diameter pipe stub. (The option of connecting to the site's exhaust system, to provide a positive air exchange from interior of enclosure, by Others.) Rear Enclosure shall have hinged removable doors and shall be secured with a lift-slide-latch handle. Rear

removable door shall include an integral viewing door that shall be secured with a lift-slide-latch handle to provide access for a quick look inside.

- E. Link System: The link system shall be 316 stainless steel castings and have a minimum ultimate strength of 60,000 lbs with a minimum cross section of 1.5 inches and weighing a minimum of 4.5 lbs each. The link system includes 316 stainless steel retaining rings and 316 stainless steel pins.
- F. Scrapers: Scrapers shall be spaced 21 inches apart. To provide long product life the scraper shall move at no greater than 28 inches per minute at standard operating speed of ½ rpm allowing for approximately 1 debris discharge per minute. Staging Scrapers and Thru Bar Scrapers shall be a maximum ratio of 3:1 per manufacturer recommendations. At least one scraper every 84 inches shall fully penetrate the bar screen, cleaning all three sides of the bars as well as through to the cross members in openings of 0.25, 0.375 and 0.50 inches.
 - 1. Staging Scrapers; Staging Scrapers shall be 1 inch thick x 5 inches x screen width UV Stable UHMW-PE with a serrated edge.
 - 2. Thru Bar Scrapers: Thru Bar Scrapers shall be minimum .375 inch thick 316 stainless steel.
- G. Drive Head: The Drive Head shall be located at the top of the mechanically cleaned bar screen.
 - 1. Drive Unit: Each mechanically cleaned bar screen unit shall operate independently and shall have its own drive unit and driven components.
 - a. Drive Sprockets and end castings shall be cast 316 stainless steel.
 - b. Drive Shaft shall be 316 stainless steel.
 - c. Gearbox shall be shaft-mounted, right angle type and incorporate cycloidal and spiral bevel gearing with a total ratio of 809:1. The gear reducer output shaft speed shall be controlled by a volts/hertz type inverter or per rake manufacturer's recommendation. It shall have at least a 1.52 or greater service factor based on machine torque requirements. The gearbox shall not be vented to the outside atmosphere.
 - d. The motor shall be AC induction type, 3 phase 240/480 volt and mounted to the gear reducer. Motor shall be ½ hp, designed for 1800 RPMs base speed and rated for Class I, Groups C & D, Class II Groups F & G environments and for use with an inverter. Motor shall have a 4/1 speed range, EPNV enclosure, NEMA design B with a 56C frame size. Service factor shall be 1.0 with 1600V, Class F insulation rated for temperatures up to 40 degrees C. The motor will have 1600 volt insulation, optimized for IGBT type inverters and shall be UL listed.

- e. Motor shall have built in thermostat to protect from overheating that is to be field wired to corresponding terminal in control panel for redundant (ambient) overload protection.
 - f. All drive head components shall be of components available in the United States.
- 2. Bearing: Bearing shall be greased ball bearing type, non self-aligning, sealed and lubricated and shall have a 24/7/365 L10 life of 20 years when in compliance with stated O&M recommendations.
 - 3. Speed Reducer: Speed reducer shall be 0.50 to 2.2 (in high flow conditions) output rpm, 11,417 in.lb. output torque 809:1.
- H. Standard Coating: All non stainless bar screen components shall be coated with a urethane moisture-cure two coat paint system in accordance with the paint manufacturer's specification. Products will be MC Zinc and MC Ferrox and MC Luster, as manufactured by Wasser, or equivalent. Standard color is Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements.

2.04 ELECTRICAL, CONTROLS, INSTRUMENTATION

- A. General: Controls for each rake shall be in enclosures provided by the bar screen manufacturer. The bar screen manufacturer shall be responsible for proper sizing and function of the controls at 120V, unless specified otherwise.
- 1. (1) Wall mount NEMA 4X SS enclosure, for (2) bar screens and (1) conveyor
 - 2. (1) Wall mount NEMA 4X SS enclosure, for (1) bar screen and (1) conveyor
 - 3. Main control panels require shading from the sun and shall be operated within a temperature range between 35°F and 104°F. Sunshields, visors or other structures needed to provide shade are by others. (If the controls will experience temperatures outside this range, then special climate provisions are available.)
 - 4. Controls shall be designed to accept incoming power supply per plans/specs and shall include a step-down transformer as needed to achieve 120V.
 - 5. Control Panel(s) shall be constructed to meet the appropriate NEMA classification requirements and will include a main, lockable disconnect. The panel will be constructed by a UL certified control panel build facility and will be supported by the appropriate UL labeling.
 - 6. Controls shall be tested prior to shipment to owner. The rake manufacturer shall verify all overload settings in the rake controller to

insure proper overload and speed settings required for the application are properly programmed.

7. Control panel(s) shall be wired complete with a minimum of #16 MTW wire in the appropriate colors for the circuits being supplied. 120VAC control shall be red, grounded AC neutral shall be white, DC control shall be blue, DC neutral shall be blue with a white tracer, equipment ground shall be green and all incoming and outgoing external power source wires shall be a yellow configuration. All AC power wiring shall be a minimum of #12 Black. All wires shall be labeled at both ends with heat-shrink wire markers. Internal panel wiring shall be contained in non-flammable, covered wire way.
8. All panel(s) and panel mounted devices shall be labeled with engraved I.D. markers that reference back to the system schematics. Tags shall be white with black core, engraved as required.
9. All field wiring and power cables between the bar screen Main Control Panel and the Local Push Button Station shall be provided by others under the Electrical Section.

B. Components:

1. Main Control Panel
 - a. Enclosure(s) shall be NEMA 4X 316 SSSL for outdoor installation
 - b. Enclosure shall have a lockable door and shall not be located in an explosive environment.
 - c. Main Control Panel shall be designed with a SCCR rating of 18KA minimum and labeled as such.
 - d. All terminals utilized in the main panel shall be 600V rated terminals and 20% spare terminal space shall be provided for any potential future revisions.
 - e. The Main Control Panel shall include at a minimum the following
 - Main fusible disconnect with lockable operator
 - Hand/Off/Auto (HOA) Selector Switch and Push/pull E-Stop
 - Elapsed run-time meter
 - Push-To-Test type indicator lights for "Power On", "Forward" and necessary fault indication
 - Thermostat for fan and heater
 - Full voltage motor starter for conveyor control
 - Relay logic control with cycle timer and float backup
 - Intrinsically safe barrier for floats
 - Pilot lights, push buttons and selector switches on front door
 - Intrinsically safe barrier for floats

- Terminal blocks, ETM's, breakers, timers and relays where required
- (1) Zero speed controller for conveyor
- Variable Frequency Drive (VFD)
- Electronic torque control
- Hard contact SCADA Interlock(s)
- Adjustable on/off cycle timers

2. Local Control Push Button Station

- a. Enclosure shall be NEMA 7/9 rated for installation local to the equipment to maintain requirements of local safety codes as determined by the Engineer.
- b. Local station shall be mounted within 10 feet of the equipment or as close to the equipment as safely possible and be field wired by the electrical subcontractor to the corresponding terminal inputs in the main control panel.
- c. The remote pushbutton station shall include Forward, Jog Reverse and E-Stop buttons.
- d. (3) Three hole N7 PB stations with E-stop, Forward and Reverse for bar screens
- e. (2) Two hole N7 PB stations for E-stop and start on top of conveyor for conveyors

3. Instrumentation: Each rake shall have a separate level system that shall be installed and field wired by others per the manufacturer's instructions.

- a. (3) Mechanical floats for high water alarm
- b. (2) Zero speed sensors for conveyors
- c. (2) Pull cords for conveyors
- d. (5) N7 disconnect stations to provided line of sight shut off

C. Controls Design Conditions:

Approx. distance between main panel and equipment motor	TBD, To Be Determined
Climate controlled location:	No
Outdoor location (must be shaded): For temperatures below 35° F select Outdoors Option 1. For temperatures above 104° F select Outdoors Option 2	By Others
Outdoors Option 1: thermostat, heater and fan w/ grilles and rain hoods for ventilation. Appropriate N4X rating by the addition of grilles is acceptable, if is rated N4X prior to install of grilles.	Include
Outdoors Option 2: Thermostat, air conditioner and heater	TBD, To Be Determined

2.05 SPECIALTY TOOLS, SPARE PARTS AND LUBRICATION

A. Manufacturer shall provide any specialty tools and recommend spare parts required for maintaining the equipment as follows:

1. Drive Clevis Pin (1)
2. Snap/Retaining Rings (10)
3. Link Clevis Pins (4)
4. Scraper Bolts (4)
5. Scraper Nuts (4)
6. Snap Ring Tool (1)
7. Never Seez, 3 oz. tube (1)

B. Manufacturer shall provide a 5-year supply of lubrication required for maintaining all bar screen components.

PART 3 EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.

B. Anchor Bolts: Anchor bolts and nuts shall be 316 stainless steel and furnished for each item of equipment by the CONTRACTOR.

1. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.
2. Anchor bolt sizes, quantity and requirements will be indicated on the submittal drawings. Quantity is site specific but typically each Barscreen assembly requires (8) to (12) 1/2" dia. x 4 1/2" Lg. embed HILTI HAS RODS w/ RE-500 SD Adhesive system anchor bolts for Mechanical Screen anchorage and typically (8) to (12) 3/8" dia. x 3 3/8" Lg. embed HILTI HAS RODS w/ RE-500 adhesive system anchor bolts for the Return Guide/Closeouts anchorage.

3.02 TESTING

- A. After completion of installation, CONTRACTOR shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the bar screen shall demonstrate that the equipment is fully operational by picking up and depositing materials into specified containment.
- B. Field certification shall include inspection of the following:
 1. Verify equipment is properly aligned and anchored per the installation instruction and drawings. Assure the bar screen unit is square, flat and unobstructed with required clearances maintained.
 2. Assure controls and instrumentation work in all modes.
 3. Check equipment for proper operation of debris blade, scrapers, etc as well as completion of the Start-Up requirements in the installation guide.

3.03 ONSITE TECHNICAL ASSISTANCE

- A. Manufacturer shall provide services to include Installation Certification, and shall include On Site Technical Assistance as indicated below. Manufacturer shall be given minimum 14 days notification prior to the need for such services. To assure the best outcome for the Owner and Contractor, the Contractor shall provide certification for completion of the PRE-COMMISSIONING CHECKLIST.

On Site Technical Assistance

- (2) Trip(s)
- (1) Technician
- (4) 8 hour man-days

END OF SECTION

SECTION 11316

SHAFTLESS SCREW CONVEYOR

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The shaftless screw conveyor systems shall be complete with all necessary components, drives, motors, ancillary items and supports. Interconnecting chutes between screw conveyors shall be provided by the Manufacturer so that a complete screw conveyor system, from the point of receiving biosolids to the final discharge point, is supplied by a single manufacturer (hereinafter the Manufacturer).
- B. The Contract Drawings and this Section provide equipment descriptions, minimum requirements and mandatory features of the equipment to be furnished. It is the Manufacturer's responsibility to design and furnish the equipment complete in all details, performance and reliability meeting the requirements and intent of the Contract Drawings and these specifications.

1.02 SUBMITTALS

- A. General:
 - 1. All data and drawings to be provided in Imperial system. Any metric dimensions must be clearly noted and marked with an Imperial equivalent.
 - 2. Data sheets with description of the proposed equipment, size, length, type, capacity, arrangement, materials of construction, motor size, motor type, motor power requirements and equipment weight.
 - 3. List of components and accessories to be furnished with catalog information.
 - 4. Significant dimensional differences between the equipment specified herein, indicated on the Drawings and the proposed equipment.
- B. Design Calculations:
 - 1. Submit certified capacity, power and elongation calculations for the screw conveyor and spiral, respectively.
 - 2. Submit certified torsional analysis for the conveyor drive shaft.
 - 3. Submit structural calculations for the conveyor supports stamped by an Engineer certified to practice in the State in which the equipment will be service.
 - 4. Submit bearing life calculations for the gear reducer bearings and/or drive end bearings.
 - 5. Design loadings to be transmitted to foundations or supports.
- C. Shop Drawings:
 - 1. Drawings and specifications for components of the equipment, showing principal dimensions and parts, materials of construction, material thickness.

2. Screw diameter, pitch, rotational speed and torque tube diameter.
 3. Equipment performance specifications.
 4. Drive details, including service factor of gear reducer based on absorbed horsepower and installed motor horsepower.
 5. Size and location of anchor bolts or attachments to the foundations or supports.
- D. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.
- E. Quality Assurance and Control Submittals:
1. Manufacturer's Certificate of Compliance, including performance guarantee.
 2. Operation and maintenance manuals, including recommended maintenance schedule.
 3. Special shipping, storage, protection and handling instructions.
 4. Manufacturer's installation instructions.
 5. Manufacturer's Certificate of Proper Installation.

1.03 ENGINEER'S PRE-APPROVAL OF ALTERNATIVE EQUIPMENT

- A. Manufacturer of alternate equipment shall submit a pre-approval submittal package to Manatee County Purchasing contact listed in the Bid Documents, for Engineer's approval, no later than deadline for Clarification Requests date listed in the Bid Documents. Only approved alternates listed by addendum will be acceptable. Alternate manufacturer shall submit the following information and supporting documentation:
1. A complete set of drawings with dimensions specific to this project showing the individual conveyors, their interface with the barscreen units, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of each unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
 2. Detailed installation drawings illustrating how the proposed conveyors fit on top of the headworks and how it will mate to ancillary equipment. The drawings shall include dimensioned plan, and elevational and sectional views of each individual system as well as the overall installation. Drawings shall include details of the seal between the screen and the conveyor, and details of the anchor bolt locations.
 3. Equipment shall meet conveyor requirement to operate under service conditions shown in Section 2.03.
 4. Complete electrical and controls submittals including control schematics, PLC programming logic, detailed cut sheets on electrical components and a P&ID. Details of the control and instrumentation system including

complete wiring diagrams per the wiring requirements shown on the drawings for this project.

5. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drive.
6. Complete reference list of all current and active installations of same and similar equipment including contact names and phone numbers, showing at least 5 installations of the same type and size as specified.
7. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.
8. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.
9. The preapproval submittal shall be signed and sealed by a registered professional engineer in the State of Florida.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer's Qualifications - Firms regularly engaged in the manufacture of conveyor equipment and wastewater treatment plant equipment of the type and size required. Manufacturers must have been engaged in the manufacture of similar systems for a minimum of five (5) years and have similar units in satisfactory service.
- B. The Contractor shall provide only products that have a proven reliability record of at least five (5) years in operation. No equipment shall be considered which has an operating history of less than five (5) years.
- C. The Base Bid conveyors shall be as manufactured by Duperon Corporation, 1200 Leon Scott Court, Saginaw, MI. 800.383.8479.
- D. Contractors may provide an alternate which must be a pre-approved alternate manufacturer(s), as per 1.03 of this specification. The Base Bid equipment shall be Duperon.

2.02 GENERAL REQUIREMENTS

- A. Fasteners:

All fasteners and grease fittings shall be Imperial sizing. Metric fasteners and fittings shall not be used.
- B. Welding:

Except as otherwise indicated, welding shall comply with ANSI/AWWA D100 and AWWA C206, and the following:

1. Welding shall be by the metal-arc method or gas-shielded arc method described in the American Welding Society's "Welding Handbook" as supplemented by other AWS standards. Qualification of welders shall comply with AWS Standard AWS D1.198.
2. In assembly and during welding, the component parts shall be clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS code. Upon completion of welding, weld splatter, flux, slag and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. Sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32" on the flat.

C. Safety Devices:

The completed work shall include all necessary permanent safety devices, such as machinery guards and similar items as required by OSHA and other federal, state and local health and safety regulations. Conveyors shall be equipped with emergency stop pullcords.

D. Flanges and Pipe Threads:

Flanges on equipment shall comply with ANSI B16.1, Class 125 or B16.5, Class 150, unless otherwise indicated. Threaded flanges and fittings shall have standard taper pipe threads complying with ANSI/ASME B1.20.1. Metric flanges, piping and threads shall not be used.

E. Nameplates:

Equipment nameplates shall be fastened to the equipment in accessible. Nameplates shall contain the Manufacturer's name and telephone number for service.

F. Bearings:

1. Bearings shall conform to the standards of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).
2. Except where otherwise indicated, bearings of process equipment shall have a minimum B-10 life expectancy of 50,000 hours.

2.03 SERVICE CONDITIONS

A. Material:

		DCSC-01	DCSC-02	
1.	Type of residuals:	Fine Screenings	Fine Screenings	

2.	Material density - min:	50	50	lbs/ ft ³
3.	Material density - max:	60	60	lbs/ ft ³
4.	Solids, percent by weight:	18-25	18-25	%
		0.6	1.2	wtp (wet tons per hr)
		20	40	ft ³
		100	100	°F maximum,
		40	40	°F minimum

B. Physical Requirements:

1. Screw Conveyor:

Conveyor Tag No.	Minimum Screw Diameter (in.)	Nominal Length (ft)	Power (hp)	Incline (degrees)
DCSC-01	11.5	9'	1	5
DCSC-02	11.5	24'	2	5

C. Service Duty:

1. Number of hours per day: 24
2. Number of day per week: 7
3. Number starts per hour (max): 4

D. Start-up:

Screw conveyor must be able to start when loaded to 150% of the maximum capacity with wet sludge described under Clause 2.3.A.

E. Design Capacity:

The screw conveyor shall be designed to operate continuously under the specified operating conditions with peak loads of up to 150% without damage or significantly reduced service life.

2.04 COMPONENTS

A. Materials:

1. Trough cover and end plates: Type 316 stainless steel.
2. Inlets/outlets: Type 316 stainless steel.
3. Spiral Flighting: Special Alloy Bar Steel, 340 Brinell Hardness.
4. Wear Liner: UHMW-PE per ASTM D4020, minimum thickness of 1/2"
5. Supports: Type 316 stainless steel.

6. Drive shaft: C 1045 steel.
7. Gaskets: neoprene durometer 50.

B. Troughs:

1. Troughs shall conform to the dimensional standards of CEMA 300 and enclosure classification IIE and shall be U-shaped.
2. Fabricated from minimum 10 gauge plate and minimum 10 gauge thick flat bar top flanges. Top flanges shall be formed or welded in place to the trough.
3. Single welded piece for lengths up to 12 feet. Troughs longer than 18 feet shall be constructed of two or more sections bolted together at the trough joining flanges.
4. Glue neoprene (minimum 1/8" thick) gasket over full face of flanges (on one flange face only for adjoining flanges).
5. Fabricate trough drive end from 3/8" steel plates and non-drive end from 1/4" steel plates bolted across ends of the trough. Fabricate drive and non-drive support ends from the same material. These assemblies to be welded to the screw conveyor trough end plates (or may be bolted to the trough end plate using a matching 3/8" thick mounting plate).
6. Conveyor troughs to be complete with saddle-type supports shaped to the profile of the screw conveyor trough and extending to a common fixed distance below the centerline of the screw (not greater than 12 feet center-to-center). Include separate support points under the drive end assembly and end shaft assembly. These to be welded as an integral part of these assemblies using 3/8" plate.
7. Each screw conveyor trough to be complete with a 4" NPT diameter drain nipple extending three inches below the screw conveyor trough, with a threaded cap, located at the low point of trough.

C. Covers:

1. Fabricated from 12 gauge 316 SS, single-piece formed steel plate with turned down edges parallel to the sides of the trough flange.
2. Not to exceed 48" each in length.
3. The cover sections are to be attached to the trough flange utilizing hex head bolts or hinged on one side and with quick-connect clamp fittings on the other side. If cover may be opened without tools, an expanded mesh screen must be installed the full length of the conveyor
4. Foul air connections shall be of a size and location as shown on the contract documents.

D. Inlets/Outlets:

1. Fabricated from a minimum of 3/16" thick plate.

E. Spirals:

1. Spiral shall be cold formed in a continuous process from a minimum of 20' long bar sections with a minimum of 300 BHN and a tensile strength of at least 120,000 psi.
2. Spirals shall consist of an outer spiral and, where recommended by the Manufacturer, an inner spiral.
3. Spiral pitch shall be consistent to within +/- 2% of the nominal pitch.
4. Spiral outside diameter shall be consistent to within + 0" and - 1/8".
5. Where applicable, inner and outer spirals shall be stitch welded in accordance with AWS welding guidelines and shall be sufficient to ensure structural integrity under 150% load conditions. Spiral elongation under such load conditions shall be less than 0.03" per foot of spiral.
6. The total axial load, established as 150% of the design load shall be less than 40% of the spiral(s) Fy.

F. Hold down Provisions:

1. Hold down provisions shall be provided as recommended by the manufacturer to secure spiral lighting in trough bottom.
2. Hold downs shall be bolted to trough and design shall not impede material flow.
3. As a minimum, hold down shall be provided every 10 pitches of spiral length and each hold down shall span 1.5 pitches as a minimum.
4. Hold down provisions shall not require regular maintenance and any wear component shall have a life greater than or equal to the life of the trough liner.

G. Lubrication System for Drive End Bearing:

1. Bearings shall be equipped with a spring-loaded lubricator assembly. The lubricator shall be mounted above each intermediate bearing location. The spring-loaded lubricator reservoir shall be transparent with 6 oz. capacity. Each lubricator shall be equipped with a metal base complete with base coupling, piston with O-rings, compression springs and filling connections.

H. Drive Assembly, End Shaft Assembly:

1. Drive and end shaft assemblies to consist of the following separate components:
 - a. Drive assembly:
 - i. Drive shaft;
 - ii. Packing gland;
 - iii. Hollow shaft gear reducer;
 - iv. Belt drive and guard; if required.
2. Shafts to be complete with flanged ends and mating bolt holes to match the conveyor spiral flanged end plates. Shaft to be integral with the shaft flange as a single-piece or as a welded shaft-to-flange construction.
3. Adjustable packing gland seal shall be provided where drive shaft project through conveyor end plate. Packing glands to be complete with not less than three packing rings per stuffingbox where sealing is critical and as

determined by the Manufacturer. Provide grease fitting to lubricate the packing rings.

4. Outside support bearings, except where flange mounted gear reducers are used, to be SKF or Dodge spherical roller bearings, mounted in pillow block bearing houses. Mount bearing outboard of the packing gland assembly with sufficient clearance to permit removal of stuffingbox bolts, cover and repacking without having to remove the bearing housing or bearing from the housing. Fit each bearing housing with a grease nipple, with escape release provisions.
5. Except where shaft-mounted gear reducers are being used, flexible couplings shall separate drive shaft from gear reducer. Coupling to consist of two cast iron hub rings separated by synthetic elastomer bushes that absorb the misalignment that may occur between the screw conveyor drive shaft and the gear reducer shaft, as well as absorb shock loads.
6. Gear reducers to be parallel helical or bevel helical, 2, 3 or 4-stage gear reducers for shaft-mounted or foot-mounted, with flexible coupling. Gear reducers to be Eurodrive, Dodge, Nord or Flender.
7. Size gear reducers and flexible couplings based on the input power to each gear reducer, with the resulting torque calculated at the output shaft rpm, with a safety factor of 1.5 times this calculated torque. The nominal rated output torque (AGMA 2) to be greater than or equal to the calculated output torque and its safety factors. A second criteria to be met is that the nominal rated output torque must exceed the electric motor nameplate horsepower equivalent torque at the gear reducer output shaft rpm.
8. Oil level indicator and drain locations shall be readily accessible.
9. Belt drive connections between motor and gearbox shall be sized based on the electric motor drive horsepower at the sheave rpm, with a safety factor of 1.5 times the horsepower of the electric motor drive. V-belts or notched V-belts may be used on all drives.
10. Belt guards shall be in accordance with OSHA requirements.
11. Gearboxes, motors and V-belt drives shall be factory-assembled on the conveyor, factory-tested and shipped fully assembled with the conveyors.

I. Motors and Drives:

1. Provide squirrel-cage AC induction motors that meet all applicable requirements of NEMA standards. Load on motor shall not exceed nameplate horsepower rating under any anticipated load condition.
2. In addition, the motors shall meet the following specific requirements:
 - a. Voltage rating: 460 volts (or 230/460), 3 ph, 60 Hz;
 - b. Efficiency: premium;
 - c. Service factor: 1.15;
 - d. Speed: 1800 rpm, constant;
 - e. Enclosure: Explosion Proof, NEMA 7;
 - f. Mounting: C-face flanged.

J. Conveyor Supports:

1. Saddle-type supports shall be shaped to the profile of the conveyor trough and shall be designed for welding to the trough in the field after final positioning. Supports shall extend to a common fixed distance below the centerline of the screw and be spaced at 12-foot centers maximum.
2. The drive and end shaft assemblies shall have integrally welded supports constructed of 3/8" thick plates. Each support shall have a minimum of two predrilled holes for attachment to the building structure.
3. Support loads are to be based on completely filled trough, weight of the conveyor and dynamic loading when operating.
4. Coordinate support locations with facility structure. Access to other process systems shall not be restricted by the supports.
5. Shim each conveyor support in field as required to conform to Manufacturer's installation tolerances.

K. Chutes:

1. Provide chutes for connections between conveyors. Chutes shall be fabricated from minimum 3/16" thick, Type 316 stainless steel. Connection flanges shall be 1/4" x 2-3/4". Flanged connections shall be provided on the underside of the conveyor troughs at the drop point. Flanges shall be located approximately 3" below the bottom of the conveyor trough.
2. Drop chutes longer than 2 feet between connection flanges shall include gasketed flanges and at least four handles shall be provided on each chute section to facilitate removal. Handles shall be 1/2" diameter rod, of the same material as the chute, formed and welded to the sides of the section.
3. Furnish 1/8" thick, full-face neoprene gasket for installation between each flanged connection and transition chute.

2.05 ACCESSORIES

A. Motion Switches:

1. Provide non-contacting, proximity-type speed switch on each conveyor for detecting zero speed condition on monitored equipment consisting of a sensor/pre-amplifier and an amplifier/output switch unit.
2. The sensor/pre-amplifier shall utilize magnetic proximity effect to detect equipment rotational speed without physical connection to the rotating equipment. Sensors shall provide output pulses in proportion to rotational speed by detection of a ferrous target mounted on the rotating equipment. The sensor shall operate satisfactorily with air gaps of up to 4". Provide sensor/pre-amplifier complete with mounting flange, threaded body and locknut.
3. The amplifier/output switch unit shall provide two single-pole, double-throw contacts that operate on underspeed detection. Provide dry contact outputs rated for 5 amps at 120 volts AC. The unit shall include an adjustable start-up delay of 0 to 60 seconds to override zero speed alarm during initial acceleration. Units shall operate on 120 volt AC power. Provide set point adjustment range of 2 to 3,000 pulses per minute. Zero

4. speed switch shall be Milltronics MFA-4 with XPP-5 sensor/pre-amplifier. MFA-4p units to be mounted in a NEMA 4 classified area. The motion sensors shall have NEMA 7 enclosures.

2.06 FACTORY-APPLIED PROTECTIVE COATINGS

A. Stainless Steel Surfaces:

Glassblast all exterior stainless steel surfaces only to a uniform finish.

- ### **B. Gearboxes, motors, bearings, etc. are to be supplied in Manufacturer's standard enamel finish.**

2.07 SPARE PARTS

Manufacturer must have spare parts inventory within the continental USA and must be able to respond to spare parts requirements within thirty (30) days.

One (1) set of packing material for each.

One (1) set of trough liner material for all conveyors.

2.08 FACTORY ASSEMBLY AND TESTING

- ### **A. Completely shop-assemble with drive prior to shipment and run under no load for a minimum of 15 minutes to ensure proper operation. Provide a signed shop test certificate and record amperage on motor.**
- ### **B. Inspect equipment and test for proper alignment, quiet operation, proper connection and satisfactory performance of components. Match-mark any sections which have to be disassembled for the purposes of shipping.**

PART 3 EXECUTION

3.01 INSTALLATION

- ### **A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.**
- ### **B. Anchor Bolts: Anchor bolts and nuts shall be 316 stainless steel and furnished for each item of equipment by the CONTRACTOR.**

3.02 TESTING

- A. After completion of installation, CONTRACTOR shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the conveyors shall demonstrate that the equipment is fully operational by conveying screened materials into specified discharge chutes.
- B. Field certification shall include inspection of the following:
1. Verify equipment is properly aligned and anchored per the installation instruction and drawings.
 2. Assure controls and instrumentation work in all modes.
 3. Check equipment for proper operation of the screwless shafts, etc as well as completion of the Start-Up requirements in the installation guide.

3.03 ONSITE TECHNICAL ASSISTANCE

- A. Manufacturer shall provide services to include Installation Certification, and shall include On Site Technical Assistance as indicated below. Manufacturer shall be given minimum 14 days notification prior to the need for such services. To assure the best outcome for the Owner and Contractor, the Contractor shall provide certification for completion of the PRE-COMMISSIONING CHECKLIST.
- On Site Technical Assistance
- (2) Trip(s)
 - (1) Technician
 - (4) 8 hour man-days

END OF SECTION

SECTION 11322

VORTEX GRIT REMOVAL SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish, install and place into satisfactory operating condition the number of vortex grit removal systems, self-priming grit pumps, and grit cyclone-classifiers as noted in paragraph 1.03 for removing floating, particulate, fibrous and grit material from wastewater as shown on the Drawings and described in the Specifications.
- B. Related Sections
 - 1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section .

1.02 REFERENCE STANDARDS

- A. American Gear Manufacturers Association (AGMA)
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Institute of Steel Construction (AISC)
- E. American Society of Civil Engineers (ASCE)
- F. International Electrotechnical Commission (IEC)
- G. Steel Structures Painting Council (SSPC)

1.03 SYSTEM DESCRIPTION

- A. The vortex grit collection equipment shall be complete with drive assembly with paddles, vortex grit pump, grit fluidizer, self-priming pump, grit cyclone-classifier, anchorage materials, and shall be complete with electrical control panel.
- B. General Design Summary:
 - 1. Number of Vortex Grit Systems - 2
 - 2. Number of Self-Priming Grit Pumps - 2
 - 3. Number of Grit Cyclone-Classifiers - 2
 - 4. Design Average Flow, MGD - 6
 - 5. Electrical Power Characteristics, VAC - Hertz - Phase - 460-60-3
 - 6. Motor Electrical Classification - Non-Hazardous
 - 7. Electrical Remote Mounted Main Enclosure Type - NEMA 4 painted steel
- C. Vortex Grit Chamber Design Summary:
 - 1. Maximum Flow Capacity per Grit Chamber, mgd - 20.0

2. Grit Chamber Inside Diameter, feet - 16.0
3. Grit Hopper Inside Diameter, feet - 5.0
4. Grit Chamber Drive Motor Size, hp - 2
5. Grit Chamber Maximum Operating Speed, rev/min - 20
6. Drive Tube Nominal Diameter, inches - 10
7. Grit Suction Diameter, inches - 4
8. Grit Fluidizing System Minimum Water Flow Rate, gal/min - 50
9. Grit Fluidizing System Minimum Water Pressure, psig - 50

D. Self-Priming Grit Pump Design Summary:

1. Pump Capacity, gal/min - 200
2. Total Dynamic Head, feet - 30
3. Motor Size, hp - 7.5

E. Grit Cyclone-Classifer Design Summary:

1. Maximum Grit Slurry Feed Rate, gal/min - 250
2. Cyclone Inlet Diameter, inches - 4
3. Cyclone Overflow Diameter, inches - 6
4. Classifier Speed Reducer Minimum Torque Rating, in.-lb - 15,700
5. Classifier Speed Reducer Minimum Thrust Rating, lbf - 5,800
6. Classifier Motor size, hp - 1
7. Classifier Angle of Inclination, degrees - 16
8. Classifier Maximum Grit Conveying Capacity, cu ft/hr - 20

1.04 PERFORMANCE

A. The grit removal system shall be engineered to meet the following requirements at up to the maximum grit chamber hydraulic capacity noted in paragraph 1.03.C.1. and the average flow as noted in paragraph 1.03.B.4.:

1. Remove 95% of grit greater than 50-mesh in size.
2. Remove 85% of grit greater than 70-mesh in size.
3. Remove 65% of grit greater than 100-mesh in size.

The efficiency level relates to grit having a specific gravity of 2.65 and to the difference in grit content in the influent channel as compared to that of the effluent in the effluent channel

B. The grit cyclone-classifier shall be designed to receive up to the maximum grit slurry pumped flow rate noted in paragraph 1.03.E.1. and to convey the maximum grit capacity noted in paragraph 1.03.E.8.

1.05 ENGINEER'S PRE-APPROVAL OF ALTERNATIVE EQUIPMENT

A. Manufacturer of alternate equipment shall submit a pre-approval submittal package to Manatee County Purchasing contact listed in the Bid Documents, for Engineer's approval, no later than deadline for Clarification Requests date listed in the Bid Documents. Only approved alternates listed by addendum will be

acceptable. Alternate manufacturer shall submit the following information and supporting documentation:

1. A complete set of drawings with dimensions specific to this project showing the vortex grit removal system, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of each unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
2. Detailed installation drawings illustrating how the proposed equipment is installed and how it will mate to ancillary equipment. The drawings shall include dimensioned plan, and elevational and sectional views of each individual system as well as the overall installation. Drawings shall include connection details of the grit classifier and hydrocyclone, and details of the anchor bolt locations.
3. Performance of Grit Removal System shall meet criteria is Section 1.03 & 1.04
4. Complete electrical and controls submittals including control schematics, PLC programming logic, detailed cut sheets on electrical components and a P&ID. Details of the control and instrumentation system including complete wiring diagrams per the wiring requirements shown on the drawings for this project.
5. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drive.
6. Complete reference list of all current and active installations of same and similar equipment including contact names and phone numbers, showing at least 5 installations of the same type and size as specified.
7. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.
8. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.
9. The preapproval submittal shall be signed and sealed by a registered professional engineer in the State of Florida.

1.06 MATERIALS QUALITY

- A. All fabricated components of the vortex grit chamber and grit cyclone-classifier shall be AISI Type 316 stainless steel. Materials thicknesses identified in PART 2

- PRODUCTS are the minimum requirements for this project. Materials with increased thicknesses will be acceptable.

- B. To ensure spare parts availability, all fabricated components shall be manufactured in the United States. To ensure prompt service and to ensure spare parts availability in a timely manner and at a reasonable cost, foreign fabricated materials of construction for the components identified in paragraph 1.06.A. will not be acceptable for this project.

1.07 QUALITY ASSURANCE

- A. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that all equipment called for under this Section shall be supplied by a single manufacturer. The equipment manufacturer shall, in addition to the CONTRACTOR, assume the responsibility for proper installation and functioning of the equipment.
- B. Naming a Manufacturer in paragraph 2.01 does not relieve them from complying with the performance requirements, salient features and the Made in the USA requirements of the Contract Documents. The Contract Documents represent the minimum acceptable standards for the vortex grit removal equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. Equipment that is a "standard product" with the manufacturer shall be modified, redesigned from the standard mode, and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification

1.08 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer's Qualifications - Firms regularly engaged in the manufacture of screening equipment and wastewater treatment plant equipment of the type and size required. Manufacturers must have been engaged in the manufacture of similar systems for a minimum of five (5) years and have similar units in satisfactory service.
- B. The Contractor shall provide only products that have a proven reliability record of at least five (5) years in operation. No equipment shall be considered which has an operating history of less than five (5) years.

- C. The Base Bid vortex grit removal system shall be as manufactured by Lakeside Equipment Corporation, of Bartlett, IL.
- D. Contractors may provide an alternate which must be a pre-approved alternate manufacturer(s), as per 1.05 of this specification. The Base Bid equipment shall be Lakeside Equipment Corporation.

2.02 VORTEX GRIT CHAMBER EQUIPMENT

A. General

- 1. The vortex grit chamber shall be a 270-degree design configuration.
- 2. The vortex grit chamber shall have an inside diameter as noted in paragraph 1.03.C.2.
- 3. The vortex grit chamber grit hopper shall have an inside diameter as noted in paragraph 1.03.C.3.

B. Drive Assembly

- 1. The grit removal drive mechanism shall consist of an electrical motor, a helical reduction unit, and an enclosed final reduction unit consisting of one pinion and an integral gear/bearing. All components are directly coupled, eliminating the use of chains and V-belts. The drive mechanism shall not be overloaded under normal operating conditions and shall be designed for heavy duty 24 hour per day service.
- 2. The external tooth gear shall be an external gear/bearing unit such as manufactured by Rotek, Inc., Kaydon, Inc., or equal. The gear teeth shall be AGMA grade 6 or higher. The gear teeth shall have a core hardness of 250 to 300 BHN, and shall be induction hardened to a surface hardness of 52 to 60 Rc. The bearing raceway shall be hardened to 58 to 60 Rc, precision ground and have a minimum 20.5-inch ball path diameter. The main bearing shall be oil bath lubricated and have an AFBMA theoretical L10 design life in excess of 100 years. The main bearing shall have a seal to prevent contamination of the bearing raceway.
- 3. The final reduction pinion shall be made of heat-treated alloy steel and shall be mounted on the output shaft of the reduction gearbox. The gear teeth shall have a core hardness of 300-350 BHN, and shall be induction hardened to a surface hardness of 52 to 60 Rc.
- 4. The final reduction pinion and main gear shall have a service factor of 5.0, or greater, at the operating speed as noted in paragraph 1.03.C.5
- 5. The helical reduction unit shall drive the pinion of the final reduction unit. The helical reduction unit shall have a minimum service factor of 2.0. The

helical reduction unit bearings shall have an AFBMA theoretical L10 design life in excess of 100,000 hours.

6. The speed reducer shall be driven by a NEMA C-flanged, 1,800 rev/min, ball bearing, continuous-duty, totally-enclosed, fan-cooled motor with leads to a large conduit box for outdoor operation. Motor size shall be as noted in paragraph 1.03.C.4., shall be rated for electrical power characteristics as noted in paragraph 1.03.B.5. and shall be rated for an environment as noted in paragraph 1.03.B.6.
7. The fabricated and machined final reduction unit housing shall be manufactured of A36 steel plate or cast iron. All welds shall conform to applicable specifications of the American Welding Society (AWS). After welding, all mounting and mating surfaces shall be machined to insure proper fit and alignment of the drive pinion and mating gear.
8. The final reduction unit housing shall be designed to prevent water from entering the housing in case of flooding by means of an air bell.

C. Drive Tube

1. The drive tube shall be driven by the main spur gear. The drive tube shall have a nominal diameter as noted in paragraph 1.03.C.6. and shall have a minimum wall thickness of 1/4-inches. The drive tube shall be stainless steel construction.

D. Paddle Assembly

1. The paddle assembly shall consist of four (4) fixed propeller blades. The propeller blades shall be affixed to the drive tube by means of a two (2)-piece collar. The collar shall allow adjustment of the propeller assembly in either an upward or downward position to ensure maximum grit removal.
2. The paddle blades shall be tapered with ample rounded leading edges and a fixed pitch of 45 degrees. The paddle assembly shall be stainless steel construction.

E. Floor Plate

1. To minimize the possibility of organic capture, the grit collector shall have a 1/2-inch thick stainless steel floor plate in the grit chamber. The floor plate shall consist of two (2) removable sections to allow access to the grit storage hopper.

F. Inlet Baffle

1. A 1/4-inch thick stainless steel baffle shall be furnished at the inlet channel to optimize the chamber's hydraulic conditions.

G. Grit Fluidizing System

1. The grit fluidizing system minimum water flow rate shall be as noted in paragraph 1.03.C.8. at a minimum pressure as noted in paragraph 1.03.C.9.
2. The water fluidizing system shall be furnished to free the organics that have settled in the grit well. The water fluidizing system supply line shall include a 1-1/2 inch diameter manual stainless steel ball valve and a 1-1/2 inch diameter solenoid valve for water flow control.
3. Solenoid valve shall be brass body suitable for 120 VAC operation with a rating as noted in paragraph 1.03.B.6. Solenoid valves shall be normally closed and rated for up to 100 psig. Solenoid valves shall be slow close type to minimize water hammer.

2.03 SELF-PRIMING GRIT PUMP

- A. The grit pump shall be a Gorman-Rupp Company Super Series T Model T4A71S-B/F, WEMCO Self-Primer, or equal, self-priming pump. The pump shall be a 4-in. by 4-in. design and shall be capable of pumping a grit slurry flow rate as noted in paragraph 1.03.D.1. at a total dynamic head as noted in paragraph 1.03.D.2.
- B. The pump casing shall be Gray Iron No. 30 with a maximum operating pressure of 86 psig. The impeller shall be a two-vane design to handle a 3-inch maximum sphere size and shall be fabricated of G-R Hard Iron or Hi-Chrome material for superior abrasion resistance. The impeller shaft shall be 4140 alloy steel. The pump shall be provided with a replaceable wear plate of hardened alloy steel or Hi-Chrome for superior abrasion resistance. A removable cover plate shall be provided of Gray Iron No. 30.
- C. The suction side of the pump shall be provided with a flap valve fabricated of steel reinforced neoprene.
- D. The bearing housing shall be fabricated of Gray Iron No. 30. The seal plate shall be G-R Hard Iron material or Hi-Chrome for superior abrasion resistance. The shaft sleeve shall be 4130 alloy steel. The radial bearing shall be an open single ball bearing design. The thrust bearing shall be an open double ball bearing design. The bearing and seal cavity shall be oil lubricated by SAE No. 30 non-detergent oil. The bearing and seal cavity shall be provided with oil level sight gauges.
- E. The pump suction and discharge connections shall be 125 lb flanges fabricated of Gray Iron No. 30. Gaskets shall be Buna-N, synthetic fibers, vegetable fibers, PTFE, cork and rubber. O-rings shall be Buna-N.
- F. Mounting hardware shall be standard plated steel. A brass pressure relieve valve shall be provided.
- G. The pump seal shall be cartridge type, mechanical, oil-lubricated, double floating, self-aligning complete with tungsten carbide rotating and stationary faces, AISI

Type 316 stainless steel seat, Viton fluorocarbon elastomers and 18-8 stainless steel cage and spring.

- H. Motor size shall be as noted in paragraph 1.03.D.3., shall be rated for electrical power characteristics as noted in paragraph 1.03.B.5., shall be rated for an environment as noted in paragraph 1.03.B.6, and shall be inverter-duty rated.
- I. Power transmission from the motor to the pump shall be by means of a set of V-belts and sheaves. Belts and sheaves shall be designed with a minimum 1.5-service factor based on motor horsepower. Sheaves shall be two section units for both drive and driven sheaves and shall consist of a tapered split shaft bushing with three tapped holes to which the sheave is attached by three cap screws. Changing sheaves shall not require a wheel puller. Belts and sheaves shall be covered with a fabricated aluminum belt guard with a hinged expanded aluminum front panel in accordance with OSHA standards. Belt guard shall be designed with the expanded aluminum front hinged to the main enclosure for ease of inspection and access. Hinged front panel shall be held in place via stainless steel captive fasteners.
- J. Pump and motor shall be provided on a fabricated steel base with a sliding motor base for belt tension adjustment.

2.04 GRIT CYCLONE AND CLASSIFIER

- A. Grit Cyclone
 - 1. The grit cyclone inlet diameter shall be as noted in paragraph 1.03.E.2. and the overflow diameter shall be as noted in paragraph 1.03.E.3.
 - 2. Each cyclone shall consist of a heavy-duty cast iron volute feed chamber with cylindrical and conical sections of steel and aluminum to minimize overhung weight. Each section of the cyclone shall be completely lined and protected from the high velocity grit by replaceable neoprene liner sections. The cyclone shall be so constructed so any section liner can be replaced independently. The inlet and overflow connections shall be of 125 lb ASA cast iron flanges.
 - 3. The cyclone vortex finder shall be made of an abrasion-resistant alloy with an approximate hardness of 500 Brinell. A hinge and quick disconnect clamp shall be provided between the apex assembly and lower cone section to allow removal of material which may clog the apex, without disconnecting any piping on the cyclone itself. Each cyclone inlet shall be tapped for a 1-inch diameter NPT gauge connection and a diaphragm-protected pressure gauge shall be provided.
 - 4. The cyclone underflow shall feed into the classifier for washing and dewatering, and shall be sized so that the proper hydraulic loading is provided to the classifier.

5. The cyclone overflow will feed to piping furnished by the CONTRACTOR, which must be adequately vented to prevent siphoning.

B. Grit Classifier

1. Each classifier shall be designed to handle a maximum underflow from the cyclone of 30 gal/min. The grit classifier shall comprise a complete stainless steel assembly including drive, helicoid screw conveyor, fabricated trough with supports and necessary anchorage parts.
2. Grit from the grit cyclone shall be discharged into the dewatering section of the trough and removed by the helical screw conveyor oriented at the angle noted in paragraph 1.03.E.7. The grit screw conveyor shall be capable of handling a maximum quantity of grit as noted in paragraph 1.03.E.8. The screw conveyor shall be 12-inch minimum diameter fabricated with stainless steel flights welded to a rotating 3-inch diameter Schedule 40S stainless steel pipe torque tube. The sectional flights shall be a 1/2-pitch design fabricated of 1/4-inch minimum thickness with either a field renewable 1/2-inch wide Lincore 60 hardened continuous weld on leading edge of the screw flights or shall be provided with field replaceable Ni-hard wear shoes. The drive end of the conveyor screw shall consist of 3-inch minimum diameter stainless steel stub shaft that is shrink-fit and bolted to the upper end of the screw conveyor torque tube. The lower end of the screw shall have a 3-inch minimum diameter stainless steel shaft shrink-fit and bolted to the lower end of the screw conveyor torque tube. Welding the upper and lower stub shafts to the screw conveyor torque tube will not be acceptable for this project. The lower end of the screw shall be supported with grease-lubricated bronze bushing-type bearing that shall be mounted to the outside of the classifier tank for ease of field replacement.
3. The grit conveyor screw shall operate in a washing-classifying trough fabricated with 1/4-inch stainless steel minimum plate, fitted with a grit inlet and discharge connection. Cyclone inlet housing to the classifier shall be fabricated of 12 gauge stainless steel sheet. The grit discharge chute shall be fabricated of Schedule 10S stainless steel pipe. The grit classifier tank shall be provided with a 4-inch diameter plain end Schedule 40S stainless steel overflow pipe stub. A 2-inch diameter Schedule 40S stainless steel NPT half coupling with pipe plug shall be provided to drain the tank. The supports for the grit cyclone and grit classifier tank shall be fabricated of structural stainless steel sections with a 1/4-inch minimum thickness. The grit classifier shall be provided with an 11-gauge minimum thick stainless steel split cover. The cover shall be provided with both a section that is bolted to the classifier tank and a hinged cover section complete with stainless steel butt hinges and stainless steel lifting handle to open up the hinged cover section. A neoprene gasket shall be glued to the upper classifier tank lip to prevent leakage between the classifier tank and the cover.

4. Grit laden wastewater piping from the grit pump to the grit classifier and wash water return piping from the grit classifier shall be provided by the CONTRACTOR.
5. The grit classifier screw conveyor shall be driven by a direct-connected cycloidal-helical hollow-shaft high-thrust in-line speed reducer design for a maximum output speed of 12 rev/min. The cyclo element of the speed reducer shall be designed to take a 500 percent shock load without damage. The speed reducer manufacturer shall be a member of AGMA. Combination gear motor designs will not be acceptable for this project. The speed reducer shall have a minimum torque rating as noted in paragraph 1.03.E.4. and a minimum thrust rating as noted in paragraph 1.03.E.5.
6. The speed reducer shall be bolted to the drive adaptor flange at upper end of the grit classifier tank. The reducer shall utilize a taper grip bushing to connect to the drive shaft of the screw conveyor. The use of keys and keyways will not be an acceptable connection method for this project.
7. The speed reducer shall be driven by a field replaceable NEMA C-flanged, 1,800 rev/min, ball bearing, continuous-duty, totally enclosed, fan-cooled, EPAct-efficiency, 1.15 S.F., fan-cooled motor with leads to a large conduit box for outdoor operation.
8. Motor size shall be as noted in paragraph 1.03.E.6., shall be rated for electrical power characteristics as noted in paragraph 1.03.B.5. and shall be rated for an environment as noted in paragraph 1.03.B.6.
9. A wash water supply system shall be provided in the side of the classifier tank to provide supplemental grit washing. The wash water supply system shall include a 3/4-inch diameter minimum, brass body solenoid valve suitable for 120 VAC operation with an electrical classification rating as noted in paragraph 1.03.B.6. Solenoid valves shall be normally closed and rated for up to 100 psig. Solenoid valves shall be slow close type to minimize water hammer. A ball valve shall be provided. Ball valve shall be 3/4-inch diameter, 1/4-turn, stainless steel body with stainless steel ball and Teflon seats, and shall have an adjustable stop handle for volume control of the grit wash system.

2.05 CONTROL SYSTEM

- A. All controls necessary for the fully automatic operation of each vortex grit removal system, self-priming grit pump, and grit cyclone-classifier shall be provided in accordance with IEC standards.

- B. A timer in the PLC shall be used to control the grit fluidizing system solenoid valve, self-priming vortex grit pump, grit cyclone-classifier, and the classifier grit washing solenoid valve. The grit cyclone-classifier shall be electrically interlocked to the operation of the grit fluidizing system solenoid valve, the self-priming vortex grit pump, and the classifier grit washing system solenoid valve.
- C. A remote-mounted main control panel shall be provided for the vortex grit systems, self-priming pumps, and grit cyclone classifiers that shall include the following items:
1. Door interlocked fused disconnect
 2. Allen-Bradley Micrologix 1400 programmable logic controller (PLC) with relays and timers to monitor equipment-mounted electrical devices and to perform necessary logic functions
 3. Motor starters for the following:
 - a. Vortex grit stirrer drives
 - b. Grit classifiers
 4. Variable frequency drive (VFD) with line reactor for the self-priming grit pumps
 5. Control power transformer fused primary and secondary with 120 VAC transient voltage surge suppressor (TVSS)
 6. CYCLE/Re-set pushbutton (Black)
 7. Full voltage LED pilot lights for the following for each unit:
 - a. Control power on (White)
 - b. Grit stirrer run (Green)
 - c. Grit fluidizing system RUN (Green)
 - d. Self-priming grit pump run (Green)
 - e. Grit Classifier run (Green)
 - f. Classifier grit washing system RUN (Green)
 - g. Multifunctional overload shutdown grit stirrer - grit pump - classifier fault ALARM (Red)
 8. Door-mounted non-resettable elapsed time meters for the following:
 - a. Grit stirrer drives
 - b. Self-priming grit pump drives
 - c. Grit classifier drives
 9. Remote dry contact outputs for the following for each unit:
 - a. Grit stirrer run
 - b. Grit fluidizing system RUN
 - c. Self-priming grit pump run
 - d. Grit Classifier run
 - e. Classifier grit washing system RUN

- f. Multifunctional overload shutdown grit stirrer - grit pump - classifier fault ALARM
 - 10. One (1) set of spare fuses of each size and type
 - 11. White phenolic nameplates with black lettering
 - 12. 600 VAC terminal block
 - 13. U.L. 508 label
 - 14. Electrical enclosure shall be provided in accordance with paragraph 1.03.B.7.
- D. A local-mounted operator control station for each vortex grit system and self-priming grit pump shall contain the following items:
- 1. HAND-OFF selector switch for the vortex system grit stirrer drive
 - 2. Hand-Off-Auto selector switch for each of the following:
 - a. Self-priming grit pump
 - b. Grit fluidizing solenoid valve
 - 3. E-stop pushbutton (Red)
 - 4. White phenolic nameplates with black lettering
 - 5. NEMA 4/7/9 4-hole cast aluminum explosion-proof enclosure
- E. A local-mounted operator control station for each grit cyclone-classifier shall contain the following items:
- 1. Hand-Off-Auto selector switch for each of the following:
 - a. Grit classifier drive
 - b. Classifier grit washing system solenoid valve
 - 2. E-stop pushbutton (Red)
 - 3. White phenolic nameplates with black lettering
 - 4. NEMA 4/7/9 3-hole cast aluminum explosion-proof enclosure

2.06 ANCHOR BOLTS

- A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Bolts, washers and hex nuts shall be 316 stainless steel unless noted otherwise. Anchor bolts shall be expansion-type or epoxy-type stainless steel.

- B. Anchor bolts shall be set by the CONTRACTOR. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

2.07 SPARE PARTS

- A. The following spare parts shall be provided:
 - 1. One (1) set of V-belts for the self-priming grit pump
 - 2. One (1) set of liners for the grit cyclone
 - 3. One (1) grit fluidizing system solenoid valve re-build kit
 - 4. One (1) classifier grit washing system solenoid valve re-build kit

2.08 SHOP SURFACE PREPARATION AND PAINTING

- A. All fabricated carbon steel or cast iron components for submerged service shall be solvent-cleaned SSPC-SP1 followed by a near-white blast cleaning SSPC-SP10 and given a 2.5 to 3.5-mil dry film thickness (DFT) coat of Tnemec Series 1 Omnithane Primer.
- B. All fabricated carbon steel or cast iron components for non-submerged service shall be solvent-cleaned SSPC-SP1 followed by a commercial blast cleaning SSPC-SP6 and given a 2.5 to 3.5-mil dry film thickness (DFT) coat of Tnemec Series 1 Omnithane Primer.
- C. Electric motors, speed reducers, and other self-contained or enclosed components shall be supplied with the manufacturer's standard finish coating.
- D. Rust preventative compound shall be applied to all machined, polished, and nonferrous surfaces that are not to be painted.
- E. Clean all stainless steel surfaces and provide glass bead blast or chemically treat all external non-wetted stainless steel to a uniform finish with Citrisurf 77. Chemical passivated stainless steel products shall not produce any hazardous wastes during the passivation process. The vortex grit system manufacturer shall clearly identify the passivation procedure methodology and shall certify that no hazardous wastes were produced.

2.09 SOURCE QUALITY CONTROL

- A. All structural stainless steel and carbon steel components shall be fabricated in the United States and shall conform to the requirements of "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" published by the American Institute of Steel Construction.

- B. All stainless steel parts and assemblies shall be fabricated from sheets and plates of AISI Type 316 stainless steel conforming to AISI 316 and ASTM A666, unless noted otherwise. Fabricate all rolled or extruded shapes to conform to ASTM A276. All stainless steel tubular products and fittings shall conform to ASTM A269, A351 and A403.
- C. All welding in the factory shall use shielded arc, inert gas, MIG or TIG method. Add filler wire to all welds to provide for a cross section equal to or greater than the parent metal does. Fully penetrate butt welds to the interior surface and provide gas shielding to interior and exterior of the joint.
- D. Field welding of stainless steel will not be permitted.
- E. Bolts, nuts and washers shall be AISI Type 316 stainless steel furnished in accordance with ASTM A193.
- F. All surfaces that are specified to be machined shall be designed and fabricated to provide a runout of not more than 0.005 inches and a concentricity to within 0.005 inches.
- G. Design and fabrication of structural steel members shall be in accordance with AISC and AWS Standards. The manufacturer shall comply with the American Welding Society (AWS) and the American Institute of Steel Construction (AISC) most current listed standards and qualifications in 2004 D1.1, the criteria per the requirements of Section 6 - Inspection - Structural Welding Code. Evidence of such AWS and AISC compliance shall be submitted with shop drawing submittals as follows:
 - 1. AWS Certified Welding Inspectors (minimum 2 on staff) shall conform to all standards, current or previous as listed in section 6.1.4 AWS QC1, Standard and Guide for Qualification and Certification of Welding Inspectors.
 - 2. AWS Non Destructive Testing Inspectors (Level I, II, III) for Magnetic Particle and Ultra-Sonic testing (minimum 2 on staff) shall conform to all standards, current or previous as listed in and in conformance with The American Society for Non-Destructive Testing (ASNT-TC-1A).

PART 3 EXECUTION

3.01 FIELD PREPARATION AND PAINTING

- A. Finish field preparation and painting shall be performed as specified in Section 09900 - Painting.

- B. The CONTRACTOR shall touch-up all shipping damage to the paint and stainless steel as soon as the equipment arrives on the job site.
- C. The CONTRACTOR shall supply paint for field touch-up and field painting.
- D. The CONTRACTOR shall finish paint electrical motors, speed reducers, and other self-contained or enclosed components with oil-resistance enamel.
- E. Prior to assembly the CONTRACTOR shall coat all stainless steel bolts and nut threads with a non-seizing compound.

3.02 INSTALLATION

- A. The manufacturer shall schedule three (3) trips to the project site for equipment start-up assistance as noted in paragraph 3.02.B. for the CONTRACTOR and for operating training as noted in paragraph 3.05.A. for OWNER personnel.
- B. After the CONTRACTOR has installed the vortex grit removal system and the equipment is capable of being operated, the equipment manufacturer shall furnish a qualified representative for a minimum of five (5) days (up to 40 hours) to inspect the equipment and to supervise field-testing and start-up for the CONTRACTOR.
- C. After the equipment has been placed into operation, the manufacturer's representative shall make all final adjustments for proper operation.

3.03 OPERATOR TRAINING

- A. Provide operator training for OWNER'S personnel after system is operational. Training will take place while manufacturer's representative is at the job site for inspection.

END SECTION

SECTION 11386

HORIZONTAL AXIAL FLOW PROPELLER PUMP

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Provide and install four (4) Horizontal Axial Flow Propeller Pumps, each designed for a maximum capacity of 8,200 GPM at 7.0 feet of total dynamic head. Each pump shall be provided with a suction/discharge elbow, packing box, mechanical seal, propeller, sweep liner, pump shaft, shaft sleeve, shaft coupling, bearing frame, oil seals, base plate, cleanout, variable speed electric motor and back pull-out assembly. Each pump will be installed outdoors between two existing anoxic/aeration basins replacing an existing pump.

1.02 RELATED SECTIONS

- A. Section 13300- Controls and Instrumentation
- B. Division 16- Electrical

1.03 REFERENCE STANDARDS

- A. National Electrical Code
- B. ANSI/NEPA
- C. Underwriters Laboratory
- D. Hydraulic Institute Standards
- E. ASTM- American Society for Testing and Materials
- F. AISI- American Iron and Steel Institute

1.04 QUALITY ASSURANCE

- A. Pumps shall be the product of a manufacture with a minimum of five years' experience in the design and building of such pumping equipment. All workmanship and materials throughout shall be of the highest quality.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work are limited to the following:
 - 1. Lawrence Pumps a Flowserve Company
 - 2. Or Preapproved Equal
- C. Provide nameplate identifying the manufacturer's name, model number, rating/capacity and electrical equipment.
- D. Electrical work shall conform to the latest NEC, State, local and power company standards.
- E. All electrical equipment shall be UL approved and labeled.

1.05 SUBMITTALS

- A. Obtain shop drawings showing dimensions. Incorporate in piping drawings. Verify dimensions and make necessary adjustments in installations.
- B. Submit manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards.
- C. Submit certified copies of reports of factory tests specified in this section and required by referenced standards. Include performance data and physical characteristics.
- D. Submit dimension data, manufacturer's parts list, operation and maintenance literature and instructions as part of Record Information in accordance with Section 01730.
- E. Submit product data in accordance with Section 01340:
 - 1. Indicate pump type, capacity and power requirements.
 - 2. Submit certified pump curves showing pump performance characteristics with duty point plotted. Include NPSH curve.
 - 3. Submit pump layout with dimensions including base plate and discharge piping.
- F. Submit manufacturer's instructions for delivery, storage, assembly, installation, start-up, operation, adjusting, and finishing.
- G. Submit electrical control wiring diagrams.
- H. Submit 3 copies of the Service Representative's Report of Field Tests.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Pump and motor shall be coupled together and tested at the factory. Separate delivery of pump and motor for assembly on Site will not be permitted.
- B. After factory tests, all entrapped water shall be drained prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
- C. Each box or package shall be properly marked to show its net weight in addition to its contents.
- D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion, per division 9 of these specifications.

- E. Finished surfaces of all exposed pump openings shall be protected by wooden planks, strongly built and securely bolted.
- F. Accept equipment on Site in original factory packaging; inspect for damage.

1.07 SOURCE QUALITY CONTROL

- A. Provide certified field performance test curves for the specified conditions based upon most recent tests of a similar pump.

1.08 WARRANTY

- A. Warranties and guarantees by the suppliers of various components in lieu of a single source responsibility by the manufacturer will not be accepted. The manufacturer shall be solely responsible for the warranty of the Horizontal Axial Flow Propeller Pumps and all components.
- B. The pump manufacturer shall warrant the units to the Owner in writing against defects in workmanship and material covering parts and labor for a period of three (3) years from date of substantial completion per Article 9 of the General Conditions.
- C. In the event a component fails to perform as specified or is proven defective in service during the warrantee period, the manufacturer shall provide and install a replacement part without cost to the Owner.
- D. The Warranty shall be in published form and apply to all similar units.

1.09 ENGINEER'S PRE-APPROVAL OF ALTERNATIVE EQUIPMENT

- A. Manufacturer of alternate equipment shall submit a pre-approval submittal package to Manatee County Purchasing contact listed in the Bid Documents, for Engineer's approval, no later than deadline for Clarification Requests date listed in the Bid Documents. Only approved alternates listed by addendum will be acceptable. Alternate manufacturer shall submit the following information and supporting documentation:
 - 1. A complete set of drawings with dimensions specific to this project showing the horizontal axial flow propeller pumps, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of each unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
 - 2. Detailed installation drawings illustrating how the proposed pumps are installed and how it will mate to ancillary equipment. The drawings shall include dimensioned plan, and elevational and sectional views of each

individual system as well as the overall installation.

3. Each pump must meet design performance data mentioned in section 2.02 of this specification.
4. Complete electrical and controls submittals including control schematics, PLC programming logic, detailed cut sheets on electrical components and a P&ID. Details of the control and instrumentation system including complete wiring diagrams per the wiring requirements shown on the drawings for this project.
5. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drive.
6. Complete reference list of all current and active installations of same and similar equipment including contact names and phone numbers, showing at least 5 installations of the same type and size as specified.
7. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.
8. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.
9. The preapproval submittal shall be signed and sealed by a registered professional engineer in the State of Florida.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer's Qualifications - Firms regularly engaged in the manufacture of screening equipment and wastewater treatment plant equipment of the type and size required. Manufacturers must have been engaged in the manufacture of similar systems for a minimum of five (5) years and have similar units in satisfactory service.
- B. The Contractor shall provide only products that have a proven reliability record of at least five (5) years in operation. No equipment shall be considered which has an operating history of less than five (5) years.
- C. The Base Bid horizontal axial flow propeller pumps shall be as manufactured by Lawrence Pumps a Flowserve Company.
- D. Contractors may provide an alternate which must be a pre-approved alternate manufacturer(s), as per 1.09 of this specification. The Base Bid equipment shall be Lawrence Pumps a Flowserve Company.

2.02

HORIZONTAL AXIAL FLOW PROPELLER PUMPS

A. General

The four (4) Horizontal Axial Flow Propeller Pumps shall be identical units from one manufacturer except for their pump suction pipe location, two of which are on the right side and two of which are on the left side of their pump drive shafts.

Each pump shall have a variable speed electric motor suitable for operation at 838-281 RPM. Each pump shall be mounted on an existing concrete pad that may have to be adjusted to a different height and length in order to best match existing suction and discharge piping. The existing suction and discharge piping locations may have to be adjusted in order to match with the proposed pump.

Each Pump shall be installed with its motor drive shaft and pump drive shaft in a horizontal alignment. Each pump shall be similar to a 'top suction' type horizontal axial flow propeller pumps with its vertical pump suction pipe at an angle of 90 degrees to its drive shaft. For this application the pump suction pipe will be in a horizontal position at an angle of 90 degrees to its drive shaft. The pump discharge pipe will have its centerline at the same location as the centerline of the drive shaft. The wastewater discharge will be along the centerline of the drive shaft in a direction opposite the electric motor (see the construction plans).

Each pump shall be driven by a variable speed electric motor using a direct-drive connection. Each pump shall be provided with a non-clogging impeller designed for pumping activated sludge with a suspended solids concentration of 3,000 to 5,000 mg/l. The Orientation of each pump is shown on the Mechanical Construction drawings.

B. Design Performance Data (Each Pump)

Description of design Points	(1)	(2)	(3)	(4)
Speed- RPM	656	521	417	281
Capacity- GPM	8,200	6,500	5,200	3,500
Total Dynamic Head, Feet	7	5	3	1
Horsepower	21	10	5	2

C. Other Design Data (Each Pump)

Number of Pumps	4
Pump Size	16x16-16
Propeller Diameter- Inches	15.12
Electric Motor Characteristics	460v/3 Phase/60 Hertz
Maximum Motor Speed- RPM	900
Maximum Number of Starts per Hour	4
Pump Suction Pipe Diameter-Inches	16
Pump Discharge Pipe Diameter-Inches	16
Maximum Allowable Solid Size-Inches	4
Coupling:	Thomas or equivalent

- D. The manufacturer shall design the proposed pump motors for full load continuous operation.
- E. All mating surfaces of the major castings requiring a watertight seal shall be machined and fitted with Buna-N-rings or designed for Gasket.
- F. Each pump casting shall be free from porosity voids and other casting quality defects. The internal surface of the casing shall be smooth to the touch and free from all sharp edges.
- G. Pump propellers shall be smooth, finished throughout, and shall be free from sharp edges. Each propeller shall be statically and dynamically balanced after assembly to the drive shaft.
- H. Drive shafts shall be supported by single row outer and inner bearings for radial and axial thrust. All shafts shall be dynamically balanced and amply sized to minimize shaft deflection. Submit certified bearing life calculations to provide a minimum B10 of 50,000 hours at the design pumping capacity.
- I. The mechanical seal shall be provided with a solid silicon carbide seal face material on both the stationary and rotating components.
- J. Each pump shall be furnished with an Inverter Duty 6 or 8 pole squirrel-cage, induction motor that is totally enclosed, fan cooled (TEFC). Each motor shall be furnished with moisture resistant, Class F insulation, NEMA design, 1.15 service factor, designed for continuous duty, non-overloading throughout the entire pumping range of operation without using the motor service factor. Each motor shall be capable of sustaining four(4) starts per hour at a minimum ambient temperature of 40°C. Each motor shall be capable of uninterrupted operation with a 10% voltage drop.
- K. Each pump shall be provided with a Back Pull-Out Assembly which enables the propeller, shaft, mechanical seal, bearing and housing to be pulled out of the casing as one unit for inspection, maintenance and repairs.
- L. Each pump shall be provided with a 6-inch hand-hole in its casing in order to inspect the propeller and remove solids that get stuck.
- M. Each pump shall be provided with a Base Plate with Full Top Decking and Grout Holes
- N. Each pump shall have a Steel Shaft Tube constructed of A156 material.
- O. Materials of Construction
 - 1. Ductile iron, ASTM A395 Elbow and packing box.
 - 2. Close-grained cast iron, ASTM A48, CL30 or Dura-bar as applicable, Thrust bearing cover, bearing housing, bearing frame and radial bearing cover.

3. HC250 (ASTM A532 class III Type A Annealed) Elbow sweep liner & Propeller
4. AISI 1045 carbon steel, Pump Shaft.
5. 416 Hardened Stainless Steel, ASTM A276, Shaft Sleeve
6. Carbon steel, ASTM A108GR12L14 Base-plate with full Top Decking
7. Bronze, ASTM 584, C83600 Radial Bearings 22216 CC/W33/C3, thrust bearings SKF 7316 BECBY.
8. AISI 300 Series Stainless Steel Shaft sleeve screw, bearing locknut and washer, propeller nut.
9. Fasteners Carbon Steel / 316 as appropriate.
10. Garlock 3000 Radial bearing cover seal, thrust bearing cover seal

2.03 SPARE PARTS

- A. Furnish spare propeller for each type of pump furnished. Provide one set of interchangeable back pullout components common to both installations.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install pumps as specified in accordance with the Drawings, in accordance with the pump manufacturer's written instructions and as specified in this Section.
- B. Align pumps and motors in accordance with the manufacturer's written instructions. Lubricate pumps and motors in accordance with the manufacturer's written instructions.
- C. Adjust existing concrete pump support pads as required to fit the pumps to existing piping.

3.02 TESTING

- A. Test pumps and motors after pumping units are installed.
- B. Perform field tests in the presence of pump manufacturer's field representative.
- C. Test pumping units in accordance with pump manufacturer's written instructions.

3.03 PAINTING

- A. The exterior surfaces of the proposed pumps shall receive a primer coat of paint in the manufacturer's shop as specified in Section 09900 - Painting.
- B. The Contractor shall apply an exterior coat of finish paint to all exterior surfaces of the pumps as specified in Section 09900 - Painting. Stainless steel items shall not be painted.

3.04 CLEANING

- A. Clean grease, oil, or any other debris from exterior surfaces of equipment.

3.04 MANUFACTUER'S REPRESENTATIVE

- A. The representative shall be present for the function test of the Pumps. The representative shall also provide operation and maintenance instructions to members of the wastewater treatment plants operating staff. The General Contractor shall include the cost of the manufacturer's representative in his bid. The representative shall be on the plant site for a minimum of two 8-hour days (16 hour minimum) in two different trips.

END OF SECTION

DIVISION 13 CONTROLS AND INSTRUMENTATION

SECTION 13300 - CONTROLS AND INSTRUMENTATION GENERAL PROVISIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, devices, equipment, appurtenances, and incidentals required for a complete electrical system as hereinafter specified and/or shown on the Contract Drawings. This work may necessarily include interfacing with and/or completely installing devices and/or equipment furnished under other sections of these Specifications.
- B. The Owner, as part of an independent contract, shall provide the services of a SYSTEMS INTEGRATOR to provide programming of any/all Programmable Logic Controllers (PLC's). The SYSTEMS INTEGRATOR shall also be responsible for the modification of the SCADA System's Human Machine Interface (HMI) screens as required.
- B. It is the intent of these Specifications that the electrical systems required for the SCADA System's new Inputs and Outputs (I/O) be suitable in every way for the service required. All materials and all work/labor which may be reasonably implied as being incidental to the requirements of this Section shall be furnished at no additional cost to the Owner.
- C. All interruptions to the existing control system shall be at the Owner's convenience. Each interruption shall have prior approval. Request(s) for control system interruption(s) shall be made at least forty-eight (48) hours in advance.
- D. The work shall include complete testing of all electrical components, including wiring.
- E. All workmanship shall be of the highest quality. Substandard work will be rejected and it shall be replaced entirely at the Contractor's expense with no cost to the Owner.
- F. It shall be the responsibility of each bidder or his authorized representative to physically visit the job site in order that he may be personally acquainted with the area(s), buildings and/or structures intended for use in the installation/construction under this Specification. The submittal of a proposal/bid by a bidder shall be considered evidence that he has complied with this requirement and accepts all responsibility for a complete knowledge of all factors governing his work. Therefore, failure to comply with this requirement of the Specifications will NOT be grounds for the successful bidder (Contractor) to request approval of change orders and/or additional monetary compensation.

1.02 DIVISION OF WORK

- A. The Electrical Contractor shall be responsible for, and his/her scope of work shall include:
 - 1. Providing and installing all conduit, fittings, conductors, and raceways as indicated on the drawings and as defined in Division 16 Specifications.
 - 2. Termination of control and power wiring to supplied control panels, existing control panels and field elements. The electrical subcontractor shall mark on the record drawings the field wire numbers used for each termination point.

3. Physical installation of manufacturer supplied Bar Screen control panels and Grit System control panel and Variable Frequency Drives (VFD's). This installation shall include all conduit, fittings, conductors and structural rack(s) as required.
 4. Physical installation of manufacturer supplied flow meter transmitter. This installation shall include all conduit, fittings, conductors, structural rack(s) and sun shields as required.
 5. Providing the PLC input/output modules as indicated on the drawings and the physical installation of the cards provided.
 6. Providing conduit, fittings and conductors as required to accommodate the new flow meters, float switches, motion sensors and any/all new field devices that are supplier or installed by others.
 7. Providing accessory devices including furnishing and installation of interposing relays, surge protection devices, terminal blocks, etc. necessary to perform the intent as described by the control strategies and services necessary to achieve a fully integrated and. and operational system as shown on the Contract Drawings and defined in the Specifications.
 8. Coordinating all interface requirements with mechanical and electrical system suppliers and furnish any devices that might be required in order to insure compatibility between all equipment.
 9. Calibration of all field instruments.
 10. Obtaining, in writing, a final acceptance from the SYSTEMS INTEGRATOR to indicate that all conductors and their terminations, as well as, all field devices and their associated I/O are in proper working order. The Electrical Contractor shall make any corrections necessary, at no charge to the Owner, for items identified as unsatisfactory by the SYSTEMS INTEGRATOR.
- B. The Mechanical Contractor shall be responsible for, and his/her scope of work shall include:
1. Included within the mechanical subcontractor's scope installation of any in-line instrumentation. This instrumentation shall include the new Internal Recycle Pump flow meters.
- C. The SYSTEM INTEGRATOR (under a separate Manatee County contract) shall be responsible for, and his/her scope of work shall include:
1. Programming of any/all PLC's and the modification of the SCADA System's Human Machine Interface (HMI) screens as required.

1.03 SUBMITTALS

- A. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work.

- B. Submit complete, neat, orderly, and indexed submittal packages. Handwritten diagrams are not acceptable and all documentation submittals shall be made using CADD generated utilities as specified herein.
- C. Partial submittals or submittals that do not contain sufficient information for complete review or are unclear will not be reviewed and will be returned by the ENGINEER as not approved.
- D. Provide all shop-drawing submittals on disk in AutoCad format.
- E. Design Related Submittals: Provide individual shop drawing submittals as further defined in each specification section defining the SCADA System. Provide the following additional submittals covering the complete system:
 - 1. Loop diagrams, consisting of complete wiring and/or plumbing diagrams for each control loop showing all terminal numbers, the location of the dc power supply, surge arrestors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus divide each loop diagram into four areas for identification of element locations: SCADA System I/O point(s), panel face, back-of-panel, and field, respectively. On each diagram present a tabular summary of:
 - a. The output capability of the transmitting instruments
 - b. The input impedance of each receiving instrument
 - 2. System interconnect diagram that shows all connections required between component parts of the items covered in this section and between the various other systems specified in this Contract. Number all electrical terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme.
 - 3. Test Procedures: Submit the procedures proposed to be followed during all system testing. Procedures shall include test descriptions, forms, and check lists to be used to control and document the required tests.
- F. Instrument Installation Details Submittal
 - 1. The Electrical Contractor shall develop and submit for review, complete installation details for each field mounted device and panel furnished prior to shipment and installation. Common details may be referenced by an index showing the complete instrument tag number, service, location, and device description. Installation details shall be provided as required to adequately define the installation of the components. Drawings may be included in the Control Panel Submittal when only a few are required.
- G. System Calibration and Test Documentation Submittal
 - 1. The Electrical Contractor shall submit an example of each type of Instrument Calibration Report and Loop Functional Test Report that will be used to verify that all preliminary calibration and testing has been performed and the system is considered, by the supplier, to be ready for testing.

2. After approval of the examples, the Electrical Contractor shall prepare Loop Functional Test Report(s) for each loop and an Instrument Calibration Sheet for each active element (except simple hand switches, lights, etc.). These sheets shall be completed and submitted to the Engineer after completion of the operational availability field tests.
3. An Instrument Calibration report shall be used to certify that each instrument requiring calibration has been calibrated to its published specified accuracy shall be submitted to the Engineer. This report shall include all applicable data as listed below plus an area to identify any defects noted, corrective action required, and corrections made. This report shall include:
 - a. Facility identification (Name, location, etc.)
 - b. Loop identification (Name or function)
 - c. Scale ranges and units
 - d. Actual readings at 0, 10, 25, 50, 75, 90 and 100 percent of span
 - e. Tester's certification with name and signature
4. Upon completion of all preliminary calibration and functional testing, the Electrical Contractor, shall submit a certified report for each control panel and its associated field instruments certifying that the equipment (1) had been properly installed under his or her supervision, (2) is in accurate calibration, (3) was placed in operation, (4) has been checked, inspected, calibrated, and adjusted as necessary, (5) has been operated under maximum power variation conditions and operated satisfactorily, and (6) is fully covered under the terms of the warranty.

1.04 STANDARDS

- A The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable state and local requirements. UL listing and labeling shall be adhered to under this Contract.
- B Any equipment that does not have a UL, FM CSA, or other approved testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment furnished has been manufactured in accordance with the National Electric Code and OSHA requirements.
- C Any additional work needed resulting from any deviation from codes or local requirements shall be at no additional cost to the OWNER.
- D Instrument Society of America (ISA) and National Electrical Manufacturers Association (NEMA) standards shall be used where applicable in the design of the Control System.

- E All equipment used on this project to test and calibrate the installed equipment shall be in calibration at the time of use. Calibration shall be traceable to National Institute of Standards (NIS - formally NBS) calibration standards.

1.05 TESTS

- A. The Contractor shall test all items individually and as a system for proper operation.
- B. The Contractor shall, at his expense, make all the requisite repairs, adjustments and/or alterations to correct any shortcomings found as a result of the tests performed under Item 1.02.A.10 above.
- C. A representative of the Owner shall be present during all testing. The Owner shall be notified at least two (2) days prior to any testing.

1.06 GUARANTEES AND WARRANTIES

- A. All items furnished under the Electrical Specifications shall be guaranteed and/or warranted, in writing, against defects in materials, construction and workmanship as specified under Section 01740 of these Specifications.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All SCADA System equipment shall produce or be activated by signals, which are established standards for the water and wastewater industries. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.
- B. All equipment and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The System shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models that are the latest design currently in production.
- C. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
- D. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.
- E. All SCADA System equipment shall be designed and constructed so that in the event of a power interruption, the equipment shall resume normal operation without manual resetting when power is restored.

2.02 MATERIALS

A. PLC HARDWARE

1. The existing programmable logic controllers are as manufactured by Allen Bradley (1746 SLC System) all new components shall be of the same type manufacturer. The required I/O modules include : one (1) digital AC input module (1746-IA16), one (1) analog output module (1746-NO4I) and one (1) analog input module (1746-NI8). NO SUBSTITUTIONS!

- B. All other products required shall be as specified in other sections of the specifications.

PART 3 EXECUTION

3.01. PRODUCT HANDLING

- A. Store and protect equipment until installation following the storage and handling instructions recommended by the equipment manufacturers. Place special emphasis on proper anti-static protection of sensitive equipment.
- B. Protection During Construction: Throughout this Contract, provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction environments.
- C. Corrosion Protection: Protect all consoles, panels, enclosures, and other equipment containing electrical or instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules. Prior to shipment, include capsules in the shipping containers, and equipment as recommended by the capsule manufacturer. During the construction period, periodically replace the capsules in accordance with the capsule manufacturer's recommendations. Replace all capsules just prior to Final Acceptance.
- D. ESD Protection: Provide for the proper handling, storage, and environmental conditions required for the components deemed static sensitive by the equipment manufacturer. The components of the SCADA System shall be protected in particular. Utilize anti-stat wrist straps and matting during installation of these items to prevent component degradation.
- E. Adequately pack manufactured material to prevent damage during shipping, handling, storage and erection. Pack all material shipped to the project site in a container properly marked for identification. Use blocks and padding to prevent movement.
- F. Ship materials that must be handled with the aid of mechanical tools in wood-framed crates.
- G. Ship all materials to the project site with at least one layer of plastic wrapping or other approved means to make it weatherproof. Anti-stat protection shall be provided for all sensitive equipment.

- H. Inspect the material prior to removing it from the carrier. Do not unwrap equipment until it is ready to be installed. If any damage is observed, immediately notify the carrier so that a claim can be made. If no such notice is given, the material shall be assumed to be in undamaged condition, and any subsequent damage that is discovered shall be repaired and replaced at no additional expense to the OWNER.
- I. The Contractor shall be responsible for any damage charges resulting from the handling of the materials.

3.02. INSTALLATION

- A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work, which has a neat and finished appearance. Coordinate work with the OWNER and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing plant during construction.
- B. Provide finish on instruments and accessories that protects against corrosion by the elements in the environment in which they are to be installed. Finish both the interior and exterior of enclosures. Provide extra paint of each color used in the material from the manufacturer for touch-up purposes.
- C. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices. Coordinate grounding system with Division 16, Electrical.
- D. For the purposes of uniformity and conformance to industry standard, provide analog signal transmission modes of electronic 4-20 ma DC. No other signal characteristics are acceptable.
- E. Fully isolate outputs for transmitted electronic signals between transmitters and receivers, equipment of different manufacturers and between control panels to conform to ISA Standard S 50. 1.
- F. Discrete signal are two-state logic signals. Use 120V ac sources on all discrete signals unless otherwise noted or shown.
- G. Surge Protection: Provide appropriately sized electrical transient protection devices for all electrical elements of the system to protect the SCADA System equipment and equipment which interfaces with the SCADA System from transient surges in power and signal wiring (from lightning and other ground potential differences). Locate and properly ground surge suppressors at: any connection between power sources and electrical equipment including panels, assemblies, and field devices; and at both ends of all analog signal circuits.

3.03. TESTING

- A. All elements of the SCADA System shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents

- B. As a minimum, the testing shall include shop tests, operational check-out tests, and Demonstration Tests.
- C. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system producing the correct result (effect), the specific test requirements will have been satisfied.
- D. All tests shall be conducted in accordance with, and documented on, prior approved procedures, forms, and checklists. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion. Copies of these signoff test procedures, forms, and checklists will constitute the required test documentation.
- E. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation. Define these simulation techniques in the test procedures.
- F. The Electrical Contractor shall coordinate all of their testing with the SYSTEMS INTEGRATOR, the ENGINEER, all affected suppliers, and the OWNER.
- G. The SYSTEMS INTEGRATOR shall reserve the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The SYSTEM INTEGRATOR's decision shall be final regarding the acceptability and completeness of all testing.

END OF SECTION

SECTION 15050

PIPE AND PIPE FITTINGS - GENERAL STATEMENT

PART 1 GENERAL

DESCRIPTION OF WORK

A. General:

1. Furnish all labor, materials, tools, equipment and services for all pipe and pipe fittings as indicated in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Related specification sections include but are not limited:

1. 15062 - Ductile Iron Pipe and Fittings
2. 15066 - Plastic Pipe (Gravity Sewer)
3. 15067 - Plastic Pipe for Pressure Service
4. 15100 - Valves and Appurtenances

1.02 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.
- B. Verify on shop drawings, dimensions, schedule of pipe, linings, coatings, fittings, hangers, supports, and miscellaneous appurtenances. When special fittings are necessary, verify locations of items and include complete details.
- C. Yard piping drawings. Submit scaled drawings showing locations and dimensions to and from fittings, valves, structures, gates, and related appurtenances. Provide scaled drawings to a minimum scale of 1/8-inch equals 1-foot. Provide details to minimum scale of 1/8-inch equals 1-foot. Information shall include but not necessarily be limited to:
 1. Dimensions of piping lengths
 2. Invert or centerline elevations of piping crossings
 3. Acknowledgment of bury depth requirements
 4. Details of fittings, tapping locations, thrust blocks, restrained joint segments, harnessed joint segments, hydrants, and related appurtenances.
 5. Line slopes and vents

PART 2 PRODUCTS

2.01 GENERAL PIPING SYSTEMS

- A. Unless otherwise shown on drawings or drawing schedule, piping system materials, fittings, and appurtenances are subject to requirements of specific technical specifications and shall be as follows:

Service Category	Pipe Size Range in Inches	Piping System
Internal Recycle Pumps Rehabilitation (Mixed Liquor)	20-30 - DIP	Above ground - AWWA C115 and C151 Class 53 ductile iron, Protecto 401 ceramic epoxy lining, flanged, AWWA C110 and C111 flanged ductile iron fittings, Protecto 401 ceramic epoxy lining
Headworks Rehabilitation	4-12 - DIP	Above ground - AWWA C115 and C151 Class 53 ductile iron, Protecto 401 ceramic epoxy lining, flanged, AWWA C110 and C111 flanged ductile iron fittings, Protecto 401 ceramic epoxy lining

PART 3 EXECUTION

3.01 DELIVERY, INSPECTION AND STORAGE

- A. Inspect materials thoroughly upon arrival. Remove damaged or rejected materials from site.
- B. Observe manufacturer's directions for delivery and storage of materials and accessories.
- C. Store materials on-site in enclosures or under protective coverings above ground to keep them clean and dry.

3.02 HANDLING OF PIPE

- A. Protect pipe coating during handling using methods recommended by manufacturer. Use of bare cables, chains, hooks, metal bars, or narrow skids in contact with coated pipe is not permitted.
- B. Prevent damage to pipe during transit. Repair abrasions, scars, and blemishes. If repair of satisfactory quality cannot be achieved, replace damaged material immediately.
- C. Erect piping to accurate lines and grades and support as required on drawings or described in specifications. When temporary supports are used, ensure that sufficient rigidity is provided to prevent shifting or distortion of pipe. Install expansion devices, as

necessary, to allow expansion and contraction movements.

3.03 PIPING - GENERAL

- A. Minimum bury. Unless otherwise shown on the drawings, provide a minimum of 36-inches earth cover over exterior buried piping systems and appurtenances conveying water, fluids, or solutions.

3.04 PIPING WITHIN BUILDINGS, STRUCTURES AND UNITS

- A. Install piping in vertical and horizontal alignment as shown on drawings. Alignment of piping smaller than 4 inches may not be shown. However, install according to drawing intent and with ample clearance and allowance for:
 - 1. Expansion and contraction
 - 2. Operation and access to equipment, doors, windows, hoists, moving equipment
 - 3. Headroom and walking space for working areas and aisles
 - 4. Install vertical piping plumb and horizontal piping runs parallel with structure walls
- B. Use methods of piping support as shown on the drawings and as required in Section 15141 - Pipe Support Systems. Where pipes run parallel and at same elevation or grade, they may be grouped and supported from common trapeze-type hanger, provided hanger rods are increased in size as specified for total supported weight. The pipe in the group requiring the least maximum distance between supports shall set the distance between trapeze hangers.
- C. Locate and size sleeves required for piping system. Arrange for chases, recesses, inserts, or anchors at proper elevation and location.
- D. Install service piping to provide every plumbing fixture and equipment requiring potable water with suitable supply and soil or waste and vent connection as required by code. Consult manufacturer's data and large scale details of rooms containing plumbing fixtures before roughing in piping. Plug or cap piping immediately after installation.
- E. Use reducing fittings throughout piping systems. Bushings will not be allowed unless specifically approved.
- F. Provide drain pans and piping from items of equipment where condensation may occur. Run drain piping to nearest floor drain or rainwater downspout. Condensate drain piping shall generally be 1-inch except where otherwise indicated.
- G. Soil, waste, vent and rainwater piping installation:
 - 1. Install horizontal soil or waste lines with fall to produce flow rate of 2-feet per second or 1/8 inch per foot. Hold as close to construction as possible to maintain maximum headroom. Make changes of direction with 1/8 bends, and junctions with wye fittings. Use short wye fittings in vertical pipe only. Install handhold test tee at base of each stack. Install cleanouts at dead ends, at changes of direction, and at 50-foot intervals on horizontal runs. Where cleanouts occur in concealed spaces,

- provide with extensions to floors above or to wall as required.
2. Run vent stack parallel to each soil or waste stack to receive branch vents from fixtures. Each vent stack shall originate from soil or waste pipe at its base. Where possible, combine soil, waste, or vent stacks before passing through roof so as to minimize roof openings. Offset pipes running close to exterior walls away from such walls before passing through roof to permit proper flashing. Provide pipes passing through roofs with cast iron increases minimum of 12-inches below roof one size larger than pipe but in no case less than 4-inches. Terminate each vent with approved frost proof jacket.
 3. Provide each vent pipe passing through roof with 4-lb sheet lead flashing consisting of 18 x 18 inch base with tubular vertical sleeve surrounding pipe with 1-inch minimum spacing and turning in 2 inches at top. Provide gasket seal between top and lead sleeve.
 4. Carry vent stacks 4-inches and larger full size through roof. Extend vent stacks at least 12 inches above roofing.
 5. Provide each roof drain with 4-lb sheet lead flashing 36 x 36-inch square clamped under flashing ring of drain.

H. Potable or service water piping installation:

1. Install drain tees with capped nipples of IPS brass 3-inches long at low points. If low points occur in concealed piping, provide approved flush access panel. These drains are not shown on drawings.
2. Slope water lines down to drain points not less than 1-inch in 60-feet.
3. Wherever threaded piping is installed, provide clean-cut tapered threads with ends thoroughly reamed after cutting to remove burrs. Pipe joint cement permitted only on external threads. For screwed nipples for connections to flush valves, lavatory supplies, and other equipment with threaded connections use iron, copper, or brass pipe.
4. Install ball, butterfly, gate, check, and plug valves where indicated or required to adequately service all parts of system and equipment. Unless otherwise indicated, install valves on each branch serving restroom. Install valve on inlet and outlet connections of heat exchangers and on other equipment connected to water lines.
5. Install union between valves and connections to each piece of equipment and install sufficient number of unions throughout piping system to facilitate installation and servicing. On copper pipe line, install wrought copper solder-joint copper to copper unions for lines 2-inches and smaller; for lines 2-1/2-inches and over, install brass flange unions.
6. Construct and equip plumbing fixtures and equipment with anti-siphon devices as to entirely eliminate any danger of siphoning waste material into potable water supply system.
7. Where exposed pipes 6-inches in size and smaller pass through floors, finished walls, or finished ceilings, fit with nickel or chrome-plated plates large enough to close hole completely around pipes. Secure plates to pipe by set screw in approved manner.
8. Size supply branches to individual fixtures as scheduled or indicated on drawings.
9. Install piping so as to be free to expand with proper loops, anchors, and joints with injury to system or structure.
10. Provide branches to wall hydrants or hose bibs in exterior location with interior

shutoff and drain valves.

11. Provide approved type vacuum breaker installations indicated or as required by Code.

3.05 PIPING OUTSIDE BUILDINGS AND STRUCTURES

- A. Install piping as shown on drawings with ample clearance and allowance for expansion or contraction.
- B. Install flexible joint within two (2) feet of point where pipe enters or leaves structure. Provide balance of piping with standard laying lengths and in accordance with drawings.

3.06 PIPE INTERSECTIONS WITH STRUCTURES AND UNITS

- A. Enter and exit through structure walls by using wall seals specified or as shown on drawings.

3.07 EQUIPMENT PIPE CONNECTIONS

- A. Exercise care in bolting flanged joints so that there is no restraint on the opposite end of pipe or fitting which would prevent uniform gasket pressure at connection or would cause unnecessary stresses to be transmitted to equipment flanges. Where push-on joints are used in conjunction with flanged joints, final positioning of push-on joints shall not be made until flange joints have been tightened without strain.
- B. Tighten flange bolts at uniform rate which will result in uniform gasket compression over entire area of joint. Provide tightening torque in accordance with manufacturer's recommendations.
- C. Support and match flange face to uniform contact over their entire face area prior to installation of any bolt between the piping flange and equipment connecting flange.
- D. Permit piping connecting to equipment to move freely in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened. Align, level, and wedge equipment into place during fitting and alignment of connecting piping. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment. To provide maximum flexibility and ease of alignment, assemble connecting piping with gaskets in place and minimum of four (4) bolts per joint installed and tightened. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange. Realign as necessary, install flange bolts, and make equipment connection.
- E. Provide utility connections to equipment shown on drawings, scheduled or specified.
- F. Obtain rough-in data from approved shop drawings on equipment. Obtain rough-in data for relocating existing equipment and coordinate with Owner.
- G. Unless otherwise specified, make piping connections to equipment, including but not limited to installation of brass and fittings, strainers, pressure-reducing valves, flow control

valves, and relief valves provided with or as an integral part of equipment.

- H. Furnish and install sinks, brass, fittings, strainers, pressure-reducing valves, flow control valves, pressure relief valves, and shock absorbers which are not specified to be provided with or as an integral part of equipment.
- I. For each potable or service water supply piping connection to equipment, furnish and install union and gate or angle valve. Minimum size to be 1/2-inch.
- J. Furnish and install "P" trap for each waste piping connection to equipment if waste is connected directly to building sewer system. Size trap as required by Plumbing Code.
- K. Stub piping for equipment, sinks, lavatories, supply and drain fittings, key stops, "P" traps, miscellaneous traps, and miscellaneous brass through wall or floor and cap and protect until such time when later installation is performed. Run piping mains and branches in laboratory benches, built-in counters, and cabinet work if acceptable to Construction Manager.

3.08 ANCHORAGE AND BLOCKING

- A. Block, anchor, or harness exposed piping subjected to internal pressure, in which mechanical, push-on, flexible, or similar joints are installed to prevent separation of joints.
- B. Provide reaction blocking, anchors, joint harnesses, or other acceptable means for preventing movement of piping caused by internal pressure in buried piping tees, wye branches, plugs, or bends.
- C. Place concrete blocking so that it extends from fitting into solid undisturbed earth wall. Concrete blocks shall not cover pipe joints. Provide bearing area of concrete in accordance with drawing detail. In event that adequate support cannot be achieved against undisturbed soil, install restrained piping joints.
- D. Provide reaction blocking, anchorages, or other supports for fittings as shown on drawings for piping installed in fills, unstable ground, above grade, or exposed within structures.

3.09 CLEANING

- A. Clean interior of piping systems thoroughly before installing. Maintain pipe in clean condition during installation.
- B. Before jointing pipe, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
- C. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system.
- D. At completion of work and prior to final acceptance, thoroughly clean work installed under these specifications. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sludge which may have accumulated by operation of system, from testing or

from other causes. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner.

3.10 PIGGING, FLUSHING AND CLEANING

- A. All mains and distribution lines shall be pigged, cleaned and flushed to remove all sand and other foreign matter. The Contractor shall be responsible for developing a pigging and flushing plan to be submitted to the Engineer for approval prior to pigging and flushing. The contractor shall dispose of all water used for pigging and flushing without causing a nuisance or property damage. Any permits required for the disposal of flushing water shall be the responsibility of the Contractor.
- B. Flushing water used by the Contractor shall be taken from an approved metered source. The water utility will provide the meter and designate the source. Flushing water shall be at the Contractor's expense. Flushing water shall be potable water for potable water mains. RCW mains may be flushed with potable or reclaimed water.
- C. The cleaning of the new piping system shall be accomplished by the controlled and pressurized passage of a series of hydraulic or pneumatic polyurethane plugs of varying dimensions, coatings, and densities; which shall be selected by the pipe cleaning Contractor. The Contractor shall provide a means to enter the pig into the system, control and regulate flow, monitor flows and pressures, and to remove the pig from the system. The contractor shall maintain a constant surveillance of the system and immediately report to the proper authority any inline problems encountered or any malfunctions discovered in the piping system. A record of pig models, sizes, styles, and other pertinent information shall be kept by the Contractor and turned over to the Owner.

3.11 TESTING AND INSPECTION

- A. Upon completion of piping, but prior to application of insulation on exposed piping, test all piping systems. Utilize pressures, media and pressure test duration at specified on piping specification sheets. Isolate equipment which may be damaged by the specified pressure test conditions. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring equipment to determine leakage rates. Select each gage so that the specified test pressure falls within the upper half of the gage's range. Notify the Engineer 24 hours prior to each test.
- B. Unless otherwise specified, completely assemble and test new piping systems prior to connection to existing pipe systems.
- C. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance.
- D. Provide all necessary equipment and perform all work required in connection with the tests and inspections.
- E. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.

3.12 DISINFECTING POTABLE WATER PIPELINES

- A. All record drawing requirements must be submitted to the Owner/Engineer prior to starting the bacteriological testing of the water lines.
- B. Prior to being placed in service, all potable water pipe lines shall be chlorinated in accordance with AWWA651, "Standard Procedure for Disinfecting Water Main". The procedure shall meet Health Department requirements. The location of the chlorination and sampling points shall be determined by the Engineer. Taps for chlorination and sampling shall be uncovered and backfilled by the Contractor as required.
- C. The general procedure for chlorination shall be to flush all dirty or discolored water from the lines, and then introduce chlorine in approved dosages through a tap at one end while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipe line for 24 hours. Water for flushing, filling and disinfecting the newlines will be provided by the owner and must be obtained without contaminating existing pipe lines. Water obtained from existing pipe lines for this purpose shall pass through an approved air gap or backflow prevention device.
- D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with water from the distribution system. Bacteriological sampling (taken by the Contractor and provided to an approved laboratory by the Contractor) and analysis of the replacement water shall then be made by an approved laboratory or the Health Department in full accordance with the AWWA Manual C651. The line shall not be placed in service until the requirements of the Florida Department of Environmental Protection (FDEP) and County Public Health Department are met. Results of the bacteriological tests together with certified record drawings must be submitted to the Health Department (FDEP) within 30 days of the tests.
- E. Special disinfecting procedures when approved by the Owner may be used where the method outlined above is not practical.

3.13 LOCATION OF BURIED OBSTACLES

- A. Furnish exact location of buried utilities encountered and any below grade structures. Reference items to definitive reference point locations such as found property corners, entrances to buildings, existing structure lines, fire hydrants, and related fixed structures. Include such information as location, elevation, coverage, supports, and additional pertinent information which will be required by future contractors for replacement servicing, or adjacent construction around any buried facility.
- B. Incorporate information to "Record Drawings".

3.14 SPECIAL REQUIREMENTS AND PIPING SPECIALTIES

- A. Insulating joints: Provide insulating joints where dissimilar metals are joined together and where specifically indicated on drawings. Type of joint shall be as detailed and in accordance with the following requirements:

1. Insulating flanges: Provide each unit to consist of flat-faced rubber gaskets.
 2. Insulating unions: Provide "dielectric" union by Epco or equal.
 3. Insulating couplings: When joining larger diameter dissimilar metal pipe, use insulating coupling equal to Rockwell No. 416, Dresser Style 39, or equal. When pipes have different outside diameters, use insulating reducing couplings equal to Rockwell No. 417, Dresser Style 39-62, or equal.
- B. Welding:
1. Have each welding operator affix an assigned symbol to all his welds. Mark each longitudinal joint at the extent of each operator's welding. Mark each circumferential joint, nozzle, or other weld in two places 180° apart.
 2. Use only certified welders meeting procedures and performance outlined in Section 9 of the ASME other codes and requirements per local building and utility requirements.
 3. Have all welds conform to highest industrial practice in accordance with ANSI B31.3 and ANSIB31.1 or other codes and requirements per local building and utility requirements.
- C. Protective coatings and linings:
1. Where coatings, linings, paint, tests and other items qualified in applications of service are stated, pipe and fittings shall be included in referenced conditions.
 2. Where specified, provide coal-tar epoxy linings and coatings in accordance with AWWA C210 to a minimum thickness of 20 mils in not less than two coats.
 3. Where specified, provide cement mortar lining in accordance with AWWA C205.
 4. Where specified, provide Protecto 401 lining.
 5. Where specified, galvanize surface in accordance with hot-dip method using any grade of zinc acceptable to ASTM B6.
 6. Where specified, field paint pipe in accordance with Section 09900 - Painting and Coatings and Section 09902 - Pipe and Equipment Painting.
 7. Where specified, coat pipe 24-inch in diameter and smaller with extruded polyethylene coating equal to EnCoat.
 - a. Where specified, line pipe with a blend of high-density and low density polyethylene powders complying with ASTM D1248 and uniformly fused and bonded to the pipe to a minimum thickness of 40 mils.
- D. Underground alarming tape. Provide underground warning tape constructed of heavy gage 0.004-inch polyethylene film to identify all buried utilities except 3-inch and smaller irrigation pipe. Provide 6-inch wide tape as follows: Film Legend Film Color Electric line below Red Telephone line below Orange Water line below Blue Sewer line below Green Non potable water below Brown Reclaimed Water Below Purple
- E. Install tape directly above each buried utility at a as shown on the Drawings.

END OF SECTION

SECTION 15062

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Install within the project site all materials and incidentals including flanged joint, mechanical joint, push-on joint, and restrained joint ductile iron pipe and/or ductile iron restrained, flanged, or mechanical joint fittings for potable water mains, reclaimed water mains, wastewater treatment plant process piping, and gravity sewers, complete, as shown on the project drawings.
- B. The Contractor shall coordinate all deliveries with the related Vendor(s) in a manner not to impede construction.

1.02 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.
- B. Except as otherwise shown on the Drawings, either push- on, mechanical, restrained, or flanged joints shall be used. Prior to commencing work, jointing systems for pipe shall be submitted to the Owner's Representative for approval.
- C. All ductile iron pipe and fittings to be installed under this Contract shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. Furnish in duplicate to the Owner's Representative sworn certificates of such tests and their results.
- D. Shop Drawings including layout drawings shall be submitted to the Owner's Representative for approval and shall include dimensioning, methods and locations of supports and all other pertinent technical specifications for all piping to be furnished. Layout Drawings shall be to scale, and shall clearly indicate the amount of pipe to be restrained from each fitting.
- E. The Contractor shall transmit from the Vendor to the Owner's Representative, the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe shall be supplied in lengths not in excess of 21-feet.

- B. Buried Pipe shall conform to ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, current editions. Below grade pipe 4 to 12-inches in diameter shall be rubber-ring type push-on joint or mechanical joint, pressure Class 350. Below grade pipe 14 to 20-inches in diameter shall be rubber-ring type push-on joint, Pressure Class 250. Below grade pipe 24-inches in diameter shall be rubber-ring type push-on joint, pressure Class 200. Below grade pipe 30 to 60-inches in diameter shall be rubber-ring type push-on joint, pressure Class 150.
- C. Mechanical joint fittings for 4 to 24-inch diameter ductile iron pipe shall be compact ductile iron cast in accordance with ANSI/AWWA C153/A21.53. The working pressure rating for the fittings shall be 350 psi.
- D. Mechanical joint fittings for 30 to 60-inch diameter ductile iron pipe shall be standard size ductile iron cast in accordance with ANSI/AWWA C110/A21.10. The working pressure rating for the fittings shall be 250 psi.
- E. Gaskets shall be EPDM (Ethylene-Propylene Dine Monomer) such as the "Fastite Gasket" of American Ductile Iron Pipe Co., or approved equal in conformance with ANSI/AWWA C111/A21.11, latest edition.
- F. All mechanical joints and push-on joints for pipe, fittings and valves on the wastewater treatment plant site shall be restrained. Restraints shall be Megalug by EBAA Iron, Romac, or equal. Restraints may also be American Ductile Iron Pipe's Fast Grip Gasket, U.S. Pipe's Field Lok Gasket, or equal.
- G. Below grade pipe shall have a one-mil coal tar enamel coating on the outside. The coal tar enamel shall be in accordance with ANSI/AWWA C151/A21.51.
- H. All buried ductile iron pipe and fittings shall be provided with a 4-mil thick cross laminated high density polyethylene encasement or an 8-mil thick polyethylene encasement per ANSI/AWWA C105/A21.5. Color of encasement shall be in accordance with Manatee County requirements based on the service type of the pipe.
- I. Flanged ductile-iron pipe for above ground piping shall conform to current ANSI/AWWA C115/A21.15 with factory applied screwed long hub flanges except as otherwise specified hereinafter. Flanges shall be faced and drilled after being screwed on the pipe with flanges true to 90 degrees with the pipe axis and shall be flush with end of pipe conforming to ANSI B16.1, 125 pounds standard. Flanged pipe shall be special thickness Class 53.
- J. Flanged fittings shall be ductile as specified herein. Flanges and flanged fittings shall be flat face and shall conform to ANSI/AWWA C110/A21.10 for 350 psi pressure ratings between 4 and 24-inch diameter pipe and for 250 psi pressure ratings for 30 to 60-inch diameter pipe. Full face type 1/8-inch thick SBR rubber ring gaskets shall conform to ANSI/AWWA C111/A21.11.
- K. Bolts and nuts on flanged fittings shall be Grade B, ASTM A-307, cadmium plated and conform to ANSI B16.1 for Class 125.

- L. Pipe and fittings above grade, exposed to view in the finished work to be painted shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of Koppers No. 621 rust inhibitive primer or approved equal. All other pipe and fittings shall be shop coated on the outside with a 1.0 mil thick bituminous coat in accordance with ANSI/AWWA C151/A21.51.
 - 1. Should portions of the pipe inadvertently be given the outside coating of coal tar enamel instead of the rust inhibitive primer as required for exposed piping, the surfaces shall be sealed with a non-bleeding sealer coat such as Inertol Tar Strop, or Mobil Anti-bleeding Aluminum Sealer. Sealing shall be part of the work of this section.
- M. All ductile iron pipe and fittings carrying clarifier effluent, effluent, filter effluent, reclaimed water, reject, and potable water shall have a standard thickness cement lining and seal coats on their interiors in accordance with ANSI/AWWA C104/A21.4.
- N. All ductile iron pipe and fittings carrying raw wastewater, internal recycle, mixed liquor, plant drain wastewaters, return activated sludge, thickened sludge and waste activated sludge shall have an interior lining of Protecto 401 ceramic epoxy applied at a nominal thickness of 40 mils. The Protect 401 material shall be a high-build, multi-component, Amine- cured, Novalac epoxy lining. At least 20% of the volume of the lining material shall be ceramic quartz pigment. The linings shall be checked for thickness using a magnetic film thickness gauge and the method outlined in SSPC-PA-2, Film Thickness Rating. The interior lining of all pipe and fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Each pipe and fitting shall be marked with the date of application of the lining system and with its sequence number of application on that date. The pipe and fitting manufacturers shall supply a certificate attesting that the lining material used was as specified, and that the lining material was applied as required by the specifications and the lining material manufacturer.
- O. All interior linings for potable water piping shall be EPA/NSF approved.
- P. Pipe and fitting manufacturers shall be the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, McWane, Tyler, or approved equal.

PART 3 EXECUTION

3.01 HANDLING PIPE AND FITTINGS

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Owner's Representative.
- B. All pipe and fittings shall be subjected to a careful inspection and hammer test just prior to being installed.

- C. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner.

3.02 UNDERGROUND PIPE INSTALLATION

- A. Alignment and Grade: The pipelines shall be laid and maintained to lines and grades established by the Drawings and Specifications, with fittings, valves and hydrants at the required locations unless otherwise approved by the Owner's Representative. Valve-operating stems shall be oriented to allow proper operation. Hydrants shall be installed plumb.
- B. Underground Conflicts: Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care shall be exercised to avoid damage to existing structures. When obstructions that are not shown on the drawings are encountered during the progress of the work and interfere so that an alteration of the Drawings is required, the Owner's Representative will alter the Drawings or order a deviation in line and grade or arrange for removal, relocation, or reconstruction of the obstructions. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Owner's Representative, to provide clearance as required by federal, state, or local regulations or as deemed necessary by the Owner's Representative to prevent future damage or contamination of either structure.
- C. Trench Construction:
 - 1. Trench preparation shall proceed in advance of pipe installation for only as far as necessary to allow proper pipe installation. The width of the trench at the top of the pipe shall be ample to permit the pipe to be laid and joined properly and allow the backfill to be placed as specified.
 - 2. Bedding shall be provided and compacted in accordance with the details shown on the Drawings.
 - 3. Holes for the bells shall be provided at each joint but shall not be larger than necessary for joint assembly and assurance that the pipe barrel will lie flat on the trench bottom. Other than noted previously, the trench bottom shall be true and even in order to provide support for the full length of the pipe barrel, except that slight depression may be provided to allow withdrawal of pipe slings or other lifting-tackle.
 - 4. When excavation of rock is encountered, all rock shall be removed to provide a clearance of at least 6-inches below and on each side of all pipe, valves, and fittings for pipe sizes 24-inches or smaller, and 9-inches for pipe 30- inches and larger. When excavation is completed, a bed of sand, crushed stone or earth that is free from stones, large clods, or frozen earth shall be placed on the bottom of the trench to the previously mentioned depths, leveled, and tamped. These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers, or foundations that may be encountered during excavation.

5. This installation procedure shall be followed when gravel formations containing loose boulders greater than 8 inches in diameter are encountered. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection, or point of rock, boulder, or stones of sufficient size and placement which, in the opinion of the Engineer could cause a fulcrum point.
6. Should the trench pass over a sewer or other previous excavation, the trench bottom shall be sufficiently compacted to provide support equal to that of the native soil or conform to other regulatory requirements in a manner that will prevent damage to the existing installation.
7. When the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed, to a minimum of at least 3-inches, or to the depth ordered by the Engineer and replaced under the directions of the Engineer with clean, stable backfill material. The bedding shall be consolidated and leveled in order that the pipe may be installed as specified.
8. When the bottom of the trench or the subgrade is found to consist of material that is unstable to such a degree that, in the judgment of the Engineer it cannot be removed, a foundation for the pipe and/or appurtenance shall be constructed using piling, timber, concrete, or other materials at the direction of the Engineer.

3.03 PIPE INSTALLATION

- A. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to pipeline material and protective coatings and linings. Under no circumstances shall pipeline materials be dropped off or dumped into the trench. The trench shall be dewatered prior to installation of the pipe.
- B. All pipe fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Owner's Representative who may prescribe corrective repairs or reject the materials.
- C. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid.
- D. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.
- E. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

- F. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Owner's Representative. When practical, the plug shall remain in place until the trench is pumped completely dry. Care shall be taken to prevent pipe flotation should the trench fill with water.
- G. Trench width at the top of pipe, bedding conditions, and backfill placement and compaction shall be such that design loadings on the pipe will not be exceeded.
- H. Joint Assembly: Pipe joints shall be assembled in accordance with the Manufacturer's instructions and the requirements of ANSI/AWWA C600.
- I. Pipe Deflection: When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed that shown in AWWA C600, latest edition.
- J. Pipe Cutting: Cutting pipe for the insertion of valves, fittings, or closure pieces shall be done in a neat, workmanlike manner without creating damage to the pipe or lining. Ductile cast iron may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheel saw, or oxyacetylene torch. Cut ends and rough edges shall be ground smooth and for push-on joint connections, the cut end shall be beveled.
- K. Thrust Restraint:
 - 1. All pipe joints, plugs, caps, tees, and bends shall be suitably restrained by attaching steel tie rods or restrained joints as specified.
 - 2. Thrust-restraint design pressure shall be equal to the test pressure of the line.
 - 3. Restrained mechanical joints utilizing setscrew retainer glands or steel harness and tie rods shall be used in place of concrete. Steel tie rods or other components of dissimilar metal shall be protected against corrosion by hand application of a bituminous coating or by encasement of the entire assembly within an 8-mil thick, loose polyethylene casing in accordance with ANSI/AWWA C105/A21.5.

3.04 ABOVE GROUND PIPE INSTALLATION

- A. Install pipe in horizontal or vertical planes, parallel or perpendicular to building surfaces unless otherwise shown. Support pipe and fittings to prevent strain on joints, valves and equipment. Install flanged joints so that contact faces bear uniformly on the gasket. Tighten bolts with relatively uniform stress.

3.05 TESTING

- A. Hydrostatic pressure and leakage test shall conform to Section 4 of AWWA C600, with the exception that the Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the line.

- B. The pressure required for the field hydrostatic pressure test shall be 180 psi for potable water lines and reclaimed water lines, and shall be 150 psi for force mains. The Contractor shall provide temporary plugs and blocking necessary to maintain the required test pressure of 180 psi or 150 psi. Corporation cocks at least 3/4-inches in diameter, pipe riser and angle globe valves shall be provided at each pipe dead-end in order to bleed air from the line. Duration of pressure test shall be at least two hours.
- C. The leakage test may be conducted at the same time as the pressure test, and shall be of not less than one hour duration. All leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves and accessories shall be removed and replaced. The pipe lines shall be tested in such sections as may be required. The line shall be filled with water and all air removed and the test pressure shall be maintained in the pipe for the entire test period by means of a force pump to be furnished by the Contractor. Accurate means shall be provided for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage.
- D. The amount of leakage which will be permitted shall be in accordance with AWWA C600 Standards for all pressure tests. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula :

$$L = \frac{SD(P)^{1/2}}{133,200^*}$$

- L = Leakage in gallons per hour
- S = Length of pipe in feet
- D = Nominal diameter in inches
- P = Pressure in psi

* Note: If 20-foot pipe lengths are used, factor to be 148,000

- E. Ductile iron pipe used for gravity sanitary sewers shall be tested for leakage by conducting infiltration tests, exfiltration tests, or low pressure air tests as specified in Section 02072 - Gravity Sewer Construction.

3.06 SURFACE PREPARATION AND PAINTING

- A. All piping and fittings exposed to view shall have their surfaces prepared and painted with a prime coat as defined in these Specifications. Surface preparation and shop priming is a part of the work of this Section.

END OF SECTION

SECTION 15066

PLASTIC PIPE (GRAVITY SEWER)

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, equipment, materials, pipe and incidentals and shall construct gravity sewers or drains, complete, as shown on the drawings and as herein specified.
- B. The work shall include furnishing, laying and testing gravity sewer/drain pipe.

1.02 SUBMITTALS DURING CONSTRUCTION

- A. The Contractor shall submit prior to construction, Shop Drawings, Working Drawings and samples for approval to the Engineer.
- B. The Contractor shall submit to the Engineer not less than fourteen (14) calendar days after the date of the Notice to Proceed, a list of materials to be furnished, the names of suppliers and an expected schedule of delivery of materials to the site.
- C. The Contractor shall furnish in duplicate to the Engineer sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.
- D. The pipe manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The Contractor shall furnish to the Engineer, a manufacturer's Notarized Affidavit stating all pipe meets the requirements of ASTM, ASCE, ANSI, the Contract Documents, as well as all applicable standards regarding the joint design with respect to square ends and out-of-round joint surfaces.

1.03 INSPECTION AND TESTS

- A. All pipe and accessories installed under this Contract shall be inspected and tested as required by the Standard Specifications to which the material is manufactured. The pipe shall be tested at the place of manufacture or taken to an independent laboratory by the manufacturer.
- B. Each length of pipe shall be subject to inspection and approval at the factory, point of delivery and site of work. Sample of pipe to be tested shall be selected at random by the Engineer or the testing laboratory and shall be delivered by the Contractor to the testing laboratory approved by the Engineer.

- C. When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be submitted to the Engineer prior to the pipe installation. Acceptable pipe shall be stamped with an appropriate monogram under the supervision of the testing laboratory.
- D. All pipe test specimens failing to meet the applicable standards shall be rejected. The Contractor may provide two additional test specimens from the same shipment or delivery for each failed specimen. The pipe shall be acceptable if both of these additional specimens meet the requirements of the applicable standards.
- E. Pipe which has been deemed unacceptable by the Engineer shall be removed from the work site by the Contractor and shall be replaced with acceptable pipe

PART 2 MATERIALS

2.01 GENERAL

- A. The sizes of gravity sewer pipe shall be shown on the Drawings.
- B. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel.

2.02 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

- A. PVC pipe, sizes 4" through 12", for use in non-pressure gravity sewer mains and laterals shall have an SDR of 26 and conform to ASTM D-3034. PVC pipe shall be made of PVC plastic, homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be uniform in color, density and other physical properties.
- B. PVC pipe sizes over 12" shall be approved by Manatee County.
- C. All pipe shall be in compliance with the above standard and be clearly marked as follows at intervals of 5 feet or less:
 - 1. Manufacturer's name or trademark.
 - 2. Nominal pipe size.
 - 3. PVC cell classification (eg. 12454-B).
 - 4. The legend "Type PSM SDR-26 PVC Sewer Pipe" and the designation ASTM D-3034.
- D. In addition to the above mentioned requirements, all PVC sanitary sewer pipe shall be color coded green to conform to Manatee County Standards.

- E. PVC sewer fittings shall conform to the requirements of ASTM D-3034 and shall have an SDR of 26. Six inch PVC fittings for sewer laterals shall be SDR 26. Fittings shall be molded in one piece with elastomeric joints and minimum socket depths as measured in accordance with ASTM D- 3034. Fittings not currently available in molded form may be fabricated in accordance with ASTM D- 3034 with manufacturer's standard pipe bells and gaskets. Gasket shall have a minimum cross sectional area of 0.20 sq. in. and conform to ASTM F-477 specification.

2.03 JOINTING PVC PIPE

- A. The PVC joints shall be of the push-on type so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be a single rubber gasket conforming to ASTM F-477, designed to be assembled by the positioning of a continuous molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75 degrees F in each joint per length of pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which shall meet requirements of ASTM F-477. The thickened bell section shall be designed to be at least as strong as the pipe wall. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, and shall have no deteriorating effects on the gasket or pipe material.
- B. Wyes and riser fittings shall be gasketed connections. If female adapters SDR 26 or 35 are unavailable, solvent welds shall be acceptable upon approval by the Engineer.
- C. Rubber doughnuts are not to be used.

2.04 JOINTS FOR DISSIMILAR PIPE

Joints between pipe of different materials shall be made using mechanical joint connections. Metal piping shall not be threaded into plastic fittings, valves, or couplings, nor shall plastic piping be threaded into metal valves, fittings, or couplings.

2.05 PIPE BEDDING AND PIPE COVER MATERIALS

- A. Pipe bedding and cover material shall be as specified in the Contract Documents.
- B. Pipe bedding and cover material for polyethylene coated ductile iron pipe fittings shall be well graded sand.

PART 3 EXECUTION

3.01 PIPE DISTRIBUTION

The Contractor shall not distribute material on the job faster than it can be used to good advantage. He shall unload pipe which cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. He shall not drop pipe of any size from the bed of the truck to the ground. He shall not distribute more than one week supply of material in advance of laying, unless otherwise approved by the Engineer.

3.02 PIPE PREPARATION AND HANDLING

- A. The Contractor shall inspect all pipe and fittings prior to lowering them into trench. Cracked, broken, or otherwise defective materials are not acceptable and shall not be used. The Contractor shall clean the ends of the pipe thoroughly. He shall remove foreign matter and dirt from inside of pipe and keep the pipe clean during and after laying.
- B. The Contractor shall use proper implements, tools and facilities for the safe and proper project of the work. He shall lower the pipe into the trench in a manner to avoid any physical damage to the pipe, remove all damaged pipe from the job site and under no circumstances shall the pipe be dropped or dumped into trenches.

3.03 LINE AND GRADE

- A. The Contractor shall not deviate more than 1/2-inch for line and 1/4-inch for grade from the line design and design grade established by the Engineer provided that such variation does not result in a level or a reverse sloping invert. He shall measure the grade at the pipe invert and not at the top of the pipe. The Contractor shall furnish, set and control the line and grade by laser beam method. Other methods of controlling line and grade may be submitted to the Engineer for approval if using the laser beam method proves to be impractical because of other conditions.
- B. The Contractor shall use the laser beam method of maintaining line and grade. The Contractor shall submit evidence to the Engineer that a qualified operator shall handle the equipment during the course of construction. A "Caution-Laser Light" placard shall be displayed in a conspicuous place. When "in the pipe" method is used, grade boards shall be installed for the first 50 feet of pipe. The Contractor shall check the line and grade at any additional points at which offset stakes have been placed and when requested by the Engineer. A fan shall be provided to circulate the air if bending of the beam due to air temperature variations becomes apparent with "in the pipe" units. However excessive air velocity shall not be permitted to

cause pulsating or vibrating of the beam. If, in the opinion of the Engineer, the beam cannot be accurately controlled, this method of setting line and grade shall be discontinued. When the above ground method is used, the set-up shall be checked with the three grade boards including one set at the upstream manhole. If the laser has a gradient indicator, two boards may be used to check the set-up. The grade board at the up-stream manhole shall be retained to check into as pipe laying progresses.

3.04 PREPARATION OF TRENCH

- A. The Contractor shall provide pipe bedding material under all of the pipe for the full trench width. The minimum depth of bedding material below the pipe barrel shall be as follows

<u>Minimum Depth of Bedding Under Pipe Barrel</u>	<u>Pipe Size</u>
15" & Smaller	4 inches
18" to 36"	6 inches
42" & Large	9 inches

- B. The depth of pipe bedding material under the pipe bell shall not be less than three inches under normal trench conditions.
- C. The Contractor shall hand-grade bedding to proper grade ahead of the pipe laying operation. The bedding shall provide a firm, unyielding support along the entire pipe length.
- D. Should the Contractor excavate the trench below the required depth for pipe bedding material placement without direction from the Engineer, the Contractor shall fill the excess depth with pipe bedding material as specified herein to the proper subgrade.
- E. The Contractor shall excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

3.05 DEWATERING

The Contractor shall prevent water from entering the trench during excavation and pipe laying operations to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.

3.06 LAYING AND JOINTING PIPE AND FITTINGS

- A. The Contractor shall lay pipe upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, he shall clean the

end of the pipe to be joined, the inside of the joint and, if applicable, the rubber ring immediately prior to joining the pipe. The Contractor shall assemble the joint in accordance with the recommendations of the manufacturer of the type of joint used. He shall provide all special tools and appliances required for the jointing assembly.

- B. The Contractor shall lay all pipe uniformly to line and grade so that the finished sewer shall present a uniform bore. Variations from line and grade in excess of the tolerances specified under LINE AND GRADE are not acceptable and the work shall be rejected.
- C. The Contractor shall check the pipe for alignment and grade after the joint has been made. The pipe bedding shall form a continuous and uniform bearing and support for the pipe barrel between joints. Sufficient pressure shall be applied to the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer. The Contractor shall place sufficient pipe cover material to secure the pipe from movement prior to installing the next joint to assure proper pipe alignment and joint makeup.
- D. Pipe 21" and smaller intended to be in straight alignment shall be laid so that the inside joint space does not exceed 3/8" in width. If interior joints on 24" and larger pipe laid either in straight alignment or on a curve are greater than 3/8", the Contractor shall thoroughly clean the joint surfaces and fill and seal the entire joint with premixed mortar conforming to ASTM C-387 only after the trench has been backfilled, unless otherwise approved by the Engineer. Trowel smooth on the inside surface. Water shall not be allowed to rise in or around, or pass over any joint before it has substantially set.
- E. When the Contractor lays pipe within a movable trench shield, he shall take all necessary precautions to prevent pipe joints from pulling apart when moving the shield ahead.
- F. The Contractor shall prevent excavated or other foreign material from getting into the pipe during the laying operation. He shall close and lock the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints when laying operations cease, at the close of the day's work, or whenever the workers are absent from the job.
- G. The Contractor shall plug or close off the pipes which are stubbed off with temporary plugs.
- H. The Contractor shall take all necessary precautions to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
- I. The Contractor shall make connections of non-reinforced pipe to manholes or concrete structures, so that a standard pipe joint is located at a minimum of 18" outside the edge of structure.

- J. When field cutting and/or machining the pipe is necessary, the Contractor shall use only tools and methods recommended by the pipe manufacturer and approved by the Engineer.
- K. Service lateral shall be constructed by the Contractor as shown on the standard sewer details and located approximately as shown on the Contract Drawings.

3.07 LAYING PLASTIC PIPE

- A. Polyvinyl chloride (PVC) pipe shall be installed by the Contractor in accordance with the instructions of the manufacturer, as shown on the Drawings and as called out in the Contract Documents.
- B. The Contractor shall lay the pipe, bedding and backfill to lines and grade shown on the Drawings and called out in the Contract Documents. Blocking under the pipe will not be permitted.
- C. The Contractor shall install a green metallic tape as shown in these Standards below finish grade along the entire pipeline PVC sewer main pipe route.
- D. The Contractor shall use care in the handling, storage and installation of pipe. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's recommendation .

3.08 BACKFILL IN THE PIPE ZONE

- A. The pipe zone shall be considered to include the full width of the excavated trench from the bottom of the trench to a point above the top outside surface of the barrel of the pipe.
- B. The Contractor shall pay particular attention to the area of the pipe zone from the flow line to the springline of the pipe to ensure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone.
- C. The Contractor shall take care to insure that the pipe does not rest directly on the bell or pipe joint, but is uniformly supported on the barrel throughout its entire length.
- D. After the pipe is laid by the Contractor to line and grade, he shall place and carefully compact pipe bedding material for the full width of the trench to the springline of the pipe. He shall place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping sticks supplemented by "walking in" and slicing with a shovel to assure that all voids are filled.
- E. The Contractor shall backfill and carefully compact the area above the pipe springline with pipe cover material to a point 12" above the top outside surface of the pipe

barrel. Pipe bedding material may, at the Contractor's option, be substituted for pipe cover material.

3.09 BACKFILL TRENCH WIDTH

- A. Normal trench widths shall be as shown on the Drawings. If the normal trench width below the top of the pipe is exceeded for any reason, the Contractor shall furnish an adequate support for the pipe. The Engineer may determine that the pipe being used is strong enough for the actual trench width or the Contractor may furnish a stronger pipe or a concrete cradle for approval.
- B. Concrete thickness under the pipe shall be one-third of the nominal diameter of the pipe, but not less than four inches. Concrete block or brick may be used for adjusting and maintaining proper grade and elevation of pipe. After the pipe is laid to line and grade, the Contractor shall place 3,000 psi concrete under the pipe for the full width of the trench to form a cradle of the required length and thickness with the concrete brought up to a level equal to 1/4 of the inside pipe diameter below the springline of the pipe. Start and terminate the concrete cradle at the face of a pipe bell or collar. Do not encase pipe joints at the ends of the concrete cradle.
- C. After the concrete has taken initial set, the Contractor shall place cover material over the concrete cradle and up to a level 12" above the pipe barrel and for the full width of the trench. Cover material shall be placed by hand or by equally careful means.

3.10 CONNECTING DISSIMILAR PIPE MATERIALS

The Contractor shall use the following method to connect dissimilar pipe materials. Use concrete closure collars only when approved by the Engineer and then only to make connections between dissimilar pipe when standard rubber gasketed joints or flexible couplings are impracticable. Before the closure collars are poured, wash the pipe to remove all loose material and soil from the surface on which the concrete will be placed. Wet nonmetallic pipe thoroughly prior to pouring the collars. Wrap and securely fasten a light gauge of sheet metal or building-felt around the pipe to insure that no concrete shall enter the line. Place reinforcement as shown on the plans. Make entire collar in one pour using 3,000 psi concrete and extend a minimum 12" on each side of the joint. The minimum thickness around the outside diameter of the pipe shall be 6". No collar shall be poured in water. After the collars are poured and have taken their initial set, cure by covering with well-moistened earth.

3.11 PIPE BULKHEADS

- A. Connections for future sewers shall be bulkheaded by the Contractor in the following manner:

1. All wyes and bell-and-spigot pipe sewers 18" in diameter or smaller shall be bulkheaded with caps or disc stoppers with factory-fabricated resilient joints. The disk or cap shall be banded or otherwise secured to withstand all test pressures without leakage.
2. Connections 21' and 24' in diameter shall be bulkheaded with a four-inch brick wall, using clay brick or concrete brick. The wall shall be capable of withstanding all test pressures without leakage.
3. Connections 27" in diameter and larger shall be bulkheaded with an eight-inch wall, using clay brick or concrete brick. The wall shall be capable of withstanding all test pressures without leakage.

3.12 AIR TEST FOR GRAVITY SEWERS - GENERAL

- A. Gravity sewers shall be required to pass the low pressure air test described herein.
- B. Air loss rates may be measured by the Engineer. These tests shall be performed by the Contractor under the observation of the Engineer and County Inspector.
- C. The groundwater height above the installed pipe shall be determined by attaching a transparent plastic tube to a pipe nipple in the manhole and using the plastic tube as a manometer. A test hole may be dug directly above the sewer main for visual inspection.
- D. The ends of branches, laterals, tees, wyes and stubs included in a test section shall be plugged to prevent air leakage. All plugs shall be secured to prevent blowout due to internal pressure. A test section is defined as the length of sewer between manholes.
- E. The Contractor shall repair all visible leaks in manholes and pipe, even if the leakage test requirements are met.

3.13 LAMP TEST FOR GRAVITY SEWER MAINS

- A. Prior to testing, the Contractor shall prepare the lines for testing. All lines shall be thoroughly cleaned.
- B. The Contractor shall furnish all equipment necessary for testing including, but not limited to, ladders, a lamping light and a vehicle to use as power source.
- C. Gravity lines shall be lamped from both the upstream and downstream ends between the manholes.
- D. A minimum image of 75% shall be acceptable.

- E. Failure to meet the 75% image requirement shall result in the Contractor having to video tape the line at his own expense. The Engineer or his representative shall be present while the line is videotaped. The tape shall be submitted to Manatee County for evaluation.
- F. The Contractor shall relay or otherwise correct any line deemed unacceptable by the Engineer. This work shall be done entirely at the Contractor's expense.
- G. Grouting of sewer lines or re-rounding machines are not approved corrective measures.
- H. Sewer lines shall be re-lamped and may be required by Manatee County to be videotaped again.

3.14 FINAL SEWER CLEANING

- A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the Engineer, the Contractor shall flush and clean all parts of the system, remove all accumulated construction debris, rocks, gravel, sand, silt and other foreign material from the sewer system at or near the closest downstream manhole.
- B. During the final manhole-to-manhole inspection of the sewer system, the Engineer may require the Contractor to reflush and clean any section or portion of the line if any foreign matter is still present in the system.

END OF SECTION

SECTION 15067

PLASTIC PIPE FOR PRESSURE SERVICE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section includes materials and methods of installation of Plastic Pipe for pressure service as shown on the Drawings and as Specified herein.

1.02 SUBMITTALS

- A. Three certified copies of the tests made by the manufacturer or by a reliable commercial laboratory shall be submitted to the Engineer with each shipment of pipe.
- B. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.

1.03 HANDLING AND STORAGE

- A. All pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or by skidding in order to avoid shock or damage. Under no circumstances shall materials be dropped. Pipe handled on skid ways shall not be rolled or skidded against pipe on the ground. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or interior of the pipe.
- B. Materials, if stored, shall be kept safe from damage. The interior as well as all sealing surfaces of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage or freezing.
- C. Pipe stored outside and exposed to prolonged periods of sunlight shall be covered with canvas or other opaque material. Air circulation shall be provided under covering.
- D. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tiers shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. Pipe shall not be stored close to heat sources.
- E. Gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis. Mechanical-joint bolts shall be handled and stored in a manner that will ensure proper use with respect to types and sizes.

PART 2 MATERIALS AND EQUIPMENT

2.01 PLASTIC PIPE

- A. Pipe for pressure service shall be Class 12454-A or B rigid PVC compound in accordance with the requirements of ASTM D1784. Pipe and appurtenances for use in potable water systems shall bear the seal of approval for potable water use of the National Sanitation Foundation or other accredited testing laboratory. All pipes shall have markings indicating pipe size, manufacturer's name, AWWA and/or ASTM specification number, working pressure, and production code.
- B. PVC pressure rated pipe having a nominal diameter between 1.5" and 3", shall be made of 2000 psi hydrostatic design stress compounds designated PVC 1120 and shall conform to ASTM D2241. PVC pipe shall be furnished in 20-foot lengths unless otherwise noted. PVC pipe shall have a standard dimension ratio of SDR 21 and a water pressure rating of 200 psi. Pipe couplings shall have a dimension ratio of SDR 21 and a water pressure rating of 200 psi. Pipe shall have both ends beveled for use with gasketed couplings or one end beveled and one end with a bell. Couplings and gaskets shall be furnished with each length of pipe. Rubber ring gaskets shall conform to ASTM D3139. Nontoxic gasket lubricant shall be as specified by the manufacturer.
- C. Pressure pipe 4-inches through 12-inches in diameter shall conform to the requirements of AWWA C900 for PVC pipe with cast iron pipe equivalent outside diameters. Pipe shall be pressure class 235 unless otherwise shown. Pipe shall have a minimum wall thickness equivalent to a dimension ratio of DR 18 unless otherwise shown. Pipe may be furnished with plain ends for use with elastomeric-gasket couplings or with one end plain and one end with a gasket bell. Couplings and gaskets shall be furnished with the pipe. Gaskets shall conform to ASTM D3139. Nontoxic gasket lubricant shall be as specified by the pipe manufacturer.
- D. Pressure pipe 14-inches through 36-inches in diameter shall conform to the requirements of AWWA C 905 for PVC pipe with cast iron pipe equivalent outside diameters. Pipe 16-inch through 24-inch shall have a minimum wall thickness equivalent to a dimension ratio of DR 18 unless otherwise shown. Pipe shall be pressure Class 235 unless otherwise shown. Pipe 30-inch through 36-inch shall have a minimum wall thickness equal to a dimension ratio of DR 21 unless otherwise shown. Pipe shall be pressure Class 200 unless otherwise shown. Pipe may be furnished with plain ends for use with elastomeric gasket couplings or with one end plain and one end with a gasket bell. Couplings and gaskets shall be furnished with the pipe. Gaskets shall conform to ASTM 1869. Non-toxic gasket lubricant shall be as specified by the pipe manufacturer.

2.02 FITTINGS

- A. Fittings for use with PVC pipe 3-inches through 24-inches in diameter shall be compact mechanical joint ductile-iron fittings conforming to the requirements of ANSI/AWWA C153/A21.53. Fittings for use with pipe 30-inches and larger shall be mechanical joint gray iron or ductile-iron conforming to the requirements of ANSI/AWWA C111/A21.11a. Bolts for use with mechanical joints shall conform to the requirements of the joint standard. Fittings shall be suitable for a working pressure of 150 psi.
- B. Exterior Coating. Fittings for buried service shall be coated with a bituminous coating approximately 1 mil thick. The finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun and shall be strongly adherent to the pipe.
- C. Polyethylene Encasement. All buried ductile iron fittings shall be provided with a 4-mil thick cross-laminated high density polyethylene encasement or an 8-mil thick polyethylene encasement per ANSI/AWWA C105/A21.5.
- D. Fittings in exposed locations which are to be painted shall be primed with a universal shop primer suitable for use under the finish paint specified.
- E. Linings. Fittings shall have a cement-mortar lining conforming to the requirements of ANSI A21.4/AWWA C104 or a Protecto 401 ceramic epoxy depending upon the type of fluid being conveyed. Cement mortar linings shall be used for all ductile iron fittings conveying potable water and reclaimed water. Protecto 401 shall be used for all ductile iron fittings conveying wastewater sludge, backwash water, leachate, mixed liquor, sludge thickening water, and plant drain water.

2.03 RESTRAINED JOINTS

- A. Restrained Joints. Restrained joints for use with PVC pipe shall consist of retainer glands fabricated of ductile-iron conforming to ASTM A536. The gland shall be such that it can replace the standard mechanical joint gland and can be used with the standardized mechanical joint bell conforming to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21-53/C153. The retainer glands shall have a pressure rating equal to that of the PVC pipe on which it is used.
- B. PVC push-on joints adjacent to restrained fittings shall be restrained using harness restraint devices. This harness restraint shall be split to enable installation of the restraint after the spigot has been installed into the bell. The restraint shall consist of a split ring that fits behind the bell, a split restraint ring that installs on the spigot and a number of tie bars to connect the other two parts. Restraint components shall be of ductile-iron conforming to ASTM A536. The restraint ring shall consist of a plurality of individually activated gripping surfaces to hold the spigot and maximize restraint capability.

- C. Twist off nuts, sized same as the tee-head bolts shall be used to insure proper actuating of restraining devices.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Excavation. Excavate trenches as specified in Section 02200 - Earthwork.
- B. All pipe and appurtenances shall be examined at the point of delivery. Material found to be defective due to manufacture or damage in shipment shall be rejected. Tests as specified in the applicable material standard may be performed to ensure conformance with the standard.

3.02 TRENCH CONSTRUCTION

- A. Alignment and Grade. The pipelines shall be laid maintained to the lines and grades established by Drawings and Specifications, with fittings, valves hydrants at the required locations unless otherwise approved by the Engineer. Valve-operating stems shall be oriented to allow proper operation. Hydrants shall be installed plumb.
- B. Underground Conflicts. Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care shall be exercised to avoid damage to existing structures. When obstructions that are not shown on the drawings are encountered during the progress of work and interfere so that an alteration of the plans is required, the Owner's Representative will alter the Drawings or order a deviation in line and grade or arrange for removal, relocation, or reconstruction of the obstructions. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Owner's Representative, to provide clearance as required by the Owner's Representative to prevent future damage or contamination of either structure.
- C. Trench Construction. The trench shall be excavated to the required alignment, depth, and width. Trench preparation shall proceed in advance of pipe installation for only as far as necessary to allow proper pipe installation. The width of the trench at the top of the pipe shall be ample to permit the pipe to be laid and joined properly and allow the backfill to be placed as specified.
- D. PVC pipe shall be installed with pipe bedding and backfill as shown on the drawings.
- E. Holes for the bells shall be provided at each joint but shall not be larger than necessary for joint assembly and assurance that the pipe barrel will lie flat on the trench bottom. Other than noted previously, the trench bottom shall be true and even in order to provide support for the full length of the pipe barrel, except that a slight depression may be provided to allow withdrawal of pipe slings or other lifting tackle.

- F. When excavation of rock is encountered, all rock shall be removed to provide a clearance of at least 6-inches below and on each side of all pipe, valves and fittings. When excavation is completed, a bed of sand, crushed stone or earth that is free from stones, large clods, or frozen earth, shall be placed on the bottom of the trench to the previously mentioned depths; leveled, and tamped. These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris of subterranean structures, such as masonry walls, piers, or foundations that may be encountered during excavation. This installation procedure shall be followed when gravel formations containing loose boulders greater than 8-inches in diameter are encountered. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection, or point or rock, boulder, or stones of sufficient size and placement which, in the opinion of the Engineer could cause a fulcrum point.
- G. Should the trench pass over a sewer or other previous excavation, the trench bottom shall be sufficiently compacted to provide support equal to that of the native soil or conform to other regulatory requirements in a manner that will prevent damage to the existing installation.
- H. When the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed, to a minimum of at least 4-inches, or to the depth ordered by the Engineer and replaced under the directions of the Engineer with clean, stable backfill material. The bedding shall be consolidated and leveled in order that the pipe may be installed as specified.
- I. When the bottom of the trench or the subgrade is found to consist of material that is unstable to such a degree that, in the judgment of the Engineer it cannot be removed, a foundation for the pipe and/or appurtenance shall be constructed using piling, timber, concrete, or other materials at the direction of the Engineer.

3.03 PIPE INSTALLATION

- A. The Contractor shall install all pipe in accordance with the recommendations of the pipe manufacturer and as specified herein.
- B. The Contractor shall take care in handling, storage and installation of pipe and fittings to prevent injury to the pipe or coatings. All pipe and fittings shall be examined before installation and pipe which is deemed to be defective by the Owner/Engineer shall not be installed.
- C. The Contractor shall thoroughly clean and keep thoroughly clean, all pipe and fittings prior to during and after installation.
- D. The Contractor shall lay the pipe to the lines and grades shown on the Contract Drawings with bedding and backfill as shown on the Drawings or called out in the Contract Documents. Blocking under the pipe shall not be permitted except through casing sleeves.

- E. The Contractor shall keep the open ends of all pipe closed with a tightly fitting plug when installation is not in progress or the potential exists for dirt or debris to enter the pipe.
- F. The pipe or accessories shall not be dropped into the trench under any circumstances.
- G. The Contractor shall construct all water mains pursuant to the provisions of "Recommended Standards for Water Works", Part 8, incorporated by reference in Rule 17-555.330(3), F.A.C.
- H. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, and valves, and hydrants shall be lowered carefully into the trench by means of suitable tools or equipment in such a manner as to prevent damage to pipeline materials. Under no circumstances shall pipeline materials be dropped or dumped into the trench. The trench shall be dewatered prior to installation of the pipe.
- I. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
- J. Trench width at the top of pipe, bedding conditions, and backfill placement and compaction shall be such that design loadings on the pipe will not be exceeded.
- K. Joint Assembly. Pipe joints shall be assembled in accordance with the manufacturer's instructions.
- L. Pipe Deflection. When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed 75% of the amount recommended by the manufacturer.
- M. Pipe Cutting. Cutting pipe for the insertion of valves, fittings, or closure pieces shall be done in a neat, workmanlike manner without creating damage to the pipe. Ends shall be cut square and perpendicular to the pipe axis.
- N. Burrs shall be removed from spigots and ends shall be smoothly beveled. Field cut ends shall be marked for proper depth of joint assembly.
- O. Locator Tape. Install all plastic pipe with a locator tape of the type specified.
- P. Electronic Marker. Install electronic markers of the type specified for all buried piping at 24-inches below grade.
- Q. Thrust Restraint. All plugs, caps, tees, and bends, unless otherwise specified, shall be provided with reaction backing, or restrained joints as specified.

- R. Thrust-restraint design pressure shall be equal to 1.5 times the design pressure of the line.

3.04 TESTING

- 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. Owner's Representative and Contractor must be present for all testing, except for testing tapping valves and sleeves.
- C. All pressure pipe lines shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipe lines shall be subjected to a hydrostatic pressure test for two (2) hours at full working pressure, but not less than 180 psi for water/reclaimed (150 psi for force main). Maximum length of pipe to be tested at one time is 2,600 feet. If line is longer than 2,600 feet and cannot be sectioned in 2,600 feet (max.) lengths, the allowable leakage will be figured at 2,600 feet.
- D. Allowable leakage shall be determined by AWWA C600 table for hydrostatic tests. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof; to maintain the test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.
- E. All digging on the job site in the right-of-way must be completed before any testing of water or sewer. Any digging or boring across water or sewer lines after they have been tested may result in a retest of the lines at the Engineer's request.
- F. If any revisions or changes are made after initial testing, lines will be re-tested at the Engineer's request.
- G. Disconnect water supply during test.
- H. All force mains will be tested from the valves in the valve vault at the lift station to the point of connection whether it be against a valve on another force main or into a manhole.
- I. All services to be above ground during test. The services should be the correct length so they will be one (1) foot inside right-of-way line.
- J. All fire hydrant gate valves to be open during test.
- K. All visible leaks are to be repaired, regardless of the amount of leakage.
- L. Check gauge pressure periodically during test. If test pressure drops to 175 psi for water/reclaimed lines or to 145 psi for force mains during test, the line must be repumped back to 180 psi for water/reclaimed (150 psi force mains) and the amount of leakage measured. The test will continue on with the remaining time left. At the end of the test, the line must be repumped again back to 180 psi (150 psi for force

main) and the amount of leakage measured and added to any previous leakage determined earlier in the test.

- M. After the line passes the test, the pressure will be blown off from the opposite end of line from the gauge location. Fire hydrants, services and end-of-line blow offs will be opened to demonstrate they were on line during the test.
- N. At end of test, the test gauge must return to zero. The pressure gauge must read 0 psi to a maximum of 300 psi in 5 psi increments.
- O. The section of line being tested must be identified on the charge sheet. The length and size of pipe, the exact area being tested and the valves being tested against, must be identified. Use Station numbers if available.
- P. A copy of the charge sheet will be given to the Owner's Representative and the Contractor at the end of the test.

END OF SECTION

SECTION 15100

VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. 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 valves and appurtenances shall be of the size shown on the Drawings and to the extent possible, all equipment of the same type shall be from one manufacturer.
- C. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- D. The equipment shall include, but may not be limited to, the following:
 - 1. Plug Valves
 - 2. Rubber Flapper Swing Check Valves
 - 3. Bonneted Knife Gate Valves
 - 4. Restrained Flange Adapter
 - 4. Manual Valve Actuators
 - 5. Small Gate Valves
 - 6. Ball Valves

1.02 DESCRIPTION OF SYSTEMS

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of potable water, reclaimed water, chemicals, wastewater, etc., depending on the applications

1.03 QUALIFICATIONS

- A. 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 Specifications as applicable.

1.04 SUBMITTALS

- A. Submit to the Engineer 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 Engineer for approval in accordance with the requirements of Section 01340 - Shop Drawings, Project Data and Samples.

1.05 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

PART 2 PRODUCTS

2.01 PLUG VALVES

- A. Eccentric Plug Valves 3"-36" shall meet or exceed the latest revision of AWWA Standard C517, and shall meet or exceed the requirements of this specification.
- B. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanges shall be per the ANSI B16.1 125 lb. standard. End-to-end length of flanged valves shall be per AWWA C517, Table 1. Mechanical joint ends shall be to the AWWA Standard C111-64.
- C. Bodies shall be of ASTM A126 Class B cast iron. Port area shall be 100% of standard pipe area. Published and/or calculated Cv flow data will not be accepted in lieu of 100% port area requirement. The body shall have minimal pooling, and provide complete flushing of the valve every time it cycles. Port of valve shall be rectangular. Round ported valves will not be accepted. Only VE option that will be considered is rectangular seated non 100% port valves. VE option of round port valves will not be accepted. The term "full port" shall represent 100% port.
- D. Seats shall be rectangular ported, 1/8" thick welded overlay of not less than 95% pure nickel. Seat area shall at least 1/2" wide and raised, with the raised surface completely covered with weld to insure that the plug face contacts only nickel.
- E. Plugs shall be solid one-piece castings of ASTM A536 ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The plug shall not contact the seat prior to 90% closed. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be Chloroprene (CR), or other resilient facing suitable for the application.
- F. Bearings shall have sleeve type metal bearings and shall be of sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CF8M. Non-metallic bearings shall not be acceptable.

- G. Grit Excluders in the form of PTFE washers at the upper and lower journals shall be provided to prevent the entry of grit and foreign solids into the bearing areas.
- H. Shaft seals shall be of the multiple V-ring type with a packing gland follower. Shaft seals shall be externally adjustable and repackable under pressure without removing the actuator or bonnet from the valve. An air gap shall exist between shaft packing and bottom of actuator for visual inspection, adjustment or complete replacement of packing without disturbing any portion of the valve or actuator except the packing gland follower. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
- I. Pressure ratings shall be 175 psi (1,207 kPa) on sizes 3"-12" (80-300mm) and 150 psi (1,034 kPa) for 14"-36" (350-900mm). Every valve shall be given a hydrostatic and seat test, with test results being certified when required by the specifications.
- J. Manual valves shall have lever or gear actuators and tee wrenches, extension stems, floor stands, etc., as specified. Valves 6" and larger shall be equipped with worm gear actuators in the horizontal position. Non-buried actuators shall clearly indicate valve position.
- K. Worm Gears shall be constructed in accordance AWWA C517. Actuators shall be enclosed in a cast iron housing with outboard seals to protect the bearings and other internal components. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Input shaft and fasteners shall be made of stainless steel.
- L. Externally adjustable open and closed position stops shall be provided. The adjustable closed position stop shall be used to set closing torque and provide adjustment to compensate for change in pressure differential or flow direction.
- M. Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuators shall be 90% grease filled. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals.
- N. Eccentric plug valves shall have a two year warranty from date of shipment. Manufacturers name shall be casted in body of valve and a metal tag containing a serial number shall be riveted to the valve for future parts identification.
- O. Valves and actuators shall be DeZurik PEF, Val-matic 5600R, or Clow F5400.

2.02 RUBBER FLAPPER SWING CHECK VALVES

- A. Eccentric Plug Valves 3"-36" shall meet or exceed the latest revision of AWWA Standard C508, and shall meet or exceed the requirements of this specification.
- B. Body to be ASTM A536 ductile iron for sizes 2"-12" and ASTM A126 Class B cast iron for sizes 14" and larger.

- C. Body Seat shall be on a 45 degree angle to the centerline of the pipe, permitting horizontal or vertical (flow up) installation. The valve shall be rated to 175 psi working pressure.
- D. Rubber Flapper to have a steel disc encapsulated with nitrile butadiene (NBR) rubber. The flapper is captured between the body and valve cover to permit the disc to flex open and closed. An integral "O-ring" shall be molded onto the face of the rubber flapper for positive sealing.
- F. Hinge Section of the rubber flapper shall be designed to accelerate closing due to an elastic spring effect. Nylon shall be integrally molded in the rubber to form a flexible joint giving the flapper a high cycle life.
- G. Dual Durometer design shall be used on the rubber flapper for sizes 2"- 12". The face of the rubber flapper shall have softer durometer rubber to assure tight closing at lower pressures. The back side and the hinge portions of the flapper are to have higher durometer rubber to accelerate closing.
- O. Valves shall be DeZurik CRF or GA Industries Rubber Flapper,

2.03 BONNETED KNIFE GATE VALVES

- A. Valve shall be the bonnetless knife gate.
- B. Gate edge shall be machined, finished, and rounded and have a 45 degree beveled knife edge. The gate faces shall be finish ground.
- C. Packing system shall fit a rounded machined packing chamber. The packing system shall consist of multiple layers of packing with anti-extrusion plate. The selected packing system shall be for wet service. The packing gland shall match the valve body. The fasteners shall be 316 stainless steel.
- D. Body shall be a one piece casting of type 316 stainless steel. Valve body shall incorporate cast in guides and jams and can handle full reverse pressure without damage. Valve inside port diameter shall be equal to ANSI B36.10 STD pipe inside diameter for both metal and resilient seated valves. Raised faces shall be full width per ASME B16.20 standards for spiral-wound gaskets. Full range of valve body modifications is available.
- E. Gate edge shall be machined, finished, and rounded and have a 45 degree beveled knife edge. The gate faces shall be finish ground.
- F. Seat shall be resilient seated. Metal seated valves shall have a round port. Resilient seated valves shall have the resilient seat material molded on three sides of the stainless steel seat ring for installations where drip-tight shutoff is required. Resilient seat material shall be 316 stainless steel suitable for use with waste water.

- G. Face-to-face dimension shall meet MSS SP-81 for knife gate valves.
- H. Cold Working Pressure valve rating shall be 150 psi (1030 kPa) for 2" - 36"(50mm - 900 mm) or 100 psi (690 kPa) for 42" - 48" (1100mm - 1200mm) per MSS SP-81 specification.
- I. Flange drilling shall be in accordance with ANSI B16.5 class 150.
- J. Valves 14 - 36" (350 - 900mm) shall be supplied with handwheel actuators. The manual operated handwheel actuator yoke shall be one piece carbon steel. The bevel gear yoke shall be a two piece cast carbon steel. The yoke sleeve shall be aluminum bronze. The stem shall be type 316 stainless steel. A standard locking device shall be available upon request. The lockout shall be rated to withstand the maximum output of the actuator.
- K. All valves shall be a Model KGC-ES Cast Knife Gate Valves as manufactured by DeZURIK or approved equal.

2.04 RESTRAINED FLANGE ADAPTER

- A. Restrained flange adapters shall be of the size and pressure rating required for each installation and shall be suitable for use on either PVC, Steel, HDPE (with inserts) or ductile iron pipe.
- B. Restrained flange adapters shall be used in lieu of threaded or welded flanged spool pieces. Flange adapters shall be made of ductile iron conforming to ASTM A536, 65-45-12, and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10.
- C. Restraint for the flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limited actuating screws shall be used to insure proper initial set of gripping wedges.
- D. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6" gap between the end of the pipe and the mating flange without affecting the integrity of the seal. The joints shall be capable of deflecting between 5 degrees for 3-inch pipe and 0.5 degrees for 60-inch pipe.
- E. For PVC pipe, the flange adapter will have a pressure rating equal to the pipe.
- F. For Ductile Iron pipe, the flange adapter shall have a safety factor of 2:1 minimum.
- G. The restrained flange adapter is comprised of two rings. The first is the restraint ring which incorporates wedges around the circumference of the ring to grip the pipe firmly and securely. The wedge style of restraint offers enormous pullout strength when compared to set screw restraints. The resiliency of the wedge style restraint allows the flange adapter to withstand severe moment loads.

The second ring is the gasket ring which separates the seals dedicated to each sealing surface. This ring allows pipe to be cut to lengths in the field at a tolerance of 0.6 inch or more. And the gasket ring also enables the joint to deflect during assembly.

- H. The restrained flange adapter shall be coated with fusion bonded epoxy paint at the factory.
- I. The flange adapter shall be the Series 2100 Megaflange adapter as manufactured by EBAA Iron, Inc or approved equal.
- J. All flange adapters shall have a sufficient number of factory installed anchor studs to meet or exceed the test pressure rating for this project, 180 psi minimum.

2.05 MANUAL VALVE ACTUATORS

A. General

- 1. All manual valve actuators shall conform to Section 3.8 of the AWWA C504 Standard Specification and shall be manually operated.
- 2. 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.
- 3. Valve actuators shall be provided, mounted and tested by the valve manufacturer.

B. Manual Actuators

- 1. 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 and shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Actuators shall be fully enclosed and designed to produce the specified torque with a maximum pull of 80 pounds in the handwheel or chainwheel. Actuator components shall withstand an input of 450 foot pounds for 30" and smaller and 300 foot pounds for larger than 30" size valves at extreme actuator positions without damage. Valves located above grade shall have handwheel and position indicator, and valves located below grade shall be equipped with a two inch (2") square AWWA operating nut located at ground level and a cast iron extension type valve box. Valve actuators shall conform to AWWA C504, latest revision.

2.06 SMALL GATE VALVES

- A. Gate valves 2-1/2-in in diameter and smaller in size, shall have flanged or threaded ends as required; and shall be brass conforming to Federal Specification WWV- 54, Type I or II, solid wedge, rising-stem-type gate valves as manufactured by Jenkins Bros. or equal products as manufactured by Crane, Fairbanks. Kennedy Valve Mfg. Co., or equal.

2.07 BALL VALVES

- A. Ball Valves sizes 1/2" to 4" shall be TYPE 21 and shall be of true union design with two-way blocking capability. All O-rings shall be EPDM or FKM with PTFE seats. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. Stem shall have double O-rings and be of blowout-proof design. The valve handle shall double as carrier removal and/or tightening tool. ISO mounting pad shall be integrally molded to valve body for actuation. The ball valves shall have a pressure rating of 230 psi for sizes 1/2" to 3" and 150 psi for 4" at 70 ° F. Type 21 Ball Valves must carry a two-year guarantee, as manufactured by Asahi/America, Inc.
- B. All ball valves used for chemicals prone to "off- gassing" (e.g. sodium hypochlorite, hydrogen peroxide) shall be vented to avoid entrapment of vapors.

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 to the above items shall be repaired to the satisfaction of the Engineer before they are installed.
- 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 Engineer.
- 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 in Division 15.

- E. Flanged joints shall be made with high strength, low alloy Corten bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy.
- F. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. 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 inches from the end, and the middle ring shall be placed on the substantial completion date unless otherwise requested by the Owner.
- G. 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 a cast iron box over each stem with the base bearing on compacted fill and the top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on the cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

3.02 RESTRAINING CLAMPS AND TIE RODS ON PIPE RUN

- A. Restraining clamps and tie rods shall be used on all pipe runs, as directed by the Engineer and/or shown on the Drawings. Restraining devices shall be JCM Industries, Inc. - Sur-Grip, EBAA Iron, Inc. - Megalug, Romac, or approved equal. Other types shall be submitted to the Owner's Representative for approval.

3.03 SHOP PAINTING

- A. 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

- A. All metal valves and appurtenances specified herein and exposed to view will be painted per Section 09900 with a color appropriate to its usage in accordance with the color code.

3.05 INSPECTION AND TESTING

- A. Completed pipe shall be subjected to a hydrostatic pressure test for two hours at 180 psi pressure. All leaks shall be repaired and lines retested as approved by the Owner's Representative. Prior to testing, the gravity pipelines shall be supported in an approved manner to prevent movement during tests.

END OF SECTION

SECTION 15141
PIPE SUPPORT SYSTEMS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. General

1. Furnish all labor, materials, tools, equipment and services for all pipe support and anchor systems, in accordance with the provisions of the Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. The layout of pipe supports is the responsibility of the Contractor, and must take into consideration pipe material, joint type, location, and other requirements of these specifications.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American National Standards Institute (ANSI)
2. American Society of Mechanical Engineers (ASME)
3. American Society for Testing and Materials (ASTM)
4. ASTM A575 Merchant Quality Hot-Rolled Carbon Steel Bars
5. American Welding Society (AWS)
6. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Valve and Fittings Industry (MSS)
7. MSS SP-58-67 Pipe Hangers and Supports - Materials and Design
8. MSS SP-69-66 Pipe Hangers and Supports - Selection and Application
9. National Bureau of Standards (NBS)
10. NBS Handbook H-28

1.03 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples.
- B. Submit itemized list of wall sleeves, anchors, support devices and all other items related to pipe support system.
- C. Submit scaled drawings showing guides, hangers, supports, anchors, structural members and appurtenances to describe the pipe support system.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All structural steel angles, rods, channels and special devices integral to pipe support systems shall be fabricated from ASTM-A-276 Type 316 stainless steel. Locate supports and accessories to support pipe system at concentrated loads and in accordance with minimum suggested by MSS SP-69-66.

2.02 PIPE SADDLES

- A. Provide ASTM-A-276 Type 316 Stainless Steel pipe support saddles for pipe supported from the floor, unless otherwise indicated on the drawings. Pipe saddles equal to B-Line Figure B3090, or equal.
- B. Use Schedule 40 ASTM-A-276 Type 316 stainless steel support pipe risers and floor plate recommended by saddle manufacturer.

2.03 WALL BRACKETS

- A. Provide ASTM-A-276 Type 316 stainless steel wall bracket supports for pipe located near walls, including all horizontal pipe and all vertical pipe 8-feet or more above floor elevation or as indicated on the drawings. Provide wall brackets at all changes of direction and as shown on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install supports capable of supporting the pipe for all service and testing conditions. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.
- B. Install pipe support system in accordance with highest industry practices, and in full accordance with manufacturer's recommendations. Adjust supports and hangers to allow for proper pitch of pipes.
- C. Ensure design, materials of construction, and installation of pipe hangers, supports, guides, restraints, and anchors for chemical and waste piping are in accordance with ANSI B31.3, and MSS Standard SP-58 and SP-69, except where modified by this specification.
- D. Check all physical clearances between piping, support system, and structure. Provide for vertical adjustment after erection.
- E. Provide piping system exhibiting pulsation, vibration, swaying, or impact with suitable constraints to correct the condition. Movements from trap discharge, water hammer,

and similar internal forces are included in this requirement. No system will be accepted until the adequacy and safety of the system is assured under all anticipated conditions of operation.

- F. Weld supports in accordance with the requirements of AWS Code D1.1 Structural Welding.
- G. Locate piping and pipe supports so as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.
- H. After erection of piping systems, and prior to pipe testing and flushing, inspect for adequacy of clearance for piping and supports.
- I. Support pipes for lateral movement with clamps or brackets.
- J. Provide 20-gauge ASTM-A-276 Type 316 stainless steel pipe saddle for fiberglass and plastic support points to insure minimum contact width of 4 inches.

3.02 SUPPORT SPACING

- A. General: Locate pipe supports at maximum spacing scheduled unless indicated otherwise on the drawings. Provide at least one support for each length of pipe, at each change of direction and at each valve.
- B. Steel, stainless steel, cast-iron, and ductile iron support schedule:

<u>Pipe Size - Inches</u>	<u>Maximum Span - Feet</u>
1-1/2 and less	5.0
2 thru 4	10.0
5 thru 8	15.0
10 and greater	20.0

- C. Schedule 40 PVC Pipe, Temperature 100° or Less:

<u>Pipe Size - Inches</u>	<u>Maximum Span - Feet</u>
1	5.0
1.5	5.5
2	6.0
3	7.0
4	7.5
6	9.0
8	9.5
10	10.0
12	10.5
14	11.0

D. Schedule 80 CPVC Pipe, Temperature 140° or Less:

<u>Pipe Size - Inches</u>	<u>Maximum Span - Feet</u>
1	5.0
1.5	5.5
2	6.0
3	7.0
4	7.5
6	8.0
8	9.0
10	9.5
12	10.5

3.03 WELDING

- A. Identify welding rods clearly identified meeting the requirements of ASTM and American Welding Society Standards.
- B. Integral attachments include welded-on ears, shoes, plates, and angle clips. Ensure material for integral attachments is of good weldable quality. Have preheating, welding, and postheat treating in accordance with Chapter V of ANSI B31.3.

3.04 PAINTING

- A. All stainless steel items shall not be painted. Painting for all other materials shall comply with Section 09900 - Painting and Coatings.

END OF SECTION

DIVISION 16 ELECTRICAL

SECTION 16050 ELECTRICAL - GENERAL PROVISIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, devices, equipment, appurtenances, and incidentals required for a complete electrical system as hereinafter specified and/or shown on the Contract Drawings. This work may necessarily include interfacing with and/or completely installing devices and/or equipment furnished under other sections of these Specifications.
- B. It is the intent of these Specifications that the electrical system be suitable in every way for the service required. All materials and all work/labor which may be reasonably implied as being incidental to the requirements of this Section shall be furnished at no additional cost to the Owner.
- C. All power interruptions to existing equipment shall be at the Owner's convenience. Each interruption shall have prior approval. Request(s) for power interruption(s) shall be made at least forty-eight (48) hours in advance.
- D. The work shall include complete testing of all electrical components, including wiring.
- E. All workmanship shall be of the highest quality. Substandard work will be rejected and it shall be replaced entirely at the Contractor's expense with no cost to the Owner.
- F. It shall be the responsibility of each bidder or his authorized representative to physically visit the job site in order that he may be personally acquainted with the area(s), buildings and/or structures intended for use in the installation/construction under this Specification. The submittal of a proposal/bid by a bidder shall be considered evidence that he has complied with this requirement and accepts all responsibility for a complete knowledge of all factors governing his work. Therefore, failure to comply with this requirement of the Specifications will NOT be grounds for the successful bidder (Contractor) to request approval of change orders and/or additional monetary compensation.

1.02 TEMPORARY ELECTRICAL SERVICE

- A. The Contractor shall make the requisite arrangements for securing temporary electrical power for his use in accordance with Section 01510 of these Specifications.

1.03 CODES, INSPECTIONS AND FEES

- A. All materials and installations shall be in accordance with the National Electrical Code (latest edition) and the latest editions of all applicable national, state, Owner and local codes.
- B. To the extent that any item is routinely tested and rated by the Underwriter's Laboratories, Inc., that item shall bear the U.L. label. Additionally, all items shall be manufactured to the applicable NEMA standards.
- C. The Contractor shall make the necessary arrangements for obtaining all requisite permits and inspections and pay any applicable fees.

1.04 TESTS

- A. The Contractor shall test all items individually and as a system for proper operation.
- B. The Contractor shall, at his expense, make all the requisite repairs, adjustments and/or alterations to correct any shortcomings found as a result of the tests performed under Item 1.04.A above.
- C. A representative of the Owner shall be present during all testing. The Owner and Engineer shall be notified at least two (2) days prior to any testing.

1.05 SLEEVES AND FORMS FOR OPENINGS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

1.06 CUTTING AND PATCHING

- A. All cutting and patching shall be done in a thoroughly workmanlike manner - i.e., care shall be taken when cutting not to damage or mar surrounding areas, and when patching to match the original finish as closely as possible while providing a watertight seal. Refer to Item 1.01.E above.

1.07 INTERPRETATION OF DRAWINGS

- A. The layouts and arrangements as shown on the Contract Drawings are indicative of the physical arrangements desired; however, they are not intended to restrict the Contractor's freedom to accommodate the exact conditions as found in the field. Any deviations from the arrangements shown must be approved by the Owner and Engineer prior to the final placement of the item(s) in question.
- B. The Contract Drawings are not intended to show exact locations of conduit runs.
- C. Circuit and conduit layouts shown are not intended to indicate the exact installation details. The Contractor shall furnish and install all requisite items, including all fittings, junction boxes, etc., to insure that the electrical system operates in conformance with the Specifications and the specific requirements of an individual piece of equipment.
- D. Where circuits are shown as "home-runs", all necessary fittings and boxes shall be provided for a complete conduit installation.
- E. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Contract Drawings.
- F. Surface mounted items such as panelboards, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between the equipment and the mounting surface.
- G. The Owner and Engineer shall make the final decision in determining the exact location(s) and mounting height(s) of any item(s) or piece(s) of equipment in question.

- H. All connections to equipment shall be made in accordance with the approved shop and manufacturer's drawings, regardless of the number of conductors shown on the Contract Bid Drawings.
- I. The Contractor shall coordinate the work of the different trades in order to prevent interferences between conduit(s), piping and other non-electrical equipment. In case any interference develops, an authorized representative of the Owner shall decide which equipment, conduit(s) or piping must be relocated, regardless of which was installed first. Any such interferences shall be remedied solely at the Contractor's expense without any additional cost to the Owner.

1.08 EQUIPMENT SIZING AND HANDLING

- A. The Contractor shall thoroughly check all entryways, doors, hallways, stairways, buildings and structures through which equipment must be transported to reach its final location.
- B. If necessary for safe passage of the equipment, the manufacturer shall be required to ship his material in sections sized to pass through the restricted areas. This requirement holds even if such equipment sizing differs from the manufacturer's standard shipping section.
- C. To the extent possible, the equipment shall be kept upright at all times. If equipment has to be tilted for ease of passage through restricted areas, the manufacturer shall provide specific handling instructions as well as any requisite bracing in order to assure both the functional integrity of the equipment and the validity of the equipment warranty.

1.09 SUBMITTALS

- A. As specified under Section 01340 of these Specifications, the Contractor shall submit shop drawings and/or manufacturer's cut sheets for approval of all materials, equipment, devices, apparatus, and other items as required by the Owner and Engineer.
 - 1. Prior to submittal by the Contractor, all shop drawings shall be checked for accuracy and Contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the Specifications and Contract Drawings. This statement shall also list all discrepancies with the Specifications and Contract Drawings. Shop drawings not so checked and noted shall be returned unchecked by the Engineer.
 - 2. The Engineer's check shall be only for conformance with the design concept of the Project and compliance with the Specifications and Contract Drawings. The responsibility for, or the necessity of, furnishing materials and workmanship required by the Specifications and Contract Drawings which may not be indicated on the shop drawings is included under the work of this Section.
 - 3. No material shall be ordered, no equipment manufacturing shall be started, nor shall any shop work/fabrication commence until the Engineer has approved the shop drawings. Any deviation from this requirement of the Specifications shall be entirely at the risk and expense of the Contractor without any additional cost to the Owner.

- B. Record Drawings: As the work progresses, the Contractor shall legibly record all field changes on a set of Contract Drawings. When the project is completed, the Contractor shall furnish the Engineer with a complete set of reproducible "as-built" drawings.

1.10 MANUFACTURER'S SERVICES

- A. The Contractor shall arrange for an authorized manufacturer's representative who shall be an experienced field service engineer to be present for the inspection, installation, testing, calibration, adjusting and start-up of any item(s) or piece(s) of equipment as deemed necessary by the Owner and Engineer.
- B. In addition to the duties of Item 1.11.A above, the manufacturer's representative shall also instruct the Owner's personnel in the proper operation and maintenance of the item(s) in question.

1.11 MATERIALS

- A. All materials used shall be new, unused and as hereinafter specified. Where not specifically called out, all materials shall be of the very best quality of their respective kinds. Unless specifically otherwise approved in writing by the Owner and Engineer, only material manufactured in the United States shall be used!
- B. Where applicable, all materials and equipment shall conform with the requirements of Item 1.03.B above.
- C. Electrical equipment shall at all times during construction be adequately protected against both mechanical injury and damage by water. Electrical equipment shall be stored indoors in dry shelters. Any damaged equipment shall be replaced by the Contractor at his own expense.
- D. All items shall be manufactured from the materials specified - substitute materials will NOT be acceptable.
- E. Only the specified manufacturer's equipment shall be used unless an "or approved equal" is noted. The Engineer shall be the sole determiner of what constitutes an "approved equal".

1.12 GUARANTEES AND WARRANTIES

- A. All items furnished under the Electrical Specifications shall be guaranteed and/or warranted, in writing, against defects in materials, construction and workmanship as specified under Section 01740 of these Specifications.

END OF SECTION

SECTION 16108 MISCELLANEOUS EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install all miscellaneous equipment as hereinafter specified and/or shown on the Drawings.
- A. Installation shall be in the locations described herein and/or shown on the Drawings and/or where directed by the Owner's authorized personnel.

PART 2 PRODUCTS

2.01 MATERIALS

A. CIRCUIT BREAKERS

- 1. The circuit breakers shall be the molded case bolt-on type, shall have a single pole, shall be rated 20-amperes at 120/240 VAC, and shall have an interrupting rating of 10,000-amperes.
- 2. To match existing equipment, the circuit breakers shall be the Square "D" Catalog No. Q0B120 with "VISI-TRIP" indicator for use on a Square "D" NQOD panelboard, NO SUBSTITUTIONS!

B. SAFETY SWITCHES

- 1. The safety switches shall be the visible blade, non-fusible, heavy duty type, shall have a quick-make, quick-break, single throw operating mechanism, and shall have both a dual cover interlock and a color coded indicator handle.
- 2. The safety switches shall have three (3) poles, shall be rated 30-amperes at 600 VAC, shall have all current carrying parts made of copper, and shall be furnished in a NEMA 4X stainless steel rainproof enclosure
- 3. The safety switches shall have 1-inch bolt-on hubs, a solid neutral assembly, and a copper ground kit.
- 4. In addition to being UL listed under files E2875 and 154828, the safety switches shall comply with the following standards:
 - a. UL 98, Enclosed and Dead Front Switches.
 - b. NEMA KS1, Enclosed Switches.
 - c. Federal Spec WS-865c for Type "HD".
- 5. To match existing equipment, the safety switches shall be the Class 3110 Heavy Duty Safety Switch, Square "D" Catalog No. HU36SS, NO SUBSTITUTIONS!

C. FLOW METER

- 1. The flow meters shall be the Doppler type with separately mounted electronics and two (2) non-intrusive strap-on transducer assemblies.
- 2. The installed transducers shall be attached to the outer periphery of the pipe with stainless steel straps which shall be furnished as part of the flow meter package. Additionally, the transducers shall be furnished with a 30-foot long cable to interconnect with the meter electronics.
- 3. Flow meter electronics shall have the following:

- a. Accuracy to plus or minus 2% of the actual flow.
 - b. User-friendly keypad programming.
 - c. 90,000 point data logger.
 - d. Flow range of 0.05 to 32.0 feet per second.
 - e. Both 4-20 maDC and RS 232 outputs.
 - f. Supply voltage of 90-132 VAC, 60 Hertz, single phase.
 - g. Four (4) relays with 5 Amp SPDT contacts, fully programmable.
4. The electronics of the installed flow meter shall have a PVC or fiberglass weatherproof enclosure with a hinged cover (left vertical side) and clamps or clasps along the other three sides. The enclosure shall be approximately 24-inches square by 10-inches deep. The enclosure shall have an aluminum mounting backplate and shall be furnished with an interior-mounted duplex receptacle (see Item D.1 below). The flow meter enclosure shall be as manufactured by Hoffman, Rob Roy, or approved equal.

D. DUPLEX RECEPTACLES

1. Flow Meter Stand
 - a. The duplex receptacle shall be the ground fault circuit interrupter (GFCI) type, shall be rated 20-amperes at 125 VAC and shall be of the NEMA 5-20R configuration.
 - b. The duplex receptacle shall be made of brown nylon and shall be back and side wireable.
 - c. The duplex receptacle shall be Hubbel Catalog No. 5362, or approved equal.
 - d. The duplex receptacle shall be furnished with a surface mounted PVC or plastic device box.
 - e. The duplex receptacle shall be furnished with a cover plate. The cover plate shall be BELL 5103-6, or approved equal.

E. PAD SUPPORT STRUCTURE

1. A support structure, firmly embedded into the concrete pad shall be provided onto which the two (2) safety switches and the flow meter electronics enclosure shall be mounted.
2. The support structure shall be fabricated from stainless channels and shall have all stainless steel mounting hardware.
3. The height of the support structure shall be such as to maintain an even 6'-0" mounting height from the top surface of the concrete pad to the top surface of the individual devices mounted on the support structure.
4. The width of the support structure as well as the length and width of the steel reinforced concrete pad are predicated on the use of the devices specified elsewhere in this Section. If other than the specified items are used, the respective dimensions may have to be altered accordingly.
5. The stainless steel channel and stainless mounting hardware shall be as manufactured by Unistrut, Kindorf, or approved equal.

PART 3 EXECUTION

(NOT USED)

END OF SECTION

SECTION 16110 CONDUITS AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

Furnish and install the conduits, fittings, devices and appurtenances as hereinafter specified and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

The requirements of Section 01340 and Section 16050 shall be met.

1.03 APPLICATIONS

- A. Except where otherwise shown on the Contract Drawings, or hereinafter specified, all wiring shall be run in rigid conduits.
- B. Galvanized rigid steel conduits shall be used at all locations aboveground and within structures and buildings except where otherwise shown on the Contract Drawings.
- C. Galvanized rigid steel conduits shall be used at all locations for shielded instrumentation and shielded control wiring except where otherwise shown on the Contract Drawings.
- D. Schedule 80 PVC conduits shall be used for all underground, under-slab and in-slab applications except where otherwise shown on the Contract Drawings.
- E. Schedule 80 PVC conduits shall be used in highly corrosive areas such as chlorine storage areas, digesters, fluoride storage and handling areas, etc.
- F. All conduits of a given type shall be the product of one manufacturer.
- G. Except where otherwise shown on the Contract Drawings, or hereinafter specified, all boxes shall be metal.
- H. Flush mounted switch, receptacle and control station boxes shall be pressed steel.
- I. Surface mounted switch, receptacle and control station boxes shall be cast or malleable iron.
- J. Devices designated as NEMA Type 4X shall be 316 stainless steel, gasketed.
- K. Combination expansion-deflection fittings shall be used where conduits cross structural expansion joints.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rigid Conduit
 - 1. Rigid steel conduit shall be hot-dipped galvanized as manufactured by the Youngstown Sheet and Tube Company, Wheeling-Pittsburg Steel Corp., or approved equal.

2. Rigid PVC conduit shall be Carlon Plus 80 rigid PVC non-metallic conduit (extra heavy wall EPC-80) as manufactured by Carlon, or approved equal.
 3. Electrical metallic tubing shall be hot-dipped galvanized steel as manufactured by U.S. Steel Corp., Youngstown Sheet and Tube Company, or approved equal.
- B. Liquidtight, Flexible Conduit
1. Liquidtight, flexible metal conduits shall be Sealtite, Type UA, as manufactured by Anaconda, American Flexible Conduit Co., Inc., or approved equal.
 2. Liquidtight, flexible non-metallic conduits shall be Carflex Liquidtight Flexible Non-Metallic Conduit as manufactured by Carlon, or approved equal.
- C. Rigid Conduit Fittings
1. Rigid Steel Conduit Fittings:
 - a. Steel elbows, bends, sweeps, nipples, couplings, conduit bodies, etc., shall be hot-dipped galvanized as manufactured by Youngstown Sheet and Tube Company, or approved equal.
 - b. Conduit hubs shall be as manufactured by Meyers Electric Products, Inc., or approved equal.
 2. Rigid Non-Metallic Conduit Fittings: PVC elbows, bends, sweeps, nipples, couplings, device boxes, etc., shall be Plus 80 fittings as manufactured by Carlon, or approved equal.
 3. EMT Conduit Fittings: EMT fittings shall be hot-dipped galvanized steel, rain-tight, concrete tight, compression type, as manufactured by Crouse-Hinds, Appleton Electric Company, or approved equal.
- D. Flexible Conduit Fittings
1. Flexible Metal Conduit Fittings: Fittings used with flexible metal conduit shall be of the screw-in type as manufactured by Thomas and Betts Company, or approved equal.
 2. Flexible Non-Metallic Conduit Fittings: Fittings used with flexible non-metallic conduit shall be Carflex Liquidtight Non-metallic Fittings as manufactured by Carlon, or approved equal.
- E. Flexible Couplings: Flexible couplings shall be as manufactured by Crouse-Hinds, Appleton Electric Company, or approved equal.
- F. Wall Seals: Conduit wall seals shall be type "WSK" as manufactured by the O.Z. Electrical Manufacturing Company, or approved equal.
- G. Expansion Fittings: Combination expansion-deflection fittings shall be type "XD" as manufactured by Crouse-Hinds, or approved equal.
- H. Boxes
1. Device Boxes
 - a. Flush mounted wall device boxes shall be galvanized pressed steel as manufactured by the Raco Manufacturing Company, or approved equal.
 - b. Surfaced mounted wall device boxes shall be cast or malleable iron as manufactured by Crouse-Hinds, Appleton Electric Company, or approved equal.

- c. Flush mounted in-floor device boxes shall be cast metal, shall be watertight, shall have adjustable cover frames, and shall be as manufactured by Russell & Stoll Company, Steel City Electric, or approved equal.
 - 2. Other Boxes
 - a. Terminal boxes, junction boxes, pull boxes, etc., except as otherwise specified and/or shown on the Contract Drawings, shall be hot-dipped galvanized steel.
 - b. The boxes shall have continuously welded seams which shall be ground smooth prior to being galvanized.
 - c. The box bodies shall be flanged, shall be not less than 14-gauge metal, and shall not have holes or knockouts.
 - d. The box covers shall be not less than 12-gauge metal, shall be gasketed, and shall be fastened to the box bodies with stainless steel screws.
 - e. The boxes shall be as manufactured by Hoffman Engineering Company, or approved equal.
- I. Conduit Mounting Devices: Hangers, rods, channel, backplates, clips, straps, beam clamps, etc., shall be hot-dipped galvanized iron or steel as manufactured by Appleton Electric Company, Thomas and Betts Company, Unistrut Corp., or approved equal.
- J. Fixture Support System
 - 1. The fixture support system shall be the channel type and shall be furnished complete with all requisite mounting hardware and appurtenances.
 - 2. The channel, mounting hardware and related appurtenances shall be stainless steel.
 - 3. The fixture support system shall be as manufactured by the Unistrut Corp., or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. No conduit smaller than 3/4-inch electrical trade size shall be used nor shall either 1-1/4-inch conduit or 3-1/2-inch conduit be used. Minimum size underground, under slab or in-slab shall be 1-inch.
- B. No wires shall be pulled until the individual conduit runs are complete in all details. Additionally, each conduit shall be cleaned and reamed and certified clear of all burrs and obstructions before any wire is pulled.
- C. The ends of all conduits shall be tightly capped to exclude dust and moisture during construction.
- D. For all galvanized steel conduits, the field-cut threads shall be thoroughly cleaned and coated with a cold galvanizing compound which contains 95% pure zinc metal. The galvanizing compound shall be as manufactured by ZRC Products Company, or approved equal. This treatment shall also be used on any nipples, elbows, etc., that are not supplied with galvanized threads.
- E. Conduits shall be supported at intervals of 8-feet or less, as required to obtain a rigid installation.
- F. Exposed conduits shall be run parallel with and/or perpendicular to the surrounding

surface(s). No diagonal runs will be allowed.

- G. Single conduits shall be supported by one-hole pipe clamps in combination with one-screw backplates to provide space between the conduits and the mounting surface.
- H. Multiple horizontal runs of conduits shall be supported by trapeze type hangers (channel) suspended by threaded rod, 3/8-inch minimum diameter.
- I. Multiple vertical runs of conduits shall be supported by structurally mounted channel in combination with conduit clamps.
- J. Conduit support devices shall be attached to structural steel by welding or beam or channel clamps as indicated on the Contract Drawings.
- K. Conduit support devices shall be attached to concrete surfaces by "spot type" concrete inserts.
- L. Conduits terminating in pressed steel boxes shall have double locknuts and insulated bushings.
- M. Conduits terminating in gasketed enclosures shall be terminated with conduit hubs.
- N. Conduit wall seals, waterproof type, shall be used at all locations where conduits penetrate walls.
- O. Liquidtight, flexible conduit - metal or non-metallic as shown on the Contract Drawings - shall be used for all motor terminations and for all connections/terminations where vibration is anticipated.
- P. Flexible couplings shall be used in hazardous locations for all motor terminations and for all connections/terminations where vibration is anticipated.
- Q. Conduit stubouts for future construction shall be capped at both ends with threaded PVC conduit caps.
- R. The cement used for PVC conduit installations shall be as manufactured by Carlon, or approved equal.
- S. Galvanized steel conduits entering manholes and/or below grade pull boxes shall be terminated with grounding type bushings which shall be connected to a 5/8-inch by 10-foot long driven ground rod with No. 6 AWG bare copper wire.
- T. Galvanized rigid steel conduit shall be used for all risers. The underground portion of the riser and a 12-inch section of the riser immediately above the ground or slab/floor level shall be painted with a bitumastic coating.
- U. The use of electrical metallic tubing shall be restricted to low voltage applications (600V or less) in non-process areas where specifically approved by the Owner and Engineer on a "per installation" basis - e.g., above suspended ceilings in office areas.
- W. Conduit bodies shall be allowed to facilitate conduit installation as deemed necessary. All conduit bodies used shall be sized to accommodate the manufacturer's listed bending radius for TC Control cable, instrumentation cable or other conductors.

3.02**GUARANTEES AND WARRANTIES**

The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16120 WIRES AND CABLES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install all wires, cables and appurtenances as described hereinafter and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

- A. The requirements of Section 01340 and Section 16050 shall be met.
- B. Samples of the actual wires and cables proposed for use shall be submitted for approval. There shall be a sample for each size and type of wire and cable proposed for use. The samples shall be of sufficient length to show the maximum rated voltage, insulation type and class, conductor size, the manufacturer's name, trademark or identifying logo, and the U.L. listing number.
- C. The wires and cables as approved for use shall be compared with the wires and cables actually installed. If any unapproved wires and cables are installed, they shall be removed and replaced solely at the Contractor's expense with no additional cost to the Owner.

1.03 APPLICATIONS

- A. The wire for lighting and receptacle circuits shall be type THHN/THWN, stranded.
- B. The wire for all power circuits and motor leads shall be type THHN/THWN, stranded.
- C. Single conductor wires for control, indication and metering shall be type THHN/THWN, No. 14 AWG, stranded.
- D. Multiconductor control cable shall be No. 14 AWG, stranded.
- E. The wire for process instrumentation shall be No. 16 AWG, stranded.

1.04 MINIMUM SIZES

- A. Except for control and signal leads, no conductor smaller than No. 12 AWG shall be used.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wire and cables shall be made of annealed, 98% conductivity, soft drawn copper conductors.
- B. All conductors shall be stranded except that the uninsulated copper grounding conductors shall be solid. However, the Contractor may, at his option, install solid conductors for the lighting and receptacle circuits.

2.02 600 VOLT WIRE AND CABLE

- A. Type THHN/THWN insulation shall be used for all 600 Volt wires and cables. The insulation

shall be a flame-retardant, heat-resistant thermoplastic, and shall have a nylon, or equivalent, jacket.

- B. The 600 Volt wires and cables shall be as manufactured by Anixter, Rome Cable, Southwire, or approved equal.

2.03 INSTRUMENTATION AND CONTROL WIRING

- A. Process instrumentation wiring shall be No. 16 AWG stranded twisted pair, 600 Volt, cross-linked polyethylene insulated, aluminum tape shielded, PVC jacketed. Multiconductor cables with individually twisted pairs shall be installed where shown on the Contract Drawings.
- B. Multiconductor control cables shall be Type TC Control Cable, No. 14 AWG copper, stranded, 600 Volt, THWN insulated, PVC jacketed, U. L. listed for direct burial.
- C. Instrumentation wiring shall be as manufactured by Belden, Alpha, or approved equal.
- A. Control wiring shall be as manufactured by Southwire, or approved equal.

2.04 VFD MOTOR CABLE

- A. VFD motor supply cable shall be rated for 1000V and shall contain 4-conductors, (3) #12 AWG stranded tinned copper circuit conductors plus (1) #12 AWG ground wire with PVC insulation, XLP insulation, overall Duofoil® (100% coverage) plus a tinned copper braid shield (85% coverage) , tinned copper drain wire and a sun- & oil-resistant PVC jacket.
- B. Where called for in the contract documents, VFD motor supply cable shall be Belden 29502. NO SUBSTITUTIONS!

2.05 RTD CONDUCTORS

- A. Conductors for Inverter Duty Motor RTD's shall be as specified by the Inverter Duty Motor manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Wires and cables shall be sized as shown on the Contract Drawings and/or, where applicable, sized to match existing wiring.
- B. All conductors shall be carefully handled to avoid kinks or damage to the insulation.
- C. Lubricants or pulling compounds shall be used to facilitate wire pulling. Such lubricants/compounds shall be U.L. listed for use with the insulation specified.
- D. Use pulling means - fish-tape, cable, rope, basket weave wire/cable grips, etc. - which will not damage the wire/cable insulation or the raceway.
- E. Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.

- F. Shielded instrumentation wire shall be installed in rigid steel conduit and pull boxes that contain only instrumentation cables. Instrumentation cables shall be separated from control cables in manholes.
- G. Shielding on instrumentation cables shall be grounded at the transmitter end only.
- H. All new wires and cables shall be continuous and without splices between points of connection to equipment terminals. However, the Owner and Engineer will permit a splice provided that the length between the connection points exceeds the greatest standard shipping length available from the submitted manufacturer and no other manufacturer acceptable to the Owner or Engineer is able to furnish wires or cables of the required length.
- I. All 600 volt wire and cable connections shall be made using compression type connectors. Insulated connectors shall be used for all terminations. The connections shall be made so that both the conductivity and the insulation resistance shall be not less than that of the uncut conductor.
- J. All wires shall be numbered at both ends and at all intermediate junction points. Screw type terminations shall be made with forked tongue (spade), self-insulated, crimp terminals. All other wire terminations shall be made on appropriate terminal strips.

3.02 TESTS

- A. Upon the completion of the pulling-in of and prior to the terminating/connecting of the 600 Volt wiring, all wires shall be individually checked and tested for continuity and short circuits, and each wire/cable shall be meggered to check insulation resistance. The test voltage shall be not less than 500 Volts. Three (3) copies of these test results shall be submitted to the Owner and Engineer.
- B. An authorized representative(s) of the Owner shall witness all testing. The Owner and Engineer shall be notified at least two (2) days in advance of the testing.
- C. Any faulty conditions and/or shortcomings found during the testing shall be corrected at no cost to the Owner. However, a retest to demonstrate compliance shall be conducted before any hook-ups or terminations are made. Any such requisite retesting shall be witnessed by an authorized representative(s) of the Owner.

3.03 GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16150 MOTORS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish, install, connect and test all motors as hereinafter specified and/or shown on the Contract Drawings. This work may necessarily include furnishing/installing, connecting and testing motors required by and/or furnished under other sections of these Specifications.

1.02 SUBMITTALS

- A. The requirements of Section 01340 and Section 16050 shall be met.
- A. The Contractor shall submit to the Owner and Engineer five (5) sets of the certified motor manufacturer(s) dimension drawings showing nameplate data and outline dimensions within three (3) weeks of receiving the order.
- C. The Contractor shall submit to the Owner and Engineer five (5) sets of the standard motor manufacturer(s) test results (per 3.02 A) for the motors after they are constructed prior to the motors being shipped.

PART 2 PRODUCTS

2.01 RATING

- A. Motors shall be of the type and size to perform the required duty without exceeding their design ratings. Motors driving pumps shall not overload at any head or discharge condition of their respective pumps.
- B. Motors shall not be operated into their service factor range on a continuous basis as a means of supplying motors smaller than required by the specific applications.
- C. Unless otherwise specified and/or shown on the Contract Drawings, the following shall apply:
 - 1. Motors 200 HP and above shall be the medium voltage type for use at 4,160 Volts, 3-phase, 60 Hertz; motors smaller than 200 HP shall be the low voltage type. Where motors 100 HP and larger are used at 480 Volts, 3-phase, 60 Hertz, they shall be suitable for autotransformer type reduced voltage starting.
 - 2. Motors 1/2 HP through 100 HP shall be dual voltage for use at 230/460 Volts, 3-phase, 60 Hertz.
 - 3. Motors 125 HP through 199 HP shall be single voltage for use at 460 Volts, 3-phase, 60 Hertz.
 - 4. Motors smaller than 1/2 HP shall be dual voltage for use at 120/240 Volts, single phase, 60 Hertz.
- D. Use inverter duty motors with all adjustable speed drive systems. These motors shall be built with Class F or Class H insulation systems, designed to operate at 70 degrees C rise over ambient at full load, and be provided with insulated bearings. The drive system should always be located within 150 feet of the motor it is servicing.

2.02 POWER FACTOR CORRECTION CAPACITORS

- A. Motors 100 HP and larger shall be furnished with power factor correction capacitors. The capacitors shall be located in the motor controller. The motor manufacturer shall provide suitable capacitors to the motor controller manufacturer.
- B. Capacitors shall have both integral fuse protection and a discharge resistor. Capacitor current shall not exceed the motor no-load magnetizing current.
- C. Capacitor insulating media shall strictly conform to the requirements of the Environmental Protection Agency, particularly with regards to non-flammability and environmental safety.
- D. With power factor correction, motors shall have a minimum power factor of .95 at full load running conditions.

2.03 EFFICIENCY

- A. Medium voltage motors shall have a minimum efficiency of 95% at full load.
- B. Low voltage motors 15 HP and larger shall have a minimum efficiency of 93% at full load, 91% for TEFC motors.

2.04 SPACE HEATERS

- A. Motors 50 HP and larger shall have a 120 Volt, single phase space heater for moisture control. The space heaters shall be the motor manufacturer's standard wattage rating for the specific motor size and type.
- B. If a motor is on the job site longer than three (3) days prior to its final installation, the motor's space heater shall be energized and the space heater shall remain energized until such time as the motor is transported for immediate final installation.
- C. After final installation, the motor's space heater shall be energized and the space heater shall remain energized until final testing. After final testing, the motor's space heater shall be connected for normal operation.

2.05 CONSTRUCTION

- A. General
 - 1. All drip proof and weather protected Type I motors shall have epoxy encapsulated windings. Non-encapsulated motors used outdoors or in specified conditions shall be totally enclosed, TENV or TEFC as specified and/or shown on the Contract Drawings. Totally enclosed motors shall be designed for severe duty.
 - 2. Motor stators shall have copper windings. The individual steel stator laminations shall be made from quality at least as good as M22 silicon steel with a lamination thickness no greater than .019 inches. The stacking factor of the assembled stator core laminations shall be 90% or higher.
 - 3. Squirrel cage rotor laminations shall be made from steel with quality at least as good as M22 silicon steel with a lamination thickness no greater than .019 inches. The stacking factor of the assembled rotor core shall be 90% or higher.

4. All applicable NEMA, ANSI, IEEE and U.L. standards will be strictly followed.
5. Motors shall have factory stamped stainless steel nameplates.
6. Motor frames 254T and larger shall have lifting lugs or "O" type bolts for ease in handling.

B. Low Voltage, 3-Phase Motors

1. Low voltage three phase motors shall be of the squirrel cage induction types, shall be NEMA Design B with normal starting torque unless otherwise specified, shall be designed for continuous duty, with a 1.15 service factor, shall have a KVA/HP as defined by NEMA of code G or less, shall be rated per Item 2.01.C.2 and C.3 above, and as specified and/or shown on the Contract Drawings, shall have normal or high thrust bearings, and a drip proof or totally enclosed housing.
2. Motors shall have a Class B nonhygroscopic insulation system. Class F insulation may be used, but shall be limited to a Class B temperature rise.
3. The output shafts shall be suitable for either belt drive or direct connection as required by the particular application.
4. Motor frames and end shields shall be made of heavy, rigid cast iron or fabricated steel construction.
5. Motor shafts shall be made from high-grade, cold-rolled steel machined to standard NEMA dimensions.
6. Motors shall have heavy-duty precision ball bearings with a minimum AFBMA bid life of five (5) years. Bearings of high thrust motors shall be locked for a momentary upthrust of 30% downthrust.
7. Vertical hollow shaft motors shall have non-reversing ratchets to prevent backspin.
8. Totally enclosed motors shall have epoxy coated motor windings.
9. Motor conduit boxes shall be gasketed. Internal motor leads shall enter the conduit boxes through grommets.
10. All interior and exterior motor surfaces shall have a final coating of a chemically resistant corrosion and fungus protective epoxy fortified enamel finish sprayed over two (2) coats of a red primer. Stator bore and rotor shall be epoxy coated.
11. All machined surfaces shall be coated with a rust inhibitor for easy disassembly.
12. All fittings, bolts, nuts and screws shall be plated to resist corrosion. Bolts and nuts shall be hex type.
13. Low voltage, 3-phase motors shall be as manufactured by General Electric Company, U.S. Motors, or approved equal.

C. Low Voltage, Single Phase Motors

1. Single phase motors shall be either the split-phase or the capacitor-start induction types rated for the continuous horsepower at the RPM specified and/or shown on the Contract Drawings.
2. Motors shall be rated 120/240 Volts, single phase, 60 Hertz, shall have a NEMA Class B insulation system, and shall have a dripproof or totally enclosed housing as required by the particular application.
3. Motors shall have a corrosion protective finish on all internal and external surfaces. All fittings shall have a corrosion resistant plating.
4. Mechanical characteristics shall be the same as those specified above for low voltage, 3-phase motors.
5. Low voltage, single phase motors shall be as manufactured by U.S. Motors, Baldor, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Unless otherwise specified and/or shown on the Contract Drawings, all motors shall be connected to the conduit system with a short section of flexible conduit, 18-inches minimum and 60-inches maximum.
- B. Flexible conduit used for motor connections of No. 6 AWG or smaller wire shall have an approved grounding conductor incorporated inside the flexible section.
- C. For motor connections of No. 4 AWG and larger wire, the Contractor shall install an appropriately sized grounding conductor in the conduit and terminate the grounding conductor at both the motor end and the motor controller end with approved grounding clamps or connectors.

3.02 TESTS

- A. Prior to shipment, all motors shall be given the manufacturer's standard tests. These tests shall include, but not necessarily be limited to, the following:
 - 1. No-Load current.
 - 2. Air gap measurement.
 - 3. High potential test.
 - 4. Shaft alignment.
 - 5. Shaft and rotor balance.
 - 6. Bearing alignment and lubrication.
- B. After installation, but prior to putting the motors into service, the Contractor shall perform the following minimum checks:
 - 1. Motor alignment.
 - 2. Motor clearances.
 - 3. Bearing alignment and lubrication.
 - 4. Correct rotation direction.
 - 5. Megger motor windings. If insulation resistance is found to be low, the Contractor shall notify the Owner and Engineer immediately and shall not energize the motor.

3.03 GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16152 INVERTER DUTY MOTORS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and factory test four (4) inverter duty motors of the sizes and types hereinafter specified.

1.02 MANUFACTURER'S QUALIFICATIONS

- A. The motors shall be the products of a single manufacturer who has a minimum provable history of three (3) years in the manufacturing and servicing of inverter duty motors of the sizes and types hereinafter specified.

1.03 APPLICATION

- A. The motors will each be used to power a variable torque load consisting of a horizontal axial flow pump in wastewater effluent pumping service.

1.04 OPERATING CONDITIONS

- A. The motors shall be able to operate under the following environmental conditions without modification or derating:
 - 1. Temperature: 0 to 40°C.
 - 2. Altitude: Up to 3,300' above sea level.
 - 3. Humidity: 0 to 95%, non-condensing.

1.05 MOTOR TESTING

- A. Prior to shipment, the motors shall be subjected to the manufacturer's standard tests. The tests shall include, but not necessarily be limited to, the following:
 - 1. No-load current.
 - 2. Air gap measurement.
 - 3. High potential test.
 - 4. Shaft alignment.
 - 5. Shaft and rotor balance.
 - 6. Bearing alignment and lubrication.
- B. The manufacturer shall certify that the motors are an improved design meeting the requirements of NEMA MG 1, Part 31 for motor insulation systems - i.e., a peak voltage of 1600 V and a time rise of 0.1 microsecond; specifically, motors that do not meet both the peak voltage level and the time rise limitation will not be acceptable under this Specification.

1.06 APPROVED EQUAL

- A. The Engineer shall be the sole determiner of what constitutes an "approved equal" product.

1.07 SUBMITTALS

- A. Within three (3) weeks of receiving the order and prior to start of fabrication of the motors, the motor manufacturer shall furnish the Owner and Engineer with five (5) sets of motor drawings for review and approval. The results of the manufacturer's standard post-manufacturing test results (per 3.01 A) for the motors shall be submitted prior to shipment.
- B. The motor drawings shall include, but not necessarily be limited to, motor nameplate data, motor mounting base dimensions, motor dimensions and weight, and the location and size of both the motor leads terminal box and the low voltage leads terminal box. Information shall be sufficiently detailed to allow for locating conduit stub-ups.
- C. Failure to comply with Item 1.07A above shall be entirely at the manufacturer's risk. Any changes required as a result of the Engineer's review will be solely at the manufacturer's expense with no cost to the Owner.

1.08 WARRANTY

- A. The manufacturer shall warrant that the motors shall be free from defects in all materials and workmanship for a period of two (2) years from date of final acceptance, or for the duration of the manufacturer's standard warranty, whichever period is longer.
- B. During the warranty period, any and all covered defects shall be corrected by the manufacturer solely at his own expense with no cost to the Owner.

PART 2 PRODUCTS

2.01 INVERTER DUTY MOTORS

A. GENERAL

- 1. The motors shall be of the type and size to perform the required duty without exceeding their design ratings. The motors shall not overload at any head or discharge condition of their respective pumps.
- 2. The motors shall be suitable for use on a 480 Volt, 3-phase, 60 Hz power system.
- 3. The motors shall have a 1.15 service factor. The motors shall not be operated into their service factor range on a continuous basis as a means of supplying motors smaller than that required by the specific applications.
- 4. The motors shall have a minimum efficiency of 93% at full load.
- 5. The motors shall each be equipped with a 120 Volt, single phase space heater for moisture control. The space heaters shall be the motor manufacturer's standard wattage rating for the size and type of motors actually furnished.
- 6. The motors shall have minimum power factors of 93% at full load and 95% when partially loaded.

B. CONSTRUCTION

- 1. The motors shall be NEMA B, vertical types specifically designed and fabricated for AC inverter usage (PWM type) and adjustable speed applications. Motors which must be used with one particular brand of inverter to achieve compliance will not be acceptable under this Specification.

2. The motors will be coupled to horizontal axial flow pumps which will be used to pump a liquid consisting of wastewater effluent having a specific gravity of 1.0 at a nominal ambient temperature of 76EF.
3. The motors shall be a normal torque, low slip design.
4. All motors shall be rated 50 HP at 1800 RPM and will drive a Horizontal Axial Flow pump with a maximum output of 8,200 GPM at 7.0 feet of total dynamic head.
5. All applicable NEMA, ANSI, IEEE, and U.L. standards and procedures shall be strictly followed in the design and fabrication of the motors. The motors shall be U.L. listed.
6. The motors shall have insulation systems designed to meet the voltage spike limits as defined in NEMA MG 1, Part 31, 1993. Complete insulation of the slot, cell, and phase groups is required. The insulation systems shall be rated for Class F temperature rise or better. Insulation systems utilizing heavy film and two film wire with a Pulse Endurance Index of less than 50 will not be acceptable under this Specification.
7. The motor windings shall be epoxy encapsuled and shall utilize copper wires. Aluminum motor windings will not be acceptable under this Specification.
8. The motors shall be furnished with TEFC enclosures designed for severe/corrosion duty. Motor enclosures shall be fabricated of cast iron or rolled steel and shall be provided with a condensate drain hole. Aluminum motor enclosures will not be acceptable under this Specification.
9. The squirrel cage rotors shall be made from high grade steel laminations tightly fastened together and securely affixed to the motor shaft. Steel bar type construction with steel ends rings is also acceptable. Aluminum rotors of any type will not be acceptable under this Specification.
10. The stator cores shall be made from high grade steel and shall utilize reinforced end turn construction for high rigidity, minimum winding mechanical fatigue, and low resonant noise level. Aluminum stator will not be acceptable under this Specification.
11. The stator windings shall be provided with six (6) resistance temperature detectors (RTD's), two (2) per phase. The leads of the highest reading detector as determined by factory test shall be brought to terminals in the low voltage terminal box. The motor manufacturer shall provide a suitable relay to the VFD supplier for mounting in the VFD controller enclosures. The relay provided shall accommodate the stator winding RTD input and shall provide double-pole, single throw form-C contacts rated for 2 amperes at 120V AC. Relay power input shall be 120V AC. The motor manufacturer shall specify the required RTD conductors required for the application.
12. The temperature rise of the motors shall not exceed Class F insulation limits, with an allowable winding hot spot temperature of 115EC when operated on inverter power across the motors' nameplate speed and torque envelope. Sine wave temperature rise shall be Class F or better.
13. The motors shall be equipped with both space heaters per Item 2.01.A.5 above.

14. The motors shall be fitted with oil lubricated high thrust bearings of the type (spherical roller, ball or Kingsbury) required by the specific application. The bearings shall be locked for a momentary upthrust of 30% downthrust. Minimum bearing life shall be five (5) years as determined in accordance with AFBMA standards.
15. The bearings shall be provided with RTD's, the leads of which shall be brought to terminals in the low voltage terminal box. The motor manufacturer shall provide suitable relays to the VFD supplier for mounting in the VFD controller enclosures. The relays provided shall accommodate the bearing RTD input's and shall provide double-pole, single throw form-C contacts rated for 2 amperes at 120V AC. Relay power input shall be 120V AC. The motor manufacturer shall specify the required RTD conductors required for the application.
16. Bearing housings shall be equipped with sight gauges, fillers, and drain plugs.
17. The motors shall be equipped with two (2) gasketed conduit boxes - a high voltage terminal box of adequate size to accommodate the motor leads and a low voltage terminal box with a terminal strip for the leads of the space heaters, the stator winding RTD's, and the bearing RTD's. The wiring, which shall be factory installed and tested, shall enter the terminal boxes through grommets.
18. The motor shafts shall be solid and shall be fabricated from stainless steel, shall have standard NEMA dimensions, shall have non-reversing ratchets to prevent backspin, and shall be suitable for direct coupling to the driven pumps. The motor manufacturer shall furnish to the Owner suitable couplings of the bolted type to couple the motors with their respective pumps.
19. The motors shall be furnished with permanently attached stainless steel nameplates containing the requisite NEC, NEMA data. In addition, the motor manufacturer shall expand his standard nameplate or add an additional permanently attached stainless steel data plate containing, as a minimum, the following adjustable speed performance information:
 - a. Application Type - Variable Torque.
 - b. Maximum approved continuous torque.
 - c. Approved speed (RPM) range.
 - d. Approved frequency (Hz) range.
 - e. Motor full load current (Amps) on inverter power.
20. All fittings, bolts, nuts, and screws shall be plated to resist corrosion. Bolts and nuts shall be Hex type.
21. The motor frames shall have lifting lugs or "O" type bolts for ease in handling.
22. All interior and exterior motor surfaces shall have a final coating of a chemically resistant corrosion and fungus protective epoxy fortified enamel finish sprayed over two (2) coats of a red primer. The stator core and the rotor shall be epoxy coated.
23. All machined surfaces shall be coated with a rust inhibitor for easy disassembly.
24. The motors shall be "Inverter Grade" products as manufactured by U.S. Electrical Motors, or approved equal.

PART 3 EXECUTION

3.01 FACTORY TESTING

- A. Prior to shipment, the motors shall be tested in accordance with Item 1.05.A above.
- B. After successfully completing the tests of Item 3.01.A above, the motors shall be tested and evaluated on inverter power over the approved speed range. Computer simulation of motor inverter operation is an acceptable alternative to actually connecting the motors to an inverter.
- C. During the testing, the major motor parameters shall be recorded and the test results shall be forwarded to the Engineer for review and approval prior to shipment of the motors.

3.02 SHIPPING

- A. The motors shall be so packaged for shipment that they are maximally protected from both physical and environmental damage.
- B. The motors shall be transported to the Owner's job sites utilizing the manufacturer's customary method of shipment.

3.03 INSTALLATION

- A. The motors shall be installed by the Owner's personnel in accordance with the recommendations and procedures set forth in the installation manuals furnished by the manufacturer.
- B. An authorized factory trained representative(s) of the manufacturer shall be available to assist the Owner's personnel on an "as needed" basis.

3.04 WARRANTY

- A. The manufacturer shall furnish to the Owner a written warranty which complies with the requirements of Item 1.08 above.

END OF SECTION

SECTION 16160 PANELBOARDS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, devices, and incidentals required and install all panelboards as hereinafter specified and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

- A. The requirements of Section 01340 and Section 16050 shall be met.

PART 2 PRODUCTS

2.01 RATING

- A. All panelboards shall be rated for the intended voltage. Panelboard ratings shall be as shown on the Contract Drawings.
- B. Panelboards shall be U.L. listed.

2.03 CONSTRUCTION

A. Interiors

1. Interiors shall be completely factory assembled with main breakers, bus bars, branch circuit breakers, wire connectors, etc.
2. All wire connectors, except screw terminals, shall be of the anti-turn solderless type.
3. All wire connectors shall be suitable for use with copper wires of the size(s) indicated on the Contract Drawings.
4. Branch circuits shall be arranged using double row construction except where narrow column panels are called for on the Contract Drawings.
5. Branch circuits shall be numbered by the panelboard manufacturer.
6. Interiors shall be so designed that circuits may be changed without machining, drilling or tapping; without disturbing adjacent units; and without removing the main bus connectors.
7. Interiors shall be durably marked by the manufacturer with the voltage, current rating and number of phases for which the panelboards are designed. The markings, which shall be visible after installation without disturbing the interior parts or wiring, shall also include the manufacturer's name or trademark.
8. All current carrying parts, including cross connectors, shall be copper.

B. Bus Bars

1. The bus bars for the mains shall be sized as shown on the Contract Drawings.
2. Both a full-capacity neutral bus and a separate ground bus shall be provided. Neutral bus bars shall have a suitable lug for each outgoing feeder requiring a neutral connection.
3. Phase bus bars shall be full height without reduction.
4. Bus bar taps for panelboards with single pole branches shall be arranged for sequence phasing of the branch circuit devices.

5. Bus bars shall be braced to conform to industry standards for short circuit stresses in panelboards.

C. Circuit Breakers

1. The panelboards shall be equipped with circuit breakers, main and branch, with trip settings as shown on the Contract Drawings.
2. The circuit breakers shall be of the molded case, bolt-on type with the number of poles as shown on the Contract Drawings.
3. Circuit breakers used in 120/240 Volt and 120/208 Volt panelboards shall have a minimum interrupting rating of 10,000 Amperes RMS symmetrical.
4. Three-pole circuit breakers used in 480 Volt panelboards shall have a minimum interrupting rating of 14,000 Amperes RMS symmetrical.

D. GFCI (Ground Fault Circuit Interrupter)

1. GFCI units shall be provided for all circuits where shown on the Contract Drawings.
2. The GFCI units shall be 1-pole, 120 Volt, molded case, bolt-on circuit breakers incorporating a solid state ground fault interrupter circuit which shall be insulated and isolated from the breaker mechanism.
3. The GFCI units shall be U.L. listed Class A, Group I devices (5 milliamp sensitivity, 25 millisecond trip time), and shall have an interrupting capacity of 10,000 Amperes RMS symmetrical.

E. Enclosures, Covers and Trim

1. The enclosures shall be of the NEMA Type (1, 3R, 4, 4X, 12), material (code gauge steel, stainless steel, fiberglass), and mounting configuration (flush, surface) as shown on the Contract Drawings.
2. Enclosures shall be of sufficient size to provide a minimum 4-inch gutter space on all sides. At least four (4) interior mounting studs shall be provided for each enclosure. Enclosures shall be furnished without conduit knockouts. Enclosures shall have hinged doors which cover all circuit breaker handles.
3. Stainless steel enclosures and covers shall have a natural metal finish. Enclosures and covers shall be joined together with a concealed piano type stainless steel hinge. Conduit openings in the enclosures shall be field drilled and, if applicable, tapped.
4. Fiberglass enclosures and covers shall be the manufacturer's standard color. Enclosures and covers shall be joined together with a concealed piano type stainless steel hinge. Conduit openings in the enclosures shall be field drilled and, if applicable, tapped.
5. Code gauge steel enclosures and covers shall be galvanized steel finished as per Item 2.03.E.7 below. Enclosures and covers shall be joined together with a concealed piano type hinge. Conduit openings in the enclosures shall be field punched.
6. Code gauge steel enclosures shall have panel trims of code gauge sheet steel. Trims for flush mounted enclosures shall overlap the enclosures by at least 3/4-inch all around. Surface mounted enclosures shall have trims the same height and width as the enclosures. Trims shall be fastened to the enclosures with quarter-turn clamps or screws.
7. All interior and exterior surfaces of the panelboards, enclosures and trims shall be properly cleaned, painted with a rust inhibitor (two coats), and over-coated with ANSI Z55.1, No. 61 light gray paint. The finish paint shall be of a type to which field applied paint will adhere.

8. The inside surface of each cover shall have a directory frame with a transparent cover and a directory card.
9. Covers shall have semi-flush type cylinder locks and catches, except that covers over 48-inches in height shall have vault handles and 3-point catches, complete with lock, arranged to fasten at top, bottom and center. Two (2) keys shall be furnished for each lock and all locks shall be keyed alike.

F. Manufacturer

1. 120/240 Volt and 120/208 Volt panelboards shall be type NQOD with QOB bolt-on circuit breakers as manufactured by the Square "D" Company, or approved equal.
2. 480 Volt panelboards shall be the I-Line type as manufactured by the Square "D" Company, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Surface mounted panelboards shall be installed using spacers so that there is an air space between the enclosure and the mounting surface.
- B. Unless otherwise shown on the Contract Drawings, the tops of the enclosures shall be mounted at a height of 6-feet above the floor. The enclosures shall be properly aligned, true-and-square, and shall be adequately supported independently of the connecting conduits.
- C. All panelboard wiring shall be neatly formed, grouped, laced, and identified to provide a neat and orderly appearance.
- D. The Contractor shall type on the directory card the description/use of each active circuit. "Spare" shall be indicated in erasable pencil!

3.02 TESTS

- A. Each individual circuit breaker, including the main breaker and the GFCI breaker(s), shall be tested for proper operation under the appropriate overload/ground fault conditions.

3.03 GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16370 VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish four (4) variable frequency drives as specified hereinafter.

1.02 DRIVE APPLICATION

- A. The variable frequency drives will be used to control the speed of inverter duty rated NEMA B design squirrel cage induction motors driving horizontal axial flow pumps in wastewater effluent pumping service. The motors will be rated 50 HP.

1.03 DRIVE PARAMETERS

- A. The variable frequency drives shall be designed and sized for the loads intended, shall not exceed their full-rated capacity when the driven pumps are operating at maximum capacity, shall not overload under any operating condition of the pumps, and shall be provided with an integral bypass motor starter package.

1.04 SPARE PARTS

- A. As a minimum, each of the variable frequency drives shall be furnished with the following spare parts:
 1. One (1) circuit board of each type used.
 2. Three (3) spare bulbs of each type and size used.
 3. Three (3) lens caps of each color and size used.
 4. Three (3) sets of power fuses.
 5. Three (3) sets of control fuses.

1.05 MANUFACTURER'S QUALIFICATIONS

- A. The variable frequency drives shall be the products of a single manufacturer who has been in the business of designing and manufacturing variable frequency drives for a period of at least ten (10) years.
- B. The manufacturer shall have a factory authorized representative (s) and/or a certified repair shop(s) located within the State of Florida staffed with factory trained service personnel capable of providing installation and start-up assistance, routine and 24-hour emergency repair services (including parts), and training for the Owner's personnel in operating and maintenance procedures associated with the specific variable frequency drives furnished.
- C. The manufacturer shall offer both standard and extended period service contracts as part of his normal operating policy.
- A. The Variable Frequency Drive shall have a minimum of 28 years documented mean time between failure (MTBF). MTBF to be based on the Bellcore TR-322 standard. A certification that this standard is met is to be provided with the bid.

1.06 MANUFACTURER'S REPRESENTATIVE

- A. A factory trained authorized representative(s) of the manufacturer shall be available to perform the following functions:
1. Provide installation assistance to the Owner's personnel on an "as needed" basis, one (1) scheduled day minimum.
 2. Provide checkout and start-up services as well as conduct the final acceptance tests, two (2) scheduled days.
 3. Provide training for the Owner's personnel in the proper operation and maintenance techniques to be used with the specific AFD's furnished, two (2) scheduled days.
- B. The manufacturer shall include in his bid sufficient funds to cover all the costs (travel, meals, lodging) associated with providing the services listed in Item 1.06.A.1, 2 and 3 above.

1.07 SUBMITTALS

- A. Within six (6) weeks of receiving the order, the manufacturer shall furnish the Owner with certified dimension prints which clearly show the nameplate data and outline dimensions.
- B. Prior to start of manufacture of the variable frequency drives, the manufacturer shall submit sets of drawings which shall include, but not necessarily be limited to, enclosure drawings showing the location of both internally and externally mounted components, master wiring diagrams showing all interconnections to the discrete component level, elementary or control schematics including coordination with other external control devices operating in conjunction with the variable frequency drives, and outline drawings with sufficient details to allow for locating conduit stub-ups and field wiring. In addition, documentation certifying compliance with the MTBF standard listed in 1.05,D is to be provided.
- C. Failure to comply with Item 1.06.B above shall be entirely at the manufacturer's risk. Any changes required as a result of the Owner's review will be solely at the manufacturer's expense with no cost to the Owner.

1.08 WARRANTY

- A. The manufacturer shall warrant that the variable frequency drives shall be free from defects in all materials and workmanship for a period of two (2) years from date of final acceptance.
- B. During the Warranty period, any and all covered defects shall be corrected by the manufacturer solely at his own expense with no cost to the Owner.

PART 2 PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

- A. GENERAL
1. The variable frequency drives shall be the adjustable frequency (AF), variable torque (VT), pulse width modulated (PWM) type designed to provide continuous speed adjustment of 3-phase NEMA B squirrel cage induction motors, inverter duty rated.
 2. The adjustable frequency drives (AFD's) shall be designed to control 50 HP motors respectively, and shall be rated for the horsepower (HP), full-load current (Amps), and

- speed (RPM) of the motors actually supplied.
3. The AFD's shall be furnished in NEMA Type 3R, stainless steel (painted white), floor-mounted enclosures. The enclosures shall be forced air ventilated using door-mounted fans. Fan installation shall include cleanable, reuseable air filters.

B. CONSTRUCTION

1. The AFD's shall be microprocessor based solid state devices consisting of three (3) basic sections:
 - a. A rectifier section to change the constant frequency AC input voltage to a DC voltage. A 12-pulse full wave rectifier shall be integral to the AFD power section as part of its core design and shall reduce harmonics and prevent input line notching. Internal fast acting semiconductor fuses shall be installed to preclude the necessity for having external AC line fuses. 12-pulse low harmonic technology is to be used. Other multi-pulse systems utilizing autotransformer technology or requiring separate rectifiers are not allowed. Passive harmonic filters utilizing capacitors are not acceptable.
 - b. A DC bus/link section to interconnect the rectifier section and the inverter section. A DC line reactor and capacitors shall be used to smooth the DC bus/link operation, improve displacement power factor, lower harmonic distortion, and eliminate the need for an isolation transformer.
 - c. An inverter section to convert the DC voltage to a variable frequency AC voltage. Insulated gate bipolar transistors (IGBT's) shall be used as output switching devices to allow "tripless" operation, reduce motor noise, provide smoother motor operation, assure reliable and safe shutdowns under fault conditions, and increase drive efficiency; specifically, SCR's, GTO's, and Darlington Transistors are not acceptable as switching devices under this Specification.
2. The AFD's shall be capable of operating from a 3-phase input voltage of 480 Volts $\pm 10\%$ over a frequency range of 48-63 Hertz while providing a constant volts per Hertz excitation to the motors.
3. The AFD's shall have a one minute overload rating of 110%, minimum.
4. The AFD's shall employ surface mount technology for reduced size, high reliability, ease of maintenance, and resistance to vibration.
5. The AFD's shall incorporate full internal protection against short circuits, ground faults, over- and undervoltage, over- and undercurrent, and temperature extremes.
6. The AFD's shall contain an adjustable electronic motor overload (I^2t) circuit to eliminate the need for an external motor overload relay.
7. The AFD's shall utilize advanced diagnostic techniques to simplify trouble shooting and correcting problems.
8. The AFD's shall have a minimum drive efficiency of 97% at full speed and full load.
9. The AFD's shall have a minimum fundamental power factor of 0.98 at all speeds and loads.
10. The AFD's shall be able to operate under the following environmental conditions without modification or derating:
 - a. Temperature: 0 to 40EC.
 - b. Altitude: Up to 3,300' above sea level.
 - c. Humidity: 0 to 95%, non-condensing.
11. The AFD's shall be UL listed and shall comply fully with the applicable standards and provisions of ANSI, NEMA, IEEE, IEC, and NEC, latest revisions.

C. STANDARD FEATURES

1. The AFD's shall, as a minimum, have the standard features and adjustments listed below:
 - a. The AFD's shall have the same customer interface regardless of horsepower rating, including keypad, digital display, and user connections. The keypad and the digital display shall be accessible without opening the main door of the drive enclosures.
 - b. The keypad shall be the seven (7) button touch type and shall be used for start-up, for setting all parameters, for stepping through the displays and menus, and for local control, including speed adjustments.
 - c. In addition to the keypad speeds adjustment provisions, the AFD's shall also be furnished with a manual speed adjustment potentiometer. The potentiometer shall be accessible without opening the main door of the drive enclosures.
 - d. The digital display shall be the LCD alphanumeric type with 40-character, 2-line capability. The LCD display shall be backlit to provide easy viewing at any angle in any light condition. The display shall have adjustable contrast.
 - e. The display shall utilize plain English - i.e., all set-up parameters, indications, faults, warnings, and other such information must be displayed in words for easy user understanding; specifically, alphanumeric code numbers requiring memorization, cross-reference tables, or manuals for interpretation will not be acceptable under this Specification.
 - f. The AFD's shall incorporate pre-programmed application macros for ease of start-up. To reduce programming time, the macros shall provide one command operation to reprogram all parameters and user interfaces for a particular application.
 - g. The AFD's shall provide a user selectable option of either displaying a fault or running at a preset speed if a reference input is lost.
 - h. The AFD's shall be capable of a "flying start" into a rotating load and accelerating to setpoint without safety tripping or damage to the drives or driven equipment.
 - i. The user terminal strip shall be isolated from both the line and ground.
 - j. The AFD's shall have the ability to automatically restart after an overcurrent, overvoltage, undervoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs shall count down on the display to warn an operator that a restart will occur.
 - k. The AFD's shall be equipped with an automatic extended power loss ride-through circuit which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be two seconds, based on full load and no inertia. Removing power from the motor will not be an acceptable method of increasing power loss ride-through under this Specification.
 - l. The AFD's shall be optimized for a 3 kHz carrier frequency to reduce motor noise.
 - m. The AFD's shall incorporate the following three (3) separate current limit circuits to provide "trip free" operation:
 - 1) A slow current regulation limit circuit which shall be an adjustable percentage of the AFD's variable torque current rating, minimum setting of 125%. This adjustment shall be made via the keypad and shall be displayed in actual amperes, not as a percentage of full load.

- 2) A rapid current regulation limit circuit which shall be an adjustable percentage of the AFD's variable torque current rating, minimum setting of 170%.
 - 3) A current switch-off limit circuit which shall be a fixed percentage of the AFD's variable torque current rating, minimum setting of 255% instantaneous.
- n. In addition to any software items listed above, the AFD's shall, as a minimum, contain the following built-in software features:
- 1) Automatic slip-compensation for maintaining motor speed under varying load conditions.
 - 2) A motor under-load function to protect the pumps.
 - 3) Starting torque up to 180% of full load torque.
 - 4) User selectable manual or automatic IR compensation for torque increases over a selected frequency range.
 - 5) Five (5) adjustable/selectable critical frequency lock-out bands to avoid load resonance points during ramp-up or ramp-down.
 - 6) Two (2) acceleration and two (2) deceleration ramps, adjustable from 0.1 seconds to 1800 seconds.
 - 7) Three (3) adjustable S-curve acceleration and deceleration patterns.
 - 8) User selectable linear, squared, or automatic control of the Volts-per-Hertz shape to assure maximum energy efficiency.
 - 9) Precise full range frequency resolution adjustable in 0.01 Hertz increments.
 - 10) Integral kilowatt-hour and elapsed-time displays.
 - 11) Integral PI and sequential control functions.
 - 12) Local-Off-Remote function for local control through the integral keypad and remote control via pushbuttons and/or potentiometers.
- o. The AFD's shall have seven (7) programmable preset speeds as well as unidirectional rotation and coast-to-a-stop features.
- p. The AFD's shall have two (2) programmable analog inputs capable of accepting either a current or a voltage signal. Inputs shall be filtered and shall have adjustable gain and offset.
- q. The AFD's shall have six (6) programmable digital inputs.
- r. The AFD's shall have two (2) programmable analog outputs proportional to the chosen reference (frequency, motor speed, etc.).
- s. The AFD's shall have three (3) programmable digital outputs. Outputs must be true Form C relays; specifically, open collector outputs will not be acceptable under this Specification.
- t. The AFD's shall be equipped with an RS-485 serial port capable of communicating with external PLC's, DCS's, DDC's, and touch-screen graphic operator panels.
- u. The AFD's digital display shall contain, as a minimum, the following information shown in complete English words; specifically, alphanumeric code numbers requiring memorization, cross-reference tables, or manuals for interpretation will not be acceptable under this Specification:

Output Frequency	DC Bus Voltage
Output Voltage	Heatsink Temperature
Motor Speed	Analog Input Values
Motor Current	Keypad Reference Values
Calculated Motor Torque	Elapsed Time
Calculated Motor Power	Kilowatt-hours

- v. The AFD's shall, as a minimum, incorporate the following protective circuits which, in the case of a protective trip, shall stop the drive and announce the fault condition in complete English words; specifically, alphanumeric code numbers requiring memorization, cross-reference tables, or manuals for interpretation will not be acceptable under this Specification:
 - 1) Overcurrent: Trip set at 315% instantaneous (225% RMS) of the AFD's variable torque current rating.
 - 2) Overvoltage: Trip set at 130% of the AFD's rated voltage.
 - 3) Undervoltage: Trip set at 65% of the AFD's rated voltage.
 - 4) Overtemperature: Trip set at +70EC or +85EC dependent upon drive furnished.
 - 5) Ground Fault: Both "running" and "at start".
 - 6) Adaptable Electrical Motor Overload (I^2t): Motor protection shall be based on motor speed and load; specifically, circuits which are not speed dependant will not be acceptable under this Specification.
- w. The VFD's shall incorporate a parameter lock feature which will prevent unauthorized personnel from altering the drive parameters without entering a programmable password or combination number. The parameter lock shall also be settable to a digital input.

D. FACTORY INSTALLED OPTIONS

- 1. In addition to the Local-Off-Remote switch and speed potentiometer mentioned hereinabove, the AFD's shall include the following factory installed options:
 - a. Circuit Breaker: The circuit breaker shall be the thermal magnetic, thru-the-door interlock type, padlockable in the Off position.
 - b. Relays for Stator winding RTD's and Bearing RTD's as required in Section 16152 2.01.B.11 and 16152.2.01.B.15.
 - c. 115 VAC Control Transformer and Terminal Board: A terminal board shall be provided for convenient connection of all field control wiring, including all drive inputs and outputs and 115 VAC start input. A control transformer, 150 VA minimum, shall also be included.
 - d. Numbered Wires: All internal drive wires shall be numbered at both ends to facilitate maintenance and trouble shooting.

E. STATOR WINDING AND BEARING RTD's

- 1. Per Sections 16152 2.01 B 11 and 16152 2.01 B 15 of these specifications, the Inverter Duty Motor manufacturer shall supply relays intended to interface with the associated stator winding RTD and bearing RTD's. These relays shall be installed in the VFD enclosure by the VFD supplier. The VFD supplier shall coordinate the installation requirements of the relays with the Inverter Duty Motor manufacturer.

- F. ACCEPTABLE MANUFACTURERS: The AFD's shall be as manufactured by the ABB Industrial Systems Inc., Eaton Corporation (Cutler Hammer Division), Allen-Bradley, or Yaskawa by ICON Technologies.

PART 3 EXECUTION

3.01 FACTORY TESTING

- A. Prior to assembly in the AFD's, all printed circuit boards shall be thoroughly factory tested and given a minimum eight (8) hour burn-in.
- B. After assembly, the drives shall be given a minimum eight (8) hour load test using a driven motor. The load shall be continuously cycled from no-load to full rated load to induce maximum stress and thermal variations in the drive components.
- C. During the load test, the major drive parameters (input volts, output volts, output current, output speed, output frequency, percent load, etc.) shall be recorded and a copy of the test results shall be reviewed by the Owner and Engineer prior to the shipment of the AFD's. Similarly, any failure(s) of the drives during the load test shall be recorded, analyzed, corrected, and reported to the Owner and Engineer before shipment of the AFD's.

3.02 SHIPPING

- A. The AFD's shall be so packaged for shipment that they are maximally protected from both physical and environmental damage.
- B. The AFD's shall be transported to the Owner's job sites utilizing the manufacturer's customary method of shipment.

3.03 INSTALLATION

- A. The AFD's shall be installed by the Owner's personnel in accordance with the recommendations and procedures set forth in the installation manual furnished by the manufacturer.
- B. An authorized factory trained representative(s) of the manufacturer shall be available to assist the Owner's personnel on an "as needed" basis.

3.04 CHECKOUT AND START-UP

- A. Prior to start-up, a factory trained representative(s) of the manufacturer shall be on hand to assure that the AFD's have been properly installed and that all field wiring is correctly terminated.
- B. After checkout, the manufacturer's representative(s) shall then conduct a certified factory start-up using procedures and forms established by the manufacturer of the AFD's.
- C. A copy of the certified start-up form(s) for each drive shall be provided to the Owner and Engineer, and a copy shall be kept on file by the manufacturer.

3.05 FIELD TESTING

- A. After satisfactory completion of the checkout and start-up procedures, the manufacturer's representative(s) shall begin an eight (8) hour acceptance test using actual plant loads.

- B. Any and all short-comings discovered and/or failures occurring during the acceptance test shall be remedied by the manufacturer solely at his own expense with no cost to the Owner.
- C. Any time after four (4) hours of acceptance testing, the Owner or Engineer may, at his option, curtail further testing and take acceptance of the AFD's.

3.06 TRAINING

- A. As set forth in Items 1.05.B and 1.06.A above, a factory trained authorized representative(s) of the manufacturer shall be available at such a time(s) and place(s) established by the owner to train the Owner's personnel in the proper operation and maintenance procedures required by the specific AFD's furnished.

3.07 WARRANTY

- A. The manufacturer shall furnish to the Owner a written warranty which complies with the requirements set forth in Item 1.08 above.

END OF SECTION

SECTION 16450 GROUNDING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install a complete grounding system in strict accordance with Article 250 of the National Electrical Code and/or as hereinafter specified and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

- A. The requirements of Section 01340 and Section 16050 shall be met.
- B. Test results as indicated in 3.02 C shall be submitted.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ground Rods: The ground rods shall be solid copper or copper-clad steel having a diameter of 5/8-inch and a length of 10-feet. The ground rods shall be as manufactured by Copperweld, or approved equal.
- B. Grounding Conductors
 - 1. All grounding conductors shall be copper. Aluminum or copper-clad aluminum grounding conductors will not be allowed.
 - 2. The grounding conductors shall be sized in accordance with the latest edition of the National Electrical Code, Table 250-94 or Table 250-95, whichever is applicable to the particular grounding conductor.
- C. Ground Rod Clamps: The ground rod clamps shall be malleable iron or cast bronze fittings suitable for use with copper conductors. The ground rod clamps shall be as manufactured by Bridgeport Fittings, Inc.; ITT Blackburn, Inc.; or approved equal.
- D. Dissimilar Metals Junctions: Connections between different metals shall be sealed using NO-OXIDE paint, Grade A, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Wherever possible, the Contractor shall connect to an existing plant, area or building grounding grid. Where no such grounding grid exists, the Contractor shall provide grounding as hereinafter specified and/or as shown on the Contract Drawings.
- B. Building grounding grid conductors shall be embedded in backfill material around the structures.
- C. All underground conductors shall be laid slack and, where exposed to mechanical injury, shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard.

- D. Grounding electrodes shall be driven as required. Where rock is encountered, grounding plates may be used in lieu of grounding rods.
- E. All equipment enclosures, motor and transformer frames, conduit systems, cable armor, exposed structural steel and similar items as required by Article 250 of the NEC shall be grounded.
- F. All steel building columns shall be bonded together and connected to the building ground grid.
- G. Exposed connections shall be made utilizing approved grounding clamps. Buried connections shall be Cadweld, or approved equal, welding process.
- H. The ground bus of service entrance equipment shall be connected to the plant, area or building ground grid, whichever is applicable.
- I. For reasons of mechanical strength, grounding conductors extending from the plant, area or building grounding grid or service entrance ground bus, whichever is applicable, to the ground buses of motor control centers and/or unit substations shall be No. 1/0 AWG bare copper.
- J. Lighting transformer neutrals shall be grounded to the nearest grounding electrode.
- K. Conduits stubbed-up below a motor control center shall be fitted with insulated grounding bushings and connected to the motor control center ground bus. Boxes mounted below motor control centers shall be bonded to the motor control center ground bus. The grounding wire shall be sized in accordance with Table 250-95 of the National Electrical Code, except that a minimum No. 12 AWG shall be used.
- L. Motors shall be grounded in accordance with Section 16150, Item 3.01.A of these Specifications.
- M. The Contractor shall exercise care to insure good ground continuity, in particular between conduits and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

3.02 TESTS

- A. The Contractor shall test the ground resistance of the system. The Contractor shall provide all test equipment of which the Owner and Engineer shall have approval.
- B. The dry season resistance of the system shall not exceed five (5) ohms. If a single driven rod does not produce this value, the Contractor shall drive additional rods and/or take other measures as directed by the Owner and Engineer without any cost to the Owner.
- C. The Contractor shall furnish to the Owner and Engineer three (3) copies of the test report certifying that the system is in compliance with the ohmic value requirement. The certified test report shall include, but not necessarily be limited to, the following:
 - 1. Description of the test.
 - 2. Type of test equipment used.
 - 3. Moisture content of the soil.
 - 4. Date and time of the test.

5. Resistance measurement of each rod cluster.
6. Name of individual(s) performing the test.
7. Contractor's certification stamp or seal.

3.03

GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16950 TESTS AND INSPECTIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall arrange for all inspections required by the local authority having jurisdiction. Approval of the installation by any such local authority shall not relieve the CONTRACTOR of any portion of his responsibility for adequate performance of the completed installation.

1.02 SUBMITTALS

- A. The CONTRACTOR shall furnish at least two copies of test records to the ENGINEER. At the completion of all tests specified herein and any others required to make operational all equipment, all records shall be viewed by the CONTRACTOR, then transmitted directly to the ENGINEER. All prints shall be corrected and verified for corrections of in-field changes by the CONTRACTOR prior to submittal.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 PREPARATION

- A. After completion and prior to being energized, the electrical installation shall be tested to the extent necessary to demonstrate that all systems are complete and ready for operation. The CONTRACTOR shall notify the ENGINEER and the OWNER for the final inspection prior to energizing the system.
- B. The CONTRACTOR shall furnish all necessary test equipment to satisfactorily perform all tests specified herein or required by applicable codes and standards.

3.02 TESTING

- A. The CONTRACTOR shall test all wire, cable, equipment, and systems installed or connected under the Agreement to assure proper installation, settings, connection, and functioning in accordance with the Drawings, Specifications and the manufacturer's recommendations.
- B. When conducting tests the CONTRACTOR shall:
 - 1. Include all tests and inspections recommended by the equipment manufacturer and applicable Codes and Standards.
 - 2. Include any additional tests required by the ENGINEER that he deems necessary because of field conditions to determine that equipment, material, and systems meet the requirements of the Specifications.
 - 3. Maintain in quadruplicate a written record of all tests showing date, personnel conducting tests, equipment or material tested, tests performed, manufacturer and serial number of testing equipment and results.

- C. Tests to be accomplished as a minimum are as follows:
1. Control Panels/Panelboards : provide temporary power source to all control/power circuits and check for proper operation prior to energizing equipment served.
 2. Wires and Cables:
 - a. The 600-volt insulated cables shall be factory tested prior to shipment in accordance with IPCEA standards for the insulation specified.
 - b. The following 600-volt wires and cable shall be tested after installation but before final connections are made up:
 - i. All feeders from motor control centers to motors 10 horsepower and larger.
 - ii. All feeders from variable speed drive units.
 - iii. All feeders from motor control centers to lighting panels and dry-type transformers.
 - c. For the above listed cables, a test voltage of 500 volts ac shall be applied for a period of 1 minute between all conductors in the same conduit, and between each conductor and ground.
 - d. All tests shall be made at the Contractor's expense, and certification of the tests shall be submitted to the Engineer. If any failures occur during the tests, the Contractor shall replace the cable.
 3. Motor Test: Motor rotation will be checked by momentary energizing of motor. Correction of rotation shall be made by changing leads on the motor. Motors shall only be energized in the presence of a representative of the OWNER.
 4. Check phase rotation on all bussing. Phasing shall be A-B-C, left to right, top to bottom, front to rear, as viewed from the front.
- D. CONTRACTOR shall be responsible for any damage to equipment or material due to improper test procedures or test apparatus handling, and shall replace or restore to original condition any damaged equipment or material.
- E. CONTRACTOR shall furnish and use safety devices such as rubber gloves and blankets, protective screens, barriers, and danger signs to adequately protect and warn all personnel in the vicinity of the tests.

3.04 DEMONSTRATION OF COMPLETED ELECTRICAL SYSTEMS

- A. Upon the completion of the installation and testing, the CONTRACTOR shall demonstrate and familiarize representatives of the OWNER with the system.

END OF SECTION