

INVITATION FOR BID
CONSTRUCTION
NO. 24-TA005609JK
NORTHWEST BOOSTER PUMP
STATION UPGRADES
PROJECT NO. 6110970
SEPTEMBER 20, 2024

Manatee County BCC
Procurement Division
1112 Manatee Avenue West, 7th Floor, Suite 705
Bradenton, FL 34205
purchasing@mymanatee.org



ADVERTISEMENT

**INVITATION FOR BID CONSTRUCTION NO. 24-TA005609JK
NORTHWEST BOOSTER PUMP STATION UPGRADES**

Manatee County, a political subdivision of the State of Florida (hereinafter referred to as County), will receive sealed bids from individuals, corporations, partnerships, and other legal entities authorized to do business in the State of Florida, to provide Northwest Booster Pump Station Upgrades, as specified in this Invitation for Bid Construction to include booster pump station upgrades.

DATE, TIME AND PLACE DUE:

The Due Date and Time for submission of Bids in response to this Invitation for Bid Construction (IFBC) is **November 14, 2024 at 2:00 PM ET**. Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205 prior to the Due Date and Time.

SOLICITATION INFORMATION CONFERENCE:

A mandatory Information Conference will be held at 8:30 AM ET on October 11, 2024 at 1525 99th Street NW, Bradenton, FL 34209. A mandatory site visit will be conducted immediately following the information conference. Attendance to mandatory information conferences is required.

DEADLINE FOR QUESTIONS AND CLARIFICATION REQUESTS:

The deadline to submit all questions, inquiries, or requests concerning interpretation, clarification or additional information pertaining to this Invitation for Bid Construction to the Manatee County Procurement Division is October 21, 2024. Questions and inquiries should be submitted via email to the Designated Procurement Contact shown below.

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

DESIGNATED PROCUREMENT CONTACT: Julie Kovacs, Procurement Agent III
(941) 749-3046, Fax (941) 749-3034
Email: julie.kovacs@mymanatee.org
Manatee County Financial Management Department
Procurement Division

Jacob Erickson,
MBA, CPPO,
NIGP-CPP

Digitally signed by Jacob
Erickson, MBA, CPPO, NIGP-CPP
Date: 2024.09.19 10:10:01 -04'00'

AUTHORIZED FOR RELEASE: _____

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SECTION A, INFORMATION FOR BIDDERS

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

A.01 BID DUE DATE

The Due Date and Time for submission of Bids in response to this Invitation for Bid Construction (IFBC) is **November 14, 2024 at 2:00 PM ET**. Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205 and time stamped by a Procurement representative prior to the Due Date and Time.

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

A.02 SOLICITATION INFORMATION CONFERENCE AND SITE VISIT:

A mandatory Information Conference will be held at 8:30 AM ET on October 11, 2024 at 1525 99th Street NW, Bradenton, FL 34209. A mandatory site tour will be conducted immediately following the Information Conference. Attendance to mandatory information conference site visit is required.

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

A.03 PUBLIC OPENING OF BIDS

Bids will be opened immediately following the Due Date and Time at the Manatee County Administration Building, 7th Floor in the presence of County officials. Bidders or their representatives may attend the Bid opening.

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

A.04 SUBMISSION OF BIDS

The contents of the Bid sealed package must include:

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

Electronic format copy should be submitted on a Universal Serial Bus (USB) portable flash memory drive or compact disc (CD) in Microsoft Office® or Adobe Acrobat® portable document format (PDF) in one continuous file. Do not password protect or otherwise encrypt electronic Bid copies. Electronic copies must be searchable and contain an identical Bid to the original.

Submit the Bid package in a sealed container with the following information clearly marked on the outside of the package: IFBC NO. 24-TA005609JK, Northwest Booster Pump Station Upgrades, Bidder's name, and Bidder's address. Bids must be delivered to the Manatee County Procurement Division prior to the Due Date and Time at the following address:

Manatee County Procurement Division
1112 Manatee Avenue West, 7th Floor, Suite 705
Bradenton, FL 34205

A.05 DISTRIBUTION OF SOLICITATION DOCUMENTS

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

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

Additionally, the IFBC and all related documents are available for public inspection at the Manatee County Procurement Division, 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205. Call (941) 749-3014 to schedule an appointment. Documents are available between the hours of 8:00 A.M. and 5:00 P.M., Monday through Friday, with the exception of County holidays.

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

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

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

Each bidder may, at bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and

data which pertain to the physical conditions at or contiguous to the Project Site(s) or otherwise which may affect cost, progress, performance or furnishing of the Work and which bidder deems necessary to determine his bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the IFBC documents. County will provide each bidder access to the site(s) to conduct such explorations and tests.

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

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

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

A.07 ADDENDA

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

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

A.08 BID FORMS

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

A.09 BID EXPENSES

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

the Bidder.

A.10 QUESTION AND CLARIFICATION PERIOD

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

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

A.11 FALSE OR MISLEADING STATEMENTS

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

A.12 CONFIDENTIALITY OF SECURITY RELATED RECORDS

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

with a court order requiring such release or disclosure. To the extent successful Bidder receives a request for such records, it shall immediately contact the County's designated Contract administrator who shall coordinate County's response to the request.

A.13 LOBBYING

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

A.14 UNBALANCED BIDDING PROHIBITED

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

- a. Bids showing omissions, alterations of form, additions not specified, or required conditional or unauthorized alternate bids.
- b. Bids quoting prices that substantially deviate, either higher or lower, from those included in the Bids of competitive Bidders for the same line item unit costs.
- c. Bids where the unit costs offered are in excess of, or below reasonable cost analysis values.

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

A.15 FRONT LOADING OF BID PRICING PROHIBITED

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

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

A.16 WITHDRAWAL OR REVISION OF BIDS

Bidders may withdraw Bids under the following circumstances:

- a. If Bidder discovers a mistake(s) prior to the Due Date and Time. Bidder may withdraw its Bid by submitting a written notice to the Procurement Division. The notice must be received in the Procurement Division prior to the Due Date and Time for receiving Bids. A copy of the request shall be retained, and the unopened Bid returned to the Bidder; or
- b. After the Bids are opened but before a contract is signed, Bidder alleges a material mistake of fact if:
 1. The mistake is clearly evident in the solicitation document; or
 2. Bidder submits evidence which clearly and convincingly demonstrates that a mistake was made in the Bid. Request to withdraw a Bid must be in writing and approved by the Purchasing Official.

A.17 IRREVOCABLE OFFER

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

A.18 RESERVED RIGHTS

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

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

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

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

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

A.19 APPLICABLE LAWS

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

A.20 COLLUSION

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

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

A.21 CODE OF ETHICS

With respect to this and any bid, if a Bidder violates, directly or indirectly, the ethics provisions of the Manatee County Procurement Code and/or Florida criminal or civil laws related to public procurement, including but not limited to Florida Statutes Chapter 112, Part II, Code of Ethics for Public Officers and Employees, such Bidder will be ineligible for award to perform the work described in this IFBC, and may be disqualified from submitting on any future quote or bid requests to supply goods or services to Manatee County. By submitting a bid, the Bidder represents to County that all statements made, and materials submitted are truthful, with no relevant facts withheld.

A.22 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES

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

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

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

A.23 SCRUTINIZED COMPANIES

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

extent a certification is required, it shall be provided on the form located at Appendix F *Vendor Certification Regarding Scrutinized Companies Lists*.

A.24 AGREEMENT

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

A.25 LEGAL NAME

Bidders shall clearly indicate the full legal name, including any d/b/a, address, email address, and telephone number on the Bid Form. Bid Forms shall be signed above the typed or printed name and title of the signer. The signer must be an official of the organization and have the authority to bind the bidder to the submitted bid.

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

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

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

A.26 DISCOUNTS

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

A.27 TAXES

Manatee County is exempt from Federal Excise and State Sales Taxes. (F.E.T. Cert. No. 59-78-0089K; Florida Sales Tax Exempt Cert. No. 85-8012622206C-6). Therefore, the Bidder is prohibited from delineating a separate line item in its bid for any sales or service taxes.

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

A.28 QUALITY

Unless otherwise specifically provided in the IFBC documents, all goods provided shall

be new, the latest make or model, of the best quality, of the highest grade of workmanship, and of the most suitable for the purpose intended.

Unless otherwise specifically provided in the IFBC documents, reference to any equipment, material, article or patented process, by trade name, brand name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.

A.29 AUTHORIZED PRODUCT REPRESENTATION

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

A.30 ROYALTIES AND PATENTS

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

A.31 AMERICANS WITH DISABILITIES ACT

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

A.32 EQUAL EMPLOYMENT OPPORTUNITY

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

A.33 MINORITY AND/OR DISADVANTAGED BUSINESS ENTERPRISES

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

A.34 DELIVERY

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

A.35 MATHEMATICAL ERRORS

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

A.36 SUBCONTRACTORS

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

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

A.37 E-Verify

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

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

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

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

A.38 DISCLOSURE

Upon receipt, all inquiries and responses to inquiries related to this IFBC become “Public Records,” and shall be subject to public disclosure consistent with Florida Statutes, Chapter 119.

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

Based on the above, County will receive bids at the time and date stated and will make public at the opening the names of the business entities of all that submitted a bid.

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

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

- a. Keep and maintain public records required by public agency to perform the service.
- b. Upon request from the public agency’s custodian of public records, provide the public agency with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Florida Statutes, Chapter 119, or as otherwise provided by law.
- c. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the successful Bidder does not transfer the records to the public agency.
- d. Upon completion of the contract, transfer, at no cost, to the public agency all public records in possession of contractor or keep and maintain public records required by the public agency to perform the service. If the successful Bidder transfers all public records to the public agency upon completion of the contract, the successful Bidder shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the successful Bidder keeps and maintains public records upon completion of the contract, the successful Bidder shall meet all applicable requirements for retaining public records. All records stored

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

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

Phone: (941) 742-5845

Email: LACY.PRITCHARD@MYMANATEE.ORG

Mail: Manatee County BCC

Attn: Records Manager

1112 Manatee Ave W.

Bradenton, FL 34205.

A.39 LOCAL PREFERENCE

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

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

- a. Purchases or agreements which are funded, in whole or in part, by a governmental or other funding entity, where the terms and conditions governing the funds prohibit the preference.
- b. Any bid announcement which specifically provides that local preference, as set forth in this section, is suspended due to the unique nature of the goods or services sought, the existence of an emergency as found by either the County Commission or County Administrator, or where such suspension is, in the opinion of the County Attorney, required by law.
- c. For a competitive solicitation for construction services in which fifty percent (50%) or more of the cost will be paid from state.
- d. To qualify for local preference under this section, **a local business must certify to County** by completing an **"Affidavit as to Local Business Form,"** which is available for download at www.mymanatee.org/vendor. Click on "Affidavit for Local Business" to access and print the form. Complete, notarize, and mail the notarized original to the following address: Manatee County Procurement Division, 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205.
- e. It is the responsibility of the bidder to ensure accuracy of the Affidavit as to Local Business and notify County of any changes affecting same.

A.40 VENDOR REGISTRATION

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

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

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

A.41 ENVIRONMENTAL SUSTAINABILITY

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

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

A.42 ePAYABLES

Manatee County Board of County Commissioners and the Manatee County Clerk of the Circuit Court have partnered to offer the ePayables program, which allows payments to be made to vendors via credit cards.

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

If Bidder is interested in participating in this program, complete the ePayables Application attached herein and return the completed form via email to victoria.casey@manateeclerk.com.

A.43 BASIS OF AWARD

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

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

Only one (1) completion schedule for 270 calendar days shall be submitted and considered.

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

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

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

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

A.44 SCOPE OF WORK

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

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

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

Replacement of one existing pump with two 2,600 gallons per minute (gpm) @ 30 feet, 30 horsepower pumps, including electrical instrumentation & controls, pressure sustaining valves and yard piping.

A.45 COMPLETION OF WORK

The Work will be completed and ready for final inspection within the specified calendar days from the date the Contract Time commences to run. Substantial completion shall be based on 270 calendar days.

A.46 LIQUIDATED DAMAGES

If the successful Bidder fails to achieve substantial completion of the Work within the contract time and as otherwise required by the Agreement (to include not only the entire Work but any portion of the Work as set forth therein), the County shall be entitled to retain or recover from the successful Bidder, as liquidated damages and not as a penalty, the sum of \$1,413.00 per calendar day, commencing upon the first day following expiration of the contract time and continuing until the actual date of substantial completion.

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

A.47 CONTRACT CONTINGENCY WORK

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

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

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

Inappropriate uses of contract contingency include anything that changes the initial Scope of Work, including the Contract Sum and Contract Time, and adding bid items not previously contemplated that change the initial Scope of Work.

A.48 LICENSES AND PERMITS

The successful Bidder shall be solely responsible for obtaining all necessary license and

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

A.49 PROTEST

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

Protest must be in writing and delivered via email at purchasing@mymanatee.org or by hand delivery to the Procurement Division at 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205 by 5:00 p.m. on the fifth business day following the date of posting of the Notice of Intent to Award on the County website. There is no stay of the procurement process during a protest. The Purchasing Official shall have the authority to settle and resolve a protest concerning the intended award of a contract.

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

A.50 ACCESSIBILITY

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

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

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

A.51 SOLICITATION SCHEDULE

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

Scheduled Item	Scheduled Date
----------------	----------------

Mandatory Information Conference and
Mandatory site tour in accordance with
Article A.02

October 11, 2024 @ 8:30 AM ET

Question and Clarification Deadline

October 21, 2024

Bid Response Due Date and Time

November 14, 2024, 2:00 PM, ET

Projected Award

January 2025

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

END OF SECTION A

SECTION B, BID FORMS

(To be completed and returned with Bid)

APPENDIX A, MINIMUM QUALIFICATIONS

IFBC No. 24-TA005609JK

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

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

No documentation is required. The County will verify registration.

2. Bidder must possess a General Contractor's License issued by the Florida Department of Business and Professional Regulation for a period of at least three (3) consecutive years since September 1, 2021. License must be current and valid through the Due Date for submission of bids for this IFBC.

Bidder shall provide a copy of the license, issued by the Florida Department of Business and Professional Regulation and documentation confirming Bidder has been licensed and or certified for the period of three (3) consecutive years since September 1, 2024, through the date of submission of the bid.

3. Bidder or Bidder's subcontractor has provided booster pump station upgrades for at least three (3) projects since September 1, 2019 in which each project included the following components: (i) Installation of 30hp or greater Electronic VFD Motors and Pumps at a booster station or wastewater treatment plant; (ii) Installation of Ductile Iron (DI) Pipe and Valves 24" diameter and larger; (iii) Wiring of electric motors to panels; (iv) Experience working on piping to and from Ground Storage Tanks; (v) Experience working inside a Ground Storage Tank. **Project clients must be agreeable to responding to an inquiry by the County.**

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

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

4. Bidder has provided turnkey operational and on time building construction projects for containing chemical dosing equipment for the same or larger footprint for at least three (3) project since September 1, 2019.

Provide the following information for the qualifying reference.

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

5. Bidder, on the day the bid is submitted, has a certified or registered Qualifying Agent, as required by Section 489.119, Florida Statutes, and that Qualifying Agent has been the same Qualifying Agent of Bidder for a period of at least two (2) consecutive years, since September 1, 2022.

Submit a copy of Bidder's Qualifying Agent's registration or certification along with supporting documentation confirming Qualifying Agent has been the Qualifying Agent for Bidder for two (2) years, since September 1, 2022.

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

No documentation is required. The County will verify.

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

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

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

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

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

END OF APPENDIX A

APPENDIX B, BIDDER'S QUESTIONNAIRE

IFBC No. 24-TA005609JK

Bidder must fully complete and return this form with its Bid. Bidder warrants the truth and accuracy of all statements and answers herein contained. (Attach additional pages if necessary.)

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID

1. Contact Information:

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

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

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

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

For how many years? _____

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

Is this firm in bankruptcy? _____

6. Attach a detailed list of Bidders workloads for the next six (6) months that are related to the project as outlined in this IFBC.

BIDDER: _____

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

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

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

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

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

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

BIDDER: _____

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

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

Boring specialist's name: _____

Boring specialist's years of experience in supervising directional bores _____

Provide contact name, and contact number for projects:

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

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

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

OR

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

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

BIDDER: _____

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

18. List the following regarding the surety which is providing the bond(s):

Surety's Name: _____

Address: _____

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

Agent's Name: _____

Address: _____

Phone: _____

Email: _____

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

Yes

No

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

BIDDER: _____

BY: _____

PRINTED NAME: _____

TITLE/DATE: _____

PHYSICAL ADDRESS OF QUALIFYING LOCAL LOCATION: _____

NAME OF QUALIFYING EMPLOYEE AT LOCAL LOCATION: _____

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

Yes No

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

BIDDER: _____

APPENDIX C, ENVIRONMENTAL CRIMES CERTIFICATION

IFBC No. 24-TA005609JK

SWORN STATEMENT PURSUANT TO ARTICLE V, MANATEE COUNTY PROCUREMENT CODE

Bidder must fully complete and return this form with its Bid. This form must be signed and sworn to in the presence of a notary public or other official authorized to administer oaths.

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

_____ [Print individual's name and title]

for _____ [Print name of entity submitting sworn statement]

whose business address is _____

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

_____.

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

- (1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or
- (2) been convicted of an agreement or collusion among bidders or prospective bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or
- (3) been convicted of a violation of an environmental law that, in the sole opinion of Owner's Purchasing Official, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or
- (4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or

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

(Continued)

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

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

[Signature]

STATE OF _____
COUNTY OF _____

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

Who is personally known / has produced _____ as
identification

[Type of identification]

My commission expires _____

Notary Public Signature

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

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

APPENDIX D, FLORIDA TRENCH SAFETY ACT

Bidder must fully complete and return this form with its Bid. This form must be signed in the presence of a notary public or by an officer authorized to administer oaths.

1. This Sworn Statement is submitted with **IFBC No. 24-TA005609JK**
2. This Sworn Statement is submitted by _____ whose business address is _____ and, if applicable, its Federal Employer Identification Number (FEIN) is _____. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement _____.
3. Name of individual signing this Sworn Statement is: _____, Whose relationship to the above entity is: _____.
4. The Trench Safety Standards that will be in effect during the construction of this project shall include, but are not limited to: Laws of Florida, Chapters 90-96, TRENCH SAFETY ACT, and OSHA RULES AND REGULATIONS 29 CFR 1926.650 Subpart P, effective October 1, 1990.
5. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless the County and Engineer of Record, and any of their agents or employees from any claims arising from the failure to comply with said standard.

6. The undersigned has appropriated the following costs for compliance with the applicable standards:

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

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

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

(Authorized signature / Title)

SWORN to and subscribed before me this _____ day of _____, 20____.
(Impress official seal)

Notary Public, State of _____ : _____

My commission expires: _____



Angelina M. Colonnese

CLERK OF THE CIRCUIT COURT AND COMPTROLLER OF MANATEE COUNTY

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

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

APPENDIX E: ePAYABLES APPLICATION

Company name _____

Contact person _____

Phone number _____

Email Address _____

FINANCE USE ONLY

.....

Open orders: YES or NO

PEID _____

CREATE DATE _____

CONFIRMED _____ WITH

Name and phone number

IFAS _____

BANK _____

INITIALS _____

Return completed form Via email to:

tina.mancini@manateeclerk.com

Via fax to: (941) 741-4011

Via mail:

PO Box 1000

Bradenton, FL 34206

Revised: September 30, 2015

“Pride in Service with a Vision to the Future”

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

APPENDIX F, SCRUTINIZED COMPANY CERTIFICATION
IFBC No. 24-TA005609JK

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

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

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

Company _____ FID _____ or EIN _____ No. _____

Address _____

City _____ State _____ Zip _____

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

Signature

Title

Printed Name

Date

APPENDIX G, MANATEE COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA INDEMNITY AND HOLD HARMLESS
 IFBC No. 24-TA005609JK

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

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

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

PROJECT NUMBER AND/OR NAME	
INSURANCE AGENT	
RESPONDENT SIGNATURE	DATE

Acknowledgement:

STATE OF _____ COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ day of _____,

20__ by _____ [FULL LEGAL NAME], who is

personally known to me / has produced _____ as identification.

Notary Signature _____

Print Name _____

APPENDIX H, INSURANCE STATEMENT

IFBC No. 24-TA005609JK

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

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

Bidder Name: _____ Date: _____

Signature
(Authorized
Official): _____

Printed
Name/Title: _____

Insurance Agency: _____

Agent Name: _____ Agent Phone: _____

APPENDIX I, ACKNOWLEDGMENT OF ADDENDA

IFBC No. 24-TA005609JK

The undersigned acknowledges receipt of the following addenda:

Addendum No. _____	Date Received:

Print or type Bidder’s information below:

Name of Bidder	Telephone Number

Street Address	City/State/Zip

Email Address	

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

APPENDIX J, AFFIDAVIT OF NO CONFLICT

IFBC No. 24-TA005609JK

COUNTY OF _____
STATE OF _____

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

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

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

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

Affiant makes this affidavit for the purpose of inducing Manatee County, a political subdivision of the State of Florida, to enter into an Agreement for Northwest Booster Pump Station Upgrades.

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

Signature

Print Name

SUBSCRIBED to and sworn before me this ____ day of _____, 20__.

[Notary Seal]

Notary Public

My commission expires: _____

Notary Signature

Print Name

Personally known OR produced identification. Type of identification produced _____
_____.

APPENDIX K, ANTI-HUMAN TRAFFICKING AFFIDAVIT

(Section 787.06, Florida Statutes)

Before me, the undersigned authority, personally appeared _____, who was sworn and says that the following information is true and correct:

1. My name is _____ of _____. I have been authorized by the Company to provide and execute this affidavit.
2. I am over eighteen years of age and the following information is given from my own personal knowledge.
3. Company is a nongovernmental entity and I hereby attest that Company does not use coercion for labor or services as defined in Section 787.06, Florida Statutes.
4. This affidavit is made and given by affiant under penalty of perjury with full knowledge of applicable Florida laws regarding sworn affidavits and the penalties and liabilities resulting from false statements and misrepresentations therein.

Signature

STATE OF _____
COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of

- physical presence or
- online notarization

this _____ day of _____, 2024, by _____, who

- is personally known to me or
- has produced _____ as identification.

[CHECK APPLICABLE BOXES TO SATISFY IDENTIFICATION REQUIREMENT OF SECTION 117.05, FLORIDA STATUTES]

Signature of Notary Public

My Commission Expires: _____

APPENDIX L, BID SIGNATURE FORM

IFBC No.24-TA005609JK, Northwest Booster Pump Station Upgrades

Total Bid Price/Offer for Bid : \$ _____ Complete. Base on a completion time of 270 calendar days.

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

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

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

Authorized Signature(s): _____

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

Date: _____



APPENDIX M, BID PRICING FORM
 IFBC No. 24-TA005609JK
 NORTHWEST BOOSTER PUMP STATION UPGRADES
 Project Number: 6110970

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

ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL
1	Mobilization/Demobilization	LS	1		
2	Site Work				
2A	New Fence & Gate	LS	1		
2B	New Asphalt	SY	50		
2C	Drainage Improvements	LS	1		
2D	Site Restoration	LS	1		
3	Demolition				
3A	Fence & Gate	LS	1		
3B	Pavement Removal	SY	50		
3C	Chemical Tank Removal	EA	2		
3D	Chemical Skid Removal	EA	2		
3E	Chemical Feed Piping Removal	LS	1		
3F	Electrical	LS	1		
4	Chemical Storage & Feed Systems				
4A	Ammonium Sulfate Tanks	EA	2		
4B	Ammonium Sulfate Metering Pump Skid	EA	1		
4C	Sodium Hypochlorite Tank	EA	2		
4D	Sodium Hypochlorite Metering Pump Skid	EA	1		
4E	3" Sch. 80 PVC / Fittings	LF	80		
4F	2" Sch. 80 PVC / Fittings	LF	80		
4G	1" Sch. 80 PVC / Fittings	LF	60		
4H	2" Sch. 80 PVC w/ 1/2" Polytube	LF	60		
4I	Pipe Hangers and Supports	LS	1		
4J	2" Ball Valve	EA	4		
4K	3" Ball Valve	EA	2		
4L	1" Flexible Connection	EA	4		
4M	Emergency Eyewash and Shower Station	EA	1		
4N	24" x 2" Stainless Steel Tapping Saddle	EA	1		
4O	1" Eyewash/Shower Feed BFP Assembly	EA	1		
5	Mechanical Improvements				
5A	Pump and Motor Replacement (Pumps #1 & #2)	EA	2		
5B	12" x 10" FL Reducer	EA	2		
5C	12" x 8" FL Reducer	EA	2		
5D	8" FL Adapter	EA	2		
5E	16" Motorized Butterfly Valve	EA	2		
5F	12" Pressure Sustaining Valve	EA	1		
5G	Pipe Supports	EA	4		
5H	Pump Pads and Grouting	LS	1		
5I	Tank Drain Pumping System	LS	1		

Bidder: _____

Manatee County BCC
 Signature: _____

ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL
6	Chemical Building, Full Construction	LS	1		
7	Electrical				
7A	General Provisions	LS	1		
7B	Grounding & Bonding	LS	1		
7C	Hangers & Supports	LS	1		
7D	Conductors & Cables	LS	1		
7E	Electrical Raceways	LS	1		
7F	Electrical Enclosures	LS	1		
7G	Underground Ductbanks	LS	1		
7H	Manholes & Handholes	LS	1		
7I	Wiring Devices	LS	1		
7J	Mini-Power Centers	LS	1		
7K	Motor Control Centers (MCCs)	LS	1		
7L	Low-Voltage Variable Frequency Drives	LS	1		
7M	Lighting	LS	1		
8	Instrumentation & Controls				
8A	Field Equipment	LS	1		
8B	Control Enclosures	LS	1		
9	Record Drawings	LS	1		
10	Permit Allowance	LS	1		
SUBTOTAL					
11	Contract Contingency (Authorized County Use Only)	10%	1		
TOTAL BID BASE ON 270 CALENDAR DAYS:					

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

Bidder: _____

Signature: _____
 Manatee County BCC

SECTION C, BID ATTACHMENTS

BID ATTACHMENT 1, INSURANCE AND BOND REQUIREMENTS

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

Automobile Liability Insurance Required Limits

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

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

This policy shall contain severability of interests' provisions.

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

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

- \$1,000,000 Single Limit Per Occurrence
- \$2,000,000 Aggregate
- \$1,000,000 Products/Completed Operations Aggregate
- \$1,000,000 Personal and Advertising Injury Liability
- \$50,000 Fire Damage Liability
- \$10,000 Medical Expense, and
- \$1,000,000, Third Party Property Damage
- \$ Project Specific Aggregate (Required on projects valued at over \$10,000,000)

This policy shall contain severability of interests' provisions.

Employer's Liability Insurance

Coverage limits of not less than:

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

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

Coverage limits of not less than:

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

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

Aircraft Liability Insurance Required Limits

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

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

Un-Manned Aircraft Liability Insurance (Drone)

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

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

Installation Floater Insurance

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

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

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

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

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

Builder's Risk Insurance

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

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

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

Cyber Liability Insurance

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

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

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

Hazardous Materials Insurance (As Noted Below)

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

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

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

Pollution Liability

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

Asbestos Liability (If handling within scope of Contract)

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

Disposal

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

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

Hazardous Waste Transportation Insurance

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

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

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

Liquor Liability Insurance

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

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

Garage Keeper’s Liability Insurance

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

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

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

Bailee’s Customer Liability Insurance

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

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

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

Hull and Watercraft Liability Insurance

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

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

Other [Specify]

BOND REQUIREMENTS

Bid Bond

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

Payment and Performance Bond

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

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INSURANCE REQUIREMENTS

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

1. Commercial General Liability and Automobile Liability Coverages

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

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

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

2. Workers' Compensation and Employers' Liability Coverages

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

II. GENERAL INSURANCE PROVISIONS APPLICABLE TO ALL POLICIES:

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

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

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

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

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

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

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BID ATTACHMENT 2, TECHNICAL SPECIFICATIONS

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

NORTHWEST BOOSTER STATION UPGRADES

**Prepared for
BOARD OF COUNTY COMMISSIONERS
COUNTY OF MANATEE, FLORIDA
COUNTY PROJECT NO. 6110970**



ISSUED FOR BID

AUGUST 2024

Prepared by



**1365 Hamlet Ave
Clearwater, Florida 33756
Ph: 727/442-7196
Fax: 727/461-3827**

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COUNTY PROJECT NO. 6110970
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06600	Fiberglass Reinforced Polymer (FRP) Products and Fabrications.....	06600-1 - 5

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16062 Lightning Protection System for Structures 16062-1 - 5
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16135 Pull, Junction and Terminal Boxes 16135-1 - 4
16140 Wiring Devices 16140-1 - 4
16143 Disconnect Switches 16143-1 - 3
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16370	Variable Frequency Drives	16370-1 - 9
16423	Motor Control Centers	16423-1 -13
16450	Grounding and Bonding for Electrical Systems	16450-1 - 5
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This specification includes by reference the Manatee County Public Works Standards, Part I Utilities Standards Manual approved September 2023 and subsequent Manatee County issued Technical Memorandum revising the Utilities Standards Manual.

This specification includes by reference the Manatee County Public Works Standards, Part 3 Highway & Traffic Standards Manual approved April 2022.

END OF TOC

SECTION 00005 - CERTIFICATION PAGES

PROFESSIONAL ENGINEER'S CERTIFICATION FOR PHILLIP J. LOCKE, PE

PROJECT NAME: NORTHWEST BOOTER STATION UPGRADES

The following sections of the Technical Specifications in the Issued for Bid submittal for the above referenced project were prepared under my direction and supervision.

DIVISION 1 - GENERAL REQUIREMENTS

01005 General Requirements
01010 Summary of Work
01015 Control of Work
01030 Special Project Procedures
01040 Coordination with Owner's Operations
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 & Testing Laboratory Services
01510 Temporary & Permanent Utilities
01570 Traffic Regulation
01580 Project Identification & Signs
01600 Material and Equipment
01620 Storage and Protection
01700 Contract Closeout
01710 Cleaning
01720 Project Record Documents
01724 Connections to Existing Systems
01730 Operating and Maintenance Data
01740 Warranties and Bonds
01900 Permits

DIVISION 2 - SITE WORK

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02064 Modifications to Existing Structures, Piping and Equipment
02110 Clearing and Grubbing

- 02220 Excavation, Backfill, Fill and Grading for Structures
- 02221 Trenching, Bedding and Backfill for Pipe
- 02223 Excavation Below Grade and Crushed Stone or Shell Refill
- 02260 Finish Grading
- 02276 Temporary Erosion and Sedimentation Control
- 02315 Excavating, Backfilling and Compacting
- 02485 Seeding and Sodding
- 02513 Asphalt Concrete Paving
- 02575 Pavement Repair and Restoration
- 02615 Ductile Iron Pipe and Fittings
- 02616 Disinfection
- 02617 Installation and Testing of Pressure Pipe
- 02640 Valves and Appurtenances

DIVISION 11 - EQUIPMENT

- 11235 Chemical Storage and Feed Systems
- 11310 Axial Split Case Centrifugal Pumps

DIVISION 15 - MECHANICAL

- 15051 Pipe and Pipe Fittings - General Statement

Phillip J. Locke, PE
Florida Professional Engineer No. 57527
McKim & Creed, Inc.
1365 Hamlet Avenue
Clearwater, Florida 33756

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THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY PHILIP LOCKE, PE ON
THE DATE ADJACENT TO THE SEAL.

PROFESSIONAL ENGINEER'S CERTIFICATION FOR ANTHONY WANG, PE

PROJECT NAME: NORTHWEST BOOTER STATION UPGRADES

The following sections of the Technical Specifications in the Issued for Bid submittal for the above referenced project were prepared under my direction and supervision.

DIVISION 3 - CONCRETE

03300 Cast-In-Place Concrete
03301 Anchor Systems
03350 Concrete Finishes
03600 Grouting

DIVISION 5 - METALS

05500 Metal Fabrications
05521 Pipe and Tube Railings
05531 Metal Gratings

DIVISION 6 - WOOD AND PLASTICS

06600 Fiberglass Reinforced Polymer (FRP) Products and Fabrications

DIVISION 9 - PAINTING

09900 Painting

Anthony Wang, PE
Florida Professional Engineer No. 64477
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Jacksonville, FL 32256

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PROFESSIONAL ARCHITECT'S CERTIFICATION FOR JOHN D. CHRISTIE, AIA

PROJECT NAME: NORTHWEST BOOSTER STATION UPGRADES

The following sections of the Technical Specifications in the Issued for Bid submittal for the above referenced project were prepared under my direction and supervision.

DIVISION 6 - WOOD AND PLASTICS

06100 Rough Carpentry
06175 Shop-Fabricated Wood Trusses

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07411 Metal Roof Panels
07920 Sealants and Caulking

DIVISION 8 - WINDOWS AND DOORS

08161 Fiberglass Doors
08710 Door Hardware

DIVISION 10

10200 Louvers and Vents
10522 Fire Extinguishers, Cabinets & Accessories



John D. Christie, AIA
Florida Registered Architect No. AR0016722
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St. Petersburg, FL 33705

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DATE ADJACENT TO THE SEAL.

PROFESSIONAL ENGINEER'S CERTIFICATION FOR LAUREL L. SMITH, PE

PROJECT NAME: NORTHWEST BOOSTER STATION UPGRADES

The following sections of the Technical Specifications in the Issued for Bid submittal for the above referenced project were prepared under my direction and supervision.

DIVISION 13 - SPECIAL CONSTRUCTION

- 13100 Instrumentation and Control, General Requirements
- 13120 Instrumentation and Control, Field Equipment
- 13130 Instrumentation and Control, Enclosures
- 13140 Instrumentation and Control, SCADA Hardware

DIVISION 16 - ELECTRICAL

- 16050 Electrical - General Provisions
- 16062 Lightning Protection System for Structures
- 16075 Identification for Electrical Systems
- 16110 Conduits and Fittings
- 16120 Wires and Cables
- 16135 Pull, Junction and Terminal Boxes
- 16140 Wiring Devices
- 16143 Disconnect Switches
- 16215 Electrical Power Distribution Studies
- 16289 Surge Protective Devices
- 16370 Variable Frequency Drives
- 16423 Motor Control Centers
- 16450 Grounding and Bonding for Electrical Systems
- 16463 Mini-Power Centers
- 16500 Lighting
- 16505 Hangers and Supports for Electrical Systems

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Florida Professional Engineer No. 91041
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THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY LAUREL SMITH, PE ON THE
DATE ADJACENT TO THE SEAL.

END OF SECTION

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. The Contractor shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the County, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all incidental costs. The Contractor 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 the Contractor's 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, vaults, pumps, and all other appurtenances and facilities pertaining thereto.

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

Public utility installations or structures owned or controlled by the County or other governmental body, which are required by this contract to be removed, relocated, replaced or rebuilt by the Contractor not identified in any separate bid item shall be

considered as a part of the general cost of doing the work and shall be included in the prices bid for the various contract items. No separate payment shall be made.

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

The Contractor shall give written notice to County and other governmental utility departments and other owners of public utilities of the location of the Contractor's proposed construction operations, at least forty-eight (48) hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the "Sunshine State One-Call of Florida, Inc. Call Center ("Call Sunshine") and per all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).

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

1.02 PLANS AND SPECIFICATIONS

A. Plans

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

B. Copies Furnished to Contractor

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

C. Supplementary Drawings

When, in the opinion of the County, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the County and five (5) paper prints thereof will be given to the Contractor.

D. Contractor to Check Plans and Data

The Contractor shall verify all dimensions, quantities, and details shown on the Plans, Supplementary Drawings, Schedules, Specifications, or other data received from the County and shall notify the Contractor 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 the Contractor's own expense. The Contractor will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the County, should such errors or omissions be discovered. All schedules are given for the convenience of the County and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

E. Specifications

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

F. Intent

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

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

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

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer

All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the County, that the manufacturer or subcontractor deal directly with the County. Any such transactions

shall not in any way release the Contractor from the Contractor's full responsibility under this Contract.

Any two (2) or more pieces or material or equipment of the same kind, type or classification, and being used for identical types of services, shall be made by the same manufacturer.

B. Delivery

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

C. Tools and Accessories

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

Spare parts shall be furnished as specified.

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

D. Installation of Equipment.

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

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

The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the County and made of ample size and strength for the purpose intended. Substantial templates and working drawings for installation shall be furnished.

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

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

E. Service of Manufacturer's Engineer

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

1.04 INSPECTION AND TESTING

A. General

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

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

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

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

The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the County formally takes over the operation thereof.

B. Costs

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

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

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

C. Inspections of Materials

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

D. Certificate of Manufacture

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

E. Shop Tests of Operating Equipment

Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the work until the County notifies the Contractor, in writing, that the results of such tests are acceptable.

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

F. Preliminary Field Tests

As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make preliminary field tests of equipment. If the preliminary field tests disclose any equipment furnished under this Contract which does not

comply with the requirements of the Contract Documents, the Contractor shall, prior to the acceptance tests, make all changes, adjustments and replacements required. The furnishing Contractor shall assist in the preliminary field tests as applicable.

G. Final Field Tests

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

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

H. Failure of Tests

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

In case the County rejects any materials and equipment, then the Contractor shall replace the rejected materials and equipment within a reasonable time. If the Contractor fails to do so, the County may, after the expiration of a period of thirty (30) calendar days after giving the Contractor 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 the Contractor's Contract.

I. Final Inspection

During such final inspections, the work shall be clean and free from water. In no case will the final pay application be prepared until the Contractor has complied with all requirements set forth and the County has made the 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 the Contractor's own expense, if so ordered by the County, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced. The County shall be solely responsible for the

determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

1.06 TEMPORARY SERVICES

A. First Aid

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

1.07 LINES AND GRADES

A. Grade

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

B. Safeguarding Marks

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

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

C. Datum Plane

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

1.08 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility

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

to avoid interference with the work, payment therefore will be made as provided for in the General Conditions.

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

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

Prior to the beginning of any excavations, the Contractor shall advise the County of all buildings or structures on which the Contractor 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 the Contractor's employees shall be replaced by the Contractor with new stock of similar size and age, at the proper season and at the sole expense of the Contractor.
2. Beneath trees or other surface structures, where possible, pipelines may be built in short tunnels, backfilled with excavated materials, except as otherwise specified, or the trees or structures carefully supported and protected from damage.
3. The County may order the Contractor, for the convenience of the County, to remove trees along the line or trench excavation. If so ordered, the County will obtain any permits required for removal of trees. Such tree removal ordered shall be paid for under the appropriate Contract Items.

C. Lawn Areas

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

D. Restoration of Fences

Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the

approval of the County. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or items, or if no specific Item is provided therefore, as part of the overhead cost of the work, and no additional payment will be made therefore.

1.09 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights

During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchpersons 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 or valves.

E. Dust prevention

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

1.10 CUTTING AND PATCHING

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

1.11 CLEANING

A. During Construction

During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the County, such material, debris, or rubbish constitutes a nuisance or is objectionable. The Contractor shall remove from the site all of the Contractor's 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 the Contractor 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 the Contractor 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 the Contractor's operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches.
2. The Contractor, at the Contractor's own expense, shall remove any siltation deposits and correct any erosion problems as directed by the County which results from the Contractor's construction operations.

B. Protection of Wetland Areas

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

C. Existing Facilities

The work shall be so conducted to maintain existing facilities in operation 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 performing upgrades to the Northwest Booster Pump Station as described in the Specifications and as shown on the Contract Drawings.
- C. 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.
- D. The Contractor shall perform the work complete, tested, in place and ready for continuous service and shall include any repairs, replacements, and/or restoration required because of damages caused prior to acceptance by the County.
- E. 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.
- F. The Contractor shall provide a Sequence of Work Plan and Maintenance of Operations Plan to be approved by the County prior to work commencement.

1.02 CONTRACTS

- A. Construct all the Work under a single contract.

1.03 WORK SEQUENCE

- A. All work done under this Contract shall be done with a minimum of inconvenience to the users of the system.
- B. The Contractor shall, if necessary and feasible, construct the work in stages to accommodate the County's use of the premises during the construction period; coordinate the construction schedule and operations with the County's Representative.

1.04 CONSTRUCTION AREAS

- A. The Contractor shall: Limit their use of the construction areas for work and for storage, to allow for:
 - 1. Work by other Contractors.
 - 2. County's Use.
- B. Coordinate use of work site under direction of County's Representative.
- C. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.

- D. Move any stored products under the Contractor's control, which interfere with operations of the County or separate contractor.
- E. Obtain and pay for the use of additional storage of work areas needed for Contractor operations.

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

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

1.02 PRIVATE LAND

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

1.03 WORK LOCATIONS

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

1.04 OPEN EXCAVATIONS

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

1.05 DISTRIBUTION SYSTEMS AND SERVICES

- A. The Contractor shall avoid interruptions to water, telephone, cable TV, sewer, gas, or other related utility services. The Contractor shall notify the County and the appropriate agency well in advance of any requirement for dewatering, isolating,

or relocating a section of a utility, so that necessary arrangements may be made.

- B. If it appears that utility service will be interrupted for an extended period, the County may order the Contractor to provide temporary service lines at the Contractor's expense. Inconvenience of the users shall be kept to the minimum, consistent with existing conditions. The safety and integrity of the systems are of prime importance in scheduling work.

1.06 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

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

1.07 TEST PITS

- A. 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 the Contractor's expense, to a condition equal or better to that existing before the damage was done, or the Contractor shall make good the damage in another manner acceptable to the County.

- B. All sidewalks which are disturbed by the Contractor's operations shall be restored to their original or better condition by the use of similar or comparable materials. All curbing shall be restored in a condition equal to the original construction and in accordance with the best modern practice.
- C. Along the location of this work, all fences, walks, bushes, trees, shrubbery and other physical features shall be protected and restored in a thoroughly workmanlike manner unless otherwise shown on the drawings. Fences and other features removed by the Contractor shall be replaced in the location indicated by the County as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be regraded and sodded to equal or exceed original conditions.
- D. Trees close to the work which drawings do not specify to be removed, shall be boxed or otherwise protected against injury. The Contractor shall trim all branches that are liable to damage because of the Contractor's operations, but in no case shall any tree be cut or removed without prior notification to the County. All injuries to bark, trunk, limbs and roots of trees shall be repaired by dressing, cutting and painting according to approved methods, using only approved tools and materials.
- E. The protection, removal and replacement of existing physical features along the line of work shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit and/or lump sum prices established under the items in the Bid.

1.09 MAINTENANCE OF TRAFFIC

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

1.10 WATER FOR CONSTRUCTION PURPOSES

- A. In locations where public water supply is available, the Contractor may purchase

water for all construction purposes.

- B. The Contractor shall be responsible for paying for all water tap fees incurred for the purpose of obtaining a potable water service or temporary use meter.

1.11 MAINTENANCE OF FLOW

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

1.12 CLEANUP

- A. During the course of the work, the Contractor shall keep the site of the Contractor's operations in as clean and neat a condition as is possible. The Contractor shall dispose of all residue resulting from the construction work and at the conclusion of the work, the Contractor shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.

1.13 COOPERATION WITHIN THIS CONTRACT

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

1.14 PROTECTION OF CONSTRUCTION AND EQUIPMENT

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

- C. Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the County.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01030 SPECIAL PROJECT PROCEDURES

PART 1 GENERAL

1.01 PERMITS

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

1.02 CONNECTIONS TO EXISTING SYSTEM

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

1.03 RELOCATIONS

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

1.04 EXISTING UNDERGROUND PIPING, STRUCTURES AND UTILITIES

- A. The attention of the Contractor is drawn to the fact that during excavation, the possibility exists of the Contractor encountering various utility lines not shown on the Drawings. The Contractor shall exercise extreme care before and during excavation to locate and flag these lines as to avoid damage to the existing lines.
- B. It is the responsibility of the Contractor to ensure that all utility or other poles, the stability of which may be endangered by the close proximity of excavation, are temporarily stayed in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice.
- C. The existing utility locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered. The Contractor shall be responsible for notifying the various utility companies to locate their respective utilities in advance of construction in conformance with all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).
- D. The existing piping and utilities that interfere with new construction shall be rerouted as shown, specified, or required. Before any piping and utilities not shown

on the Drawings are disturbed, the Contractor shall notify the County and shall provide suggestions on how best to resolve the issue.

- E. The Contractor shall exercise care in any excavation to locate all existing piping and utilities. All utilities which do not interfere with complete work shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at the Contractor's expense as directed by the County.
- F. It is intended that wherever existing utilities such as water, sewer, gas, telephone, electrical, or other service lines must be crossed, deflection of the pipe within recommended limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated in the Drawings. However, when in the opinion of the County this procedure is not feasible, the County 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 MAINTENANCE OF OPERATIONS FOR EXISTING FACILITIES

- A. Prior to beginning construction, the Contractor shall submit a Construction Sequencing and Phasing Plan for review and approval. The Plan shall include sufficient detail to indicate key activities, durations of key activities, and sequencing/phasing to illustrate the following (at a minimum):
 - 1. How operations of the existing facilities will be maintained during construction;
 - 2. How the existing booster pumping and chemical feed systems will be maintained during demolition and construction;
 - 3. Planned shutdowns of existing equipment and facilities including durations of shutdowns

Other than mobilization, no work will be allowed on the site until the Construction Sequencing and Phasing Plan is approved by the County and the County's Representative.

- B. Any power outage or any work, which requires interruption of the PUMP STATION flow, shall be scheduled during those times of the day and/or night when potable water demands are low. In such cases, the Contractor shall submit a written request at least 14-calendar days prior to the scheduled work or outage and obtain the written permission from the County. The Contractor shall coordinate with the electric utility, as required, regarding the scheduling of the power outages.
- C. The County's personnel shall be responsible for the day-to-day operations of the existing Booster Pump Station, including meter reading, process monitoring, and establishing control system modifications to ensure compliance standards.
- D. The Contractor shall consider the following scheduling criteria and constraints to assist with the development of the construction and phasing schedule.
 - 1. Prior to the complete system startup, all equipment required shall be started, tested, and made ready for operation.

2. Testing for the various project system components cannot be performed until the startup testing plan is approved by the County or the County's representative.
 3. The system cannot be placed into operation until all components and processes are started, tested, disinfected, and certified to be placed into operation.
- E. As part of the construction sequence, the Contractor shall provide temporary pumping facilities, temporary piping and temporary power, during the times for the assigned work. These pumping facilities or other means that the Contractor elects for bypass pumping shall be subject to the review and approval of the County or County's Representative and shall be provided by the Contractor. These pumping facilities shall be part of the Contractor's bid; no additional payment shall be made for temporary pumping or piping needed for Construction.
- F. Contractor shall make whatever provisions are necessary to protect all existing facilities.
- G. All existing electrical underground services and underground piping in the vicinity of the Project shall be located and identified prior to starting any new construction.
- H. Other work, including new construction and demolition not mentioned in the above schedule may be performed concurrently with the work as long as the performance of such work will in no way jeopardize the continuity and quality of treatment operations at the existing facility, and as submitted and approved by the County and County's Representative. Nothing contained herein shall preclude the Contractor from suggesting improved sequences of work. The Contractor shall coordinate their work closely with the ongoing functions of the existing pumping facility, chemical and other deliveries and with the work of all subcontractors.

1.06 OPERATIONS DURING CONSTRUCTION

- A. Maintenance of operations of the existing booter pumping and chemical feed systems is critical. All means, methods and costs to maintain the operations (as specified herein) of said facility shall be included in the Contractor's Base Bid. The following is a general list of some of the construction activities which the Contractor will need to account for in maintaining operations of the facility:
1. Temporary piping, valves.
 2. Temporary flow meter, power wire, signal wire, conduit, etc.
 3. New drives, MCCs, connections to existing yard piping, new chemical metering pumps and panels, etc.
 4. Instrumentation system modifications and integration of new components into the existing facility.
 5. Removal and replacement of existing piping, electrical wire and conduit, signal wiring and conduit.

This list does not purport to be all inclusive; the Contractor is responsible for coordinating with plant staff to perform all required construction, while maintaining operations of the existing pump station as Specified herein.

- C. In addition to the previous requirements, Table 01030-1 provides information for some of the anticipated electrical shutdowns.

TABLE 01030-1 ELECTRICAL SHUT-DOWN INFORMATION				
Shut-down No.	Area	Equipment	Constraints	Maximum Duration
1	Installation of feeder to New Electrical Building MCC	Utility Transformer	Loss of power	8hrs
2	Transfer of individual power to equipment	All equipment connected to existing pump station	Loss of individual pieces of equipment	1-4hrs

1.07 SUSPENSION OF WORK DUE TO WEATHER

- A. Refer to FDOT Standards and Specifications Book, Section 8.

1.08 HURRICANE PREPAREDNESS PLAN

- A. Within 30 days of the date of Notice to Proceed, the Contractor shall submit to the County a Hurricane Preparedness Plan. The plan should outline the necessary measures which the Contractor proposes to perform at no additional cost to the County in case of a hurricane warning.
- B. In the event of inclement weather, or whenever County shall direct, Contractor shall insure that the Contractor and the Contractor's Subcontractors shall carefully protect work and materials against damage or injury from the weather. If, in the opinion of the County, any portion of work or materials is damaged due to the failure on the part of the Contractor or Subcontractors to protect the work, such work and materials shall be removed and replaced at the expense of the Contractor.

1.09 POWER SUPPLY

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

1.10 SALVAGE

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

1.11 DEWATERING

- A. The Contractor shall do all groundwater pumping necessary to prevent flotation of any part of the work during construction operations with the Contractor's own equipment.
- B. The Contractor shall pump out water which may seep or leak into the excavations for the duration of the Contract and with the Contractor's own equipment. The Contractor shall dispose of this water in an appropriate manner.
- C. Special attention is noted for dewatering in the area adjacent to the proposed Tank Drain pumping/piping system. The Contractor shall include all necessary means and methods to ensure excavated material remains out of the adjacent stormwater pond. Items such as sheeting, silt fence and floating turbidity barriers may be considered by the Contractor for this purpose.

1.12 ADDITIONAL PROVISIONS

- A. Before commencing work on any of the existing pipelines, structures or equipment, the Contractor shall notify the County, in writing, at least 10 calendar days in advance of the date the Contractor proposes to commence such work.
- B. The Contractor shall provide, at the Contractor's own expense, all necessary temporary facilities for access to and for protection of, all existing facilities. The County's personnel must have ready access at all times to the existing facilities. The Contractor is responsible for all damage to existing structures, equipment and facilities caused by the Contractor's construction operations and must repair all such damage when and as ordered by the County.
- C. The Contractor shall submit a proposed work sequence plan at the pre-construction meeting showing all critical items of work and anticipated shut down times.
- D. Submit a detailed schedule and process description for proposed testing.

1.13 CONSTRUCTION CONDITIONS

- A. 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.

1.14 PUBLIC NUISANCE

- A. The Contractor shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, excessive noise or dust.
- B. Sound levels must meet Manatee County Ordinance #87-34, (which amends Ordinance 81-3, The Manatee County Noise Control Ordinance). Sound levels in excess of such ordinance are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the County for

excessive noise shall not relieve the Contractor of the other portions of this specification.

- C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

1.15 WARRANTIES

- A. All material supplied under these Specifications shall be warranted by the Contractor and the manufacturers for a period of three (3) years. Warranty period shall commence on the date of County acceptance.
- B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the County. All material and installation costs shall be 100% borne by the Contractor.
- C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty or guarantee period. No exception to this provision shall be allowed. The Contractor shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications,
- D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of County acceptance, the Contractor shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the Contractor of the three-year warranty starting at the time of County acceptance of the equipment.

1.16 FUEL STORAGE & FILLING

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

1.17 CONTRACTOR'S RESPONSIBILITY FOR AUTOCAD RECORD DRAWINGS

- A. Along with the expressed requirements in Section 01720 - Project Record Documents, the Contractor (or other professional hired by the Contractor) shall be entirely responsible and shall be required to perform all work associated with providing complete, updated electronic AutoCAD Drawings that incorporate all modifications from Construction activities associated with this Contract. These modifications include Civil, Mechanical, Electrical, HVAC, Instrumentation, Structural, Details, etc. Contractor shall adhere to the layering used in AutoCAD files provided to the Contractor by the Engineer of Record.

- B. AutoCAD Drawings shall be submitted to the Engineer along with documentation specified in Section 01720 - Project Record Documents, for review by the Engineer of Record and County.
- C. Engineer will review and provide comments to the Contractor. The Contractor shall then address all comments and update AutoCAD Drawings to the satisfaction of the County and Engineer prior to issuance of Certificate of Substantial Completion. The Contractor shall note that the layering, line weights, etc. used by the Engineer of Record in preparation of the Contractor Drawings shall be used to develop the Contractor provided and updated, AutoCAD Record Drawings.
- D. In addition to the requirements set forth in Section 01720 - Project Record Documents, the Contractor shall provide complete and approved AutoCAD Drawings to the Engineer of Record via two (2) thumb drives.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01040 COORDINATION WITH OWNER'S OPERATIONS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope:
1. This Section includes requirements for coordinating with the County's operations during the Work and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on the County's operations except as allowed in this Section.
 2. The Contractor shall provide labor, materials, tools, equipment and incidentals shown, specified and required to coordinate with the County's operations during the Work.
- B. Coordination:
1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.
- C. Related Sections:
1. Section 01010, Summary of Work.
 2. Section 01724, Connections to Existing Facilities.
 3. Section 02616, Disinfection.
- D. Except for shutdowns specified in this Section, perform the Work such that County's facility remains in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede County's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.
- E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed at any time during regular working hours in accordance with the County Bid Documents and Special Conditions, subject to the requirements in this Section.
- F. The Contractor has the option of providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to the County, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect the County's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.
- G. Coordinate shutdowns with the County. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on the County's operations and

processes.

- H. Do not shut off or disconnect existing operating systems, unless accepted by the County in writing. Operation of existing equipment will be by the County unless otherwise specified or indicated.

1.02 SUBMITTALS

- A. Action Submittals: Submit the following:

- 1. Bypass Piping and Pumping: Furnish for review and approval by the Engineer and County a complete bypass pumping and piping plan including the following information, as a minimum:
 - a. Proposed bypass pumps (main and standby).
 - b. Proposed bypass piping layout plan.
 - c. Detailed information that clearly and concisely illustrates how the system will operate and how the standby pump will be called into operation (if called to service).
 - d. Connection details for temporary bypass piping and pumping.
 - e. Proposed electrical connection details and information.
- 2. Substitute Sequence Submittal: When deviation from the suggested sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that the County's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule. Include schematics and or diagrams that clearly illustrate the planned sequence modifications. Any alternative sequence will be performed at no additional cost to the County.

- B. Informational Submittals: Submit the following:

- 1. Shutdown Planning Submittal:
 - a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for the County to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.
 - b. Furnish submittal to the County at least thirty days prior to proposed shutdown start date. Do not start shutdown until obtaining the County's acceptance of shutdown planning submittal.
- 2. Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to the County of date and time each shutdown is to start. Provide notification at least 14 calendar days in advance of each shutdown.

1.03

GENERAL CONSTRAINTS

- A. Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for the County's equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by the County after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.
- B. The following constraints apply to coordination with the County's operations:
1. Operational Access: The County's personnel shall have access to equipment and areas that remain in operation.
 2. Temporary Partitions and Enclosures: The Contractor shall provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas that are adjacent to the Work and that must be kept operational. Comply with Section 01510, Temporary and Permanent Utilities.
 3. Schedule and perform equipment and system start-ups for Tuesday through Thursday. Equipment and systems shall not be placed into operation on Monday, Friday, Saturday or Sunday without prior approval of the County.
 4. Dead End Valves or Pipe: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of pipes and conduits. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by the County. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of pipe or conduit, also provide on downstream side of valve a blind flange with drain/flushing connection.
 5. The County will assist the Contractor in dewatering process tanks, basins, conduits, and other work areas to be dewatered for shutdowns. Maintain clean and dry work area by pumping and properly disposing of fluid that accumulates in work areas in a manner compliant with local and government rules and regulations.
 6. Draining and Cleaning of Conduits, Tanks, and Basins:
 - a. Unless otherwise specified, the Contractor shall dewater process tanks, basins, conduits, and pipelines at beginning of each shutdown. Flush, wash down, and clean tanks, basins, pipelines, conduits, and other work areas.
 - b. The Contractor shall remove liquids and solids and dispose of them at appropriate location at the Site as directed by the County. Unless otherwise specified or indicated, contents of pipes, tanks, basins, and conduits undergoing modifications shall be transferred to existing process tanks or conduits at the Site with capacity sufficient to accept such discharges, using hoses, piping, pumps, or other means provided by the Contractor. Discharge of fluids across floors is not allowed.
 - c. If drainage point is not available on the piping or conduit to be drained, provide a wet tap using tapping saddle and valve or other method approved by the Engineer. Uncontrolled spillage of contents of pipes or conduits is not allowed.

- d. Spillage shall be brought to the Engineer's attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. The Contractor shall wash down spillage to floor drains or sumps and flush the system to prevent clogging and odors. If spillage is not suitable for discharge to the drainage system, such as chemical spills, as determined by the Engineer, the Contractor shall remove spillage by other method, such as vactor truck, acceptable to the Engineer.
7. Regular plant deliveries of chemicals/etc. shall not be postponed due to road closure.

1.04 SEQUENCE OF WORK

- A. Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if the County's operations are not adversely affected by proposed sequence change, with the County's acceptance.
- B. The Contractor shall prepare a Sequence of Work Plan that describes in detail the work that will be performed by the Contractor to maintain continuous operation of the County's existing utility services. Sequence of Work Plan shall address the permanent installation pumps and fill line as shown on the Drawings.
- C. The Sequence of Work Plan shall include a sequence of construction with projected time, in days for each step in the sequence.
- D. If the work required to maintain utility operation must occur during evening, night or weekend hours, the Contractor shall notify residents in advance of the projected work. The Contractor shall reimburse the County for overtime work, including inspector overtime, in excess of regular working hours.

1.05 SHUTDOWNS

- A. General:
 - 1. Terminology: A "shutdown" is when a portion of the normal operation of the County's Northwest Booster Pump Station, whether equipment, systems, piping roadway or conduit, will be temporarily suspended or taken out of service to perform the Work.
 - 2. Work that may interrupt normal operations shall be accomplished at times convenient to the County. Bypass pumping shall remain in operation at all times during bypass flows. Provide a diesel powered backup bypass pump that will start automatically should the main electrical bypass pump fail for any reason.
 - 3. Furnish at the Site, in close proximity to the shutdown work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to the Engineer's satisfaction that the Contractor has complied with these requirements before commencing the shutdown.

4. If the Contractor's operations cause an unscheduled interruption of the County's operations, immediately re-establish satisfactory operation for the County.
 5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of the County's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by the Contractor if, in the Engineer's opinion, the Contractor did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.
 6. For temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems, coordinate requirements for such shutdowns with the Engineer and the County.
- B. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. The Contractor shall lock out and tag circuit breakers and switches operated by the County and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify the Engineer that facilities are available for use.
- C. Shutdowns of the Northwest Booster Pump Station are limited to September through June; no shutdowns will be allowed in July or August.
- D. The County will be constructing improvements to their Elwood Booster Pump Station and their Cortez Booster Pump Station projects concurrently with the Northwest Booster Pump Station project. Since improvements to these stations are being performed as part of separate contracts, it is the Contractor's sole responsibility to coordinate and communicate any necessary shutdowns with the other Contractors, the County, and the County's Engineer. Further, the Contractor shall be required to:
1. Notify the County and the County's Engineer of planned shutdowns at least 45 calendar days in advance.
 2. Develop detailed shutdown/phasing plan and submit to the County and the County's Engineer at least 30 calendar days prior to shutdown. The Shutdown/Phasing Plan shall include a written request for authorization from the County and the County's Engineer.
 3. Upon receipt of the referenced authorization, the Contractor shall provide a minimum of 10 calendar days' notice to confirm the date(s) and duration of the shutdown.
 4. Shutdowns of the normal operations of the Northwest Booster Pump Station shall be limited to four (4) hours.

1.06 TEMPORARY BYPASS PUMPING

- A. General:
1. The proposed bypass pumping system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
 2. Bypass pumping and piping system shall be designed for potable drinking water and shall meet all applicable regulatory requirements.

3. The Contractor is responsible for all costs related to the round the clock operation of the bypass pumping system for the full duration when the bypass system is required.
4. The Contractor is responsible cutting, plugs, caps, etc. needed for the bypass system.
5. Disinfection for the system is as required in Section 02616, Disinfection. The Contractor is responsible for all costs and coordination needed for disinfection and testing of the bypass pumping system.
6. Sound levels associated with primary and backup bypass pumps, measured by the County's personnel, shall not exceed 65 dBA from 7:00 a.m. to 8:00 p.m., or 60 dBA from 8:00 p.m. to 7:00 a.m. This sound level will apply to the nearest property line of the nearest residence. Sound levels in excess of these values are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the County for excessive noise shall not relieve the Contractor of the other portions of this specification including, but not limited to contract time and contract price.
7. The standby pump shall be diesel and shall be manifolded so that it can automatically assume bypass pumping.
8. Furnish and install a temporary auto-dialer with a capability of calling a minimum of seven numbers when the standby pump is called to service.
9. The bypass pipe shall be completely new, high-density polyethylene based on PE4710 resin conforming with ASTM D3350; cell classification 44574C/E; DR 17 minimum. All bypass piping shall comply with NSF Standard 61.
10. HDPE shall be joined by the butt fusion procedure outlined in ASTM F 2620 or Plastic Pipe Institute (PPI) TR-33. All fusion joints shall be made in compliance with the pipe or fitting manufacturer's recommendations. Fusion joints shall be made by qualified fusion technicians per PPI TN-42. Fusion joints shall be designed for a maximum allowable operating pressure of at least three times the pump system's deadhead pressure.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. In addition to requirements of this Section, conform to requirements of Section 01045, Cutting and Patching, and Section 01724, Connections to Existing Facilities.

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

- A. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

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

3.02 PREPARATION

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

3.03 PERFORMANCE

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

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

END OF SECTION

SECTION 01050 FIELD ENGINEERING AND SURVEYING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall provide and pay for 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

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

1.03 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are designated on the Contract Drawings.
- B. Locate and protect all survey monumentation, property corners and project control points prior to starting work and preserve all permanent reference points during construction. All costs associated with the replacement of all survey monumentation, property corners and project control points shall be borne by the Contractor.
- C. Make no changes or relocations without prior written notice to County.
- D. Report to County when any reference point is lost, destroyed or requires relocation because of necessary changes in grades or locations.
- E. Require surveyor to replace project control points which may be lost or destroyed.
- F. Establish replacements based on original survey control.

1.04 PROJECT SURVEY REQUIREMENTS

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

1.05 RECORDS

- A. 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

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.
- B. 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.
- C. 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

- A. 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 179I 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 1022 26 th Ave E Bradenton, FL 34208
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

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

1.03 WORK OUTSIDE AUTHORIZED LIMITS

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

1.04 MEASUREMENT STANDARDS

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

1.05 AREA MEASUREMENTS

- A. 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

- A. 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

- A. 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.
- B. No separate payment will be made for the following items and the cost of such work shall be included in the applicable pay items of work. Final payments shall not be requested by the Contractor or made by the County until as-built (record) drawings have been submitted and approved by the County.
 - 1. Project signs and photographs.
 - 2. Removal, repair, replacement or relocation of all signs, walls, private irrigation systems and related items.
 - 3. Rubbish and spoil removal.
 - 4. Shop Drawings, Working Drawings.
 - 5. Clearing, grubbing, and grading except as hereinafter specified.
 - 6. Trench excavation, including necessary pavement removal and rock removal, except as otherwise specified.
 - 7. Dewatering and disposal of surplus water.
 - 8. Structural fill, backfill, and grading.
 - 9. Replacement of unpaved roadways, and shrubbery plots.
 - 10. Cleanup & miscellaneous work.
 - 11. Foundation and borrow materials, except as hereinafter specified.
 - 12. Testing and placing system in operation.
 - 13. Any material and equipment required to be installed and utilized for the tests.
 - 14. Pipe, structures, pavement replacement, asphalt, and shell driveways and/or appurtenances included within the limits of lump sum work, unless otherwise shown.
 - 15. Maintaining the existing quality of service during construction.
 - 16. Appurtenant work as required for a complete and operable system.
 - 17. Seeding and hydro mulching.

(THE BID ITEM SECTION IS TO BE COMPLETED FOR EACH ITEM TO BE BID. EXAMPLES AS FOLLOWS)

BID ITEM NO. 1 - MOBILIZATION AND DEMOBILIZATION

Measurement and payment for this Bid Item shall include full compensation for the required 100 percent (100%) Performance Bond, 100 Percent (100%) Payment Bond, all required insurance for the project and the Contractor's mobilization and demobilization costs as shown in the Bid Form. Mobilization includes, but it not limited to preparation and movement of personnel, equipment, supplies and incidentals such as safety and sanitary supplies/ facilities

Payment for mobilization shall not exceed 10 percent (10%) of the total Contract cost unless the Contractor can prove to the County that the actual mobilization cost exceeds 10 percent (10%).

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

Percent of Original Contract Amount:	Percent Allowable Payment of Mobilization/Demobilization Bid Item Price:
5	25
10	35
25	45
50	50
75	75
100	100

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

BID ITEM NO. 2 - SITE WORK

2A **New Fence and Gate** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the installation of a new fence and gate and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be lump sum.

2B **New Asphalt** - Payment for all work included in this Bid Item will be made at the applicable Contract square yards for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the expansion of the entrance drive, asphalt restoration around the new chemical building, and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be per square yard.

2C **Drainage Improvements** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the drainage improvements and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be lump sum

2D **Site Restoration** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for site restoration and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be lump sum

BID ITEM 3 - DEMOLITION

All costs for disposal of demolition items described herein and as otherwise included in the Contract Documents shall be included in the Contractor's Base Bid. The County reserves the right to retain any of the items designated for removal, replacement, or demolition.

- 3A **Fence & Gate** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the demolition of the existing gate and portion of fence and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be lump sum.

- 3B **Pavement Removal** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for pavement removal and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be per square yard.

- 3C **Chemical Tank Removal** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the removal of the existing chemical storage tanks and appurtenances, and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be each.

- 3D **Chemical Skid Removal** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the removal of the existing chemical skids and appurtenances, and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be each.

- 3E **Chemical Feed Piping Removal** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary as specified herein or as otherwise necessary for the removal of the existing chemical feed piping and appurtenances, and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be lump sum.

- 3F **Electrical** - Payment for all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and

equipment necessary as specified herein or as otherwise necessary for demolition of existing electrical equipment, wiring, conduit, MCCs, etc., and the completion of the Work associated with this Contract. Refer to drawings and specifications.

Payment for this item shall be lump sum.

BID ITEM NO. 4- CHEMICAL STORAGE AND FEED SYSTEMS

- 4A **Ammonium Sulfate Tanks** shall include all labor, materials and equipment necessary for the installation of the ammonium sulfate storage tanks as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4B **Ammonium Sulfate Metering Pump Skid** shall include all labor, materials and equipment necessary for the installation of a duplex ammonium sulfate metering skid as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4C **Sodium Hypochlorite Tanks** shall include all labor, materials and equipment necessary for the installation of a sodium hypochlorite storage tanks as called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4D **Sodium Hypochlorite Metering Pump Skid** shall include all labor, materials, and equipment necessary for the installation of a duplex sodium hypochlorite metering skid as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4E **3" Schedule 80 PVC / Fittings** shall include all labor, materials, and equipment necessary for the installation of 3" schedule 80 PVC piping and associated fittings for the chemical storage and feed equipment as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be linear feet.

- 4F **2" Schedule 80 PVC / Fittings** shall include all labor, materials, and equipment necessary for the installation of 2" schedule 80 PVC piping and associated

fittings for the chemical storage and feed equipment as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be linear feet.

- 4G **1" Schedule 80 PVC / Fittings** shall include all labor, materials, and equipment necessary for the installation of 1" schedule 80 PVC piping and associated fittings for the chemical storage feed equipment and to feed the emergency eyewash and shower station as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be linear feet.

- 4H **2" Schedule 80 PVC with 1/2" Polytube** shall include all labor, materials, and equipment necessary for the installation of 2" schedule 80 PVC with 1/2" polytube piping for the chemical storage and feed equipment as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be linear feet.

- 4I **Pipe Hangers and Supports** shall include all labor, materials, and equipment necessary for the installation of pipe supports and hangers for PVC piping for the chemical storage and feed equipment and as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 4J **3" Ball Valve** shall include all labor, materials, and equipment necessary for the installation of 3" ball valves and camlock fittings for the chemical tank fill lines and as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4K **2" Ball Valve** shall include all labor, materials, and equipment necessary for the installation of 2" ball valves for the chemical storage and feed equipment as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4L **1" Flexible Connection** shall include all labor, materials, and equipment necessary for the installation of 1" flexible connections for the chemical

storage and feed equipment as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4M **Emergency Eyewash and Shower Station** shall include all labor, materials, and equipment necessary for the installation of an emergency eyewash and shower station at the new chemical building as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall lump sum.

- 4N **24" x 2" Stainless Steel Tapping Saddle** shall include all labor, materials, and equipment necessary for the installation of a 24" x 2" stainless steel tapping saddle to feed the emergency eyewash shower and station as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

- 4O **1" Eyewash/Shower / BFP Assembly** shall include all labor, materials, and equipment necessary for the installation of a 1" backflow prevention assembly for the emergency eyewash and shower station as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

BID ITEM NO. 5 - MECHANICAL IMPROVEMENTS

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all labor, materials, and equipment necessary for the mechanical improvements to the pump station and buried site valving. Provide all new pumps and piping, valves, and supports specified herein or as otherwise necessary for the completion of the Work associated with this Contract. Refer to drawings and specifications.

- 5A **Pump and Motor Replacement (Pumps #1 & #2)** shall include all labor, materials, and equipment necessary for the installation of the two (2) new booster pumps and associated motors as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

5B **12" x 10" FL Flexible Reducer** shall include all labor, materials, and equipment necessary for the installation of 12" x 10" flanged reducer for the new booster pumps as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

5C **12" x 8" FL Flexible Reducer** shall include all labor, materials, and equipment necessary for the installation of 12" x 8" flanged reducers for the new booster pumps as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

5D **8" FL Adapter** shall include all labor, materials, and equipment necessary for the installation of 8" flanged adapters for the new booster pumps as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

5E **16" Motorized Butterfly Valves** shall include all labor, materials, and equipment necessary for the replacement of the 16" motorized butterfly valves as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

5F **12" Pressure Sustaining Valve** shall include all labor, materials, and equipment necessary for the replacement of the 12" pressure sustaining valve and all existing above-grade piping and fittings located adjacent to the existing pressure sustaining valve and as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

5G **Pipe Supports** shall include all labor, materials, and equipment necessary for the installation of the new pipe supports as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be each.

5H **Pump Pads and Grouting** shall include all labor, materials, and equipment necessary for the installation of pump pads and grouting for the new booster pumps as otherwise called out on the drawings and ancillary items as

indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 5I **Tank Drain Pumping System** shall include all labor, materials, and equipment necessary for the excavation and removal of existing material and piping, dewatering, installation of the new piping, fittings, pump system with control panel, electrical conduit, wiring, floats and panel, compaction, restoration, as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

BID ITEM NO. 6 - CHEMICAL BUILDING, FULL CONSTRUCTION

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all plant, labor, materials, and equipment necessary for the construction of the new chemical building. Provide all materials and equipment specified herein or as otherwise necessary for the completion of the Work associated with this Contract. Refer to drawings and specifications. This bid item shall include, but is not limited to:

- i. Excavation
- ii. Backfill
- iii. #57 Crushed Stone
- iv. Slab on Grade
- v. Foundation
- vi. Top Slab
- vii. Geofoam
- viii. Equipment Pads
- ix. Concrete Coatings
- x. CMU Walls
- xi. Roof Wood Truss and Plywood Sheeting
- xii. Wood Truss Hold Downs
- xiii. Wall Coatings
- xiv. Roof
- xv. Louvers
- xvi. Doors
- xvii. Ventilation Fan
- xviii. Concrete Coatings for Full Exterior of Existing High Service Pump Station Building

BID ITEM NO. 7 - ELECTRICAL

Payment of all work included in this Bid Item will be made at the applicable Contract lump sum price for furnishing all plant, labor, materials, and equipment necessary for the replacement of the electrical distribution and pump control equipment.

- 7A **Lightening Protection** shall include all labor, materials, and equipment necessary for the installation of the lightening protection system as indicated

on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 7B **Ground and Bonding** shall include all labor, materials, and equipment necessary for site work, grounding and bonding, and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 7C **Hangers and Supports** shall include all labor, materials, and equipment necessary for the installation of hangars and supports, and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 7D **Conductors & Cables** shall include all labor, materials, and equipment necessary for the installation of the instrumentation cable, power conductors and cables, and communication cables as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 7E **Electrical Raceways** shall include all labor, materials, and equipment necessary for the installation of the rigid and flexible conduits, sealing, and fittings as otherwise called out on the drawings and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 7F **Electrical Enclosures** shall include all labor, materials, and equipment necessary for the installation of the outlet boxes and pull, junction, and terminal boxes as otherwise called out on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

- 7G **Underground Duct banks** shall include all labor, materials, and equipment necessary for the installation of the underground duct banks as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

7H **Manholes and Handholes** shall include all labor, materials, and equipment necessary for the installation of the manholes and handholes as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

7I **Wiring Devices** shall include all labor, materials, and equipment necessary for the installation of the low-voltage receptacles, snap switches, and disconnects as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

7J **Mini-Power Centers** shall include all labor, materials, and equipment necessary for the installation of the dry type transformers and panelboards as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

7K **Motor Control Centers (MCCs)** shall include all labor, materials, and equipment necessary for modifications to the existing square D Motor Control Center. Work will consist of but not limited to placing and connection of equipment and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

7L **Low-Voltage Variable Frequency Drives (VFDs)** shall include all labor, materials, and equipment necessary for the installation of the new variable frequency drives (VFD) will replace the old and be installed in the pump station. In addition, work will consist of but not limited to placing and connection of the electrical equipment and ancillary items as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

7M **Lighting** shall include all labor, materials, and equipment necessary for the installation of the new lighting as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

All costs for disposal of all items shall be included in the Contractor's Base Bid.

BID ITEM NO. 8 - INSTRUMENTATION & CONTROLS

8A **Field Equipment** shall include all labor, materials, and equipment necessary

for the installation of the field equipment as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

8B **Control Enclosures** shall include all labor, materials, and equipment necessary for the installation of the control enclosures as indicated on the drawings, specified herein or as otherwise necessary for the completion of the Work associated with this Contract.

Payment for this item shall be lump sum.

BID ITEM NO. 9 - RECORD DRAWINGS

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

Payment for this item shall be lump sum.

BID ITEM 10 - PERMIT ALLOWANCE

Fees for submitting applications for permits required to complete construction in accordance with the plans and specifications, such as Building Permit, NPDES, etc. The quantity measured for payment shall be the actual receipt-supported permit fees. Payment will be made at the actual cost to the Contractor for the permits required and acquired. Upon completion of the permitting process, the Contractor will submit receipts for permit fees to the County and Engineer.

Payment for this item shall be lump sum.

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

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

1.02 FORMAT AND DATA REQUIRED

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

1.03 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the County requires substantiating data, Contractor shall submit suitable information with a cover letter.
- B. Submit one copy of data and cover letter for each copy of application.

1.04 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in application form as specified for progress payments.

1.05 SUBMITTAL PROCEDURE

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01153 CHANGE ORDER PROCEDURES

PART 1 GENERAL

1.01 DEFINITION

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

1.02 REQUIREMENTS INCLUDED

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

1.03 PRELIMINARY PROCEDURES

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

- B. Contractor may initiate changes by submitting a written notice to the Project Manager, containing:
 - 1. Description of the proposed changes.
 - 2. Statement of the reason for making the changes.
 - 3. Statement of the effect on the Contract Sum and the Contract Time.
 - 4. Statement of the effect on the work of separate contractors.
 - 5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.04 FIELD ORDER CHANGE

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

1.05 DOCUMENTATION OF PROPOSALS AND CLAIMS

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

- b. Products used, listing of quantities.
- c. Subcontracts.

1.06 PREPARATION OF CHANGE ORDERS

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

1.07 LUMP SUM/FIXED PRICE CHANGE ORDER

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

1.08 UNIT PRICE CHANGE ORDER

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

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

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

1.10 CORRELATION WITH CONTRACTOR'S SUBMITTALS

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

Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01200 PROJECT MEETINGS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 PRE-CONSTRUCTION MEETING

- A. Attendance:
 - 1. County's Engineer.
 - 2. County's Project Manager
 - 3. Contractor.
 - 4. Resident Project Representative.
 - 5. Related Labor Contractor's Superintendent.
 - 6. Major Subcontractors.
 - 7. Major Suppliers.
 - 8. Others as appropriate.
- B. Suggested Agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors.
 - b. Projected Construction Schedules.
 - c. Coordination of Utilities
 - 2. Critical work sequencing.
 - 3. Project Coordination.
 - a. Designation of responsible personnel.
 - b. Emergency contact persons with phone numbers.
 - 4. Procedures and processing of:
 - a. Field decisions.
 - b. Submittals.
 - c. Change Orders.
 - d. Applications for Payment.
 - 5. Procedures for maintaining Record Documents.

6. Use of premises:
 - a. Office, work and storage areas.
 - b. County's REQUIREMENTS.
7. Temporary utilities.
8. Housekeeping procedures.
9. Liquidated damages.
10. Equal Opportunity Requirements.
11. Laboratory testing.
12. Project / Job meetings: Progress meeting, other special topics as needed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01310 CONSTRUCTION SCHEDULE & PROJECT RESTRAINTS

PART 1 GENERAL

1.01 GENERAL

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

1.02 CONSTRUCTION SCHEDULING GENERAL PROVISIONS

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

progress payments and to allow other contractors to cooperate and coordinate their activities with those of the Contractor.

2.02 FORM OF SCHEDULES

- A. Prepare schedules using the latest version of Microsoft Project, or other County approved software, in the form of a horizontal bar chart diagram. The diagram shall be time-scaled and sequenced by work areas. Horizontal time scale shall identify the first work day of each week.
- B. Activities shall be at least as detailed as the Schedule of Values. Activity durations shall be in whole working days. In addition, man-days shall be shown for each activity or tabulated in an accompanying report.
- C. Diagrams shall be neat and legible and submitted on sheets at least 8-1/2 inches by 11 inches suitable for reproduction. Scale and spacing shall allow space for notations and future revisions.

2.03 CONTENT OF SCHEDULES

- A. Each monthly schedule shall be based on data as of the last day of the current pay period.
- B. Description for each activity shall be brief, but convey the scope of work described.
- C. Activities shall identify all items of work that must be accomplished to achieve substantial completion, such as items pertaining to Contractor's installation and testing activities; items pertaining to the approval of regulatory agencies; contractor's time required for submittals, fabrication and deliveries; the time required by County to review all submittals as set forth in the Contract Documents; items of work required of County to support pre-operational, startup and final testing; time required for the relocation of utilities. Activities shall also identify interface milestones with the work of other contractors performing work under separate contracts with County.
- D. Schedules shall show the complete sequence of construction by activities. Dates for beginning and completion of each activity shall be indicated as well as projected percentage of completion for each activity as of the first day of each month.
- E. Submittal schedule for shop drawing review, product data, and samples shall show the date of Contractor submittal and the date approved submittals will be required by the County, consistent with the time frames established in the Specifications.
- F. For Contract change orders granting time extensions, the impact on the Contract date(s) shall equal the calendar-day total time extension specified for the applicable work in the Contract change orders.
- G. For actual delays, add activities prior to each delayed activity on the appropriate critical path(s). Data on the added activities of this type shall portray all steps leading to the delay and shall further include the following: separate activity identification, activity description indicating cause of the delay, activity duration consistent with whichever set of dates below applies, the actual start and finish

dates of the delay or, if the delay is not finished, the actual start date and estimated completion date.

- H. For potential delays, add an activity prior to each potentially delayed activity on the appropriate critical path(s). Data for added activities of this type shall include alternatives available to mitigate the delay including acceleration alternatives and further show the following: separate activity identification, activity description indicating cause of the potential delay and activity duration equal to zero work days.

2.04 SUPPORTING NARRATIVE

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

2.05 SUBMITTALS

- A. Contractor shall submit estimated and preliminary progress schedules (as identified in the Terms and Conditions of the Contract and the General Conditions), monthly status reports, a start-up schedule and an as-built schedule report all as specified herein.
- B. All schedules, including estimated and preliminary schedules, shall be in conformance with the Contract Documents.
- C. The finalized progress schedule discussed in the Contract Documents shall be the first monthly status report and as such shall be in conformance with all applicable specifications contained herein.
- D. Monthly Status Report submittals shall include a time-scaled (days after notice to proceed) diagram showing all contract activities and supporting narrative. The initial detailed schedule shall use the notice to proceed as the start date. The finalized schedule, if concurred with by County, shall be the work plan to be used by the contractor for planning, scheduling, managing and executing the work.
- E. The schedule diagram shall be formatted as above. The diagram shall include (1) all detailed activities included in the preliminary and estimated schedule submittals, (2) calendar days prior to substantial completion, (3) summary activities for the remaining days. The critical path activities shall be identified, including critical paths for interim dates, if possible.
- F. The Contractor shall submit progress schedules with each application for payment.

2.06 MONTHLY STATUS REPORTS

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

2.07 STARTUP SCHEDULE

- A. At least 60 calendar days prior to the date of substantial completion, Contractor

shall submit a time-scaled (days after notice to proceed) diagram detailing the work to take place in the period between 60 days prior to substantial completion, together with a supporting narrative. County shall have 10 calendar days after receipt of the submittal to respond. Upon receipt of County's comments, Contractor shall make the necessary revisions and submit the revised schedule within 10 calendar days. The resubmittal, if concurred with by County, shall be the Work Plan to be used by Contractor for planning, managing, scheduling and executing the remaining work leading to substantial completion.

- B. The time-scaled diagram shall use the latest schedule of legal status for those activities completed ahead of the last 60 calendar days prior to substantial completion and detailed activities for the remaining 60-day period within the time frames outlined in the latest schedule of legal status.
- C. Contractor will be required to continue the requirement for monthly reports, as outlined above. In preparing this report, Contractor must assure that the schedule is consistent with the progress noted in the startup schedule.

2.08 REVISIONS

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

PART 3 EXECUTION (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 County for review and approval: working drawings, shop drawings, test reports and data on materials and equipment (hereinafter in this section called data) that have been produced within the last three (3) years, 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. Submittals may be done electronically via PDF documents.
- B. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the County. The County will provide the initial submittal log in electronic format. The electronic log (excel file) shall be passed back and forth between the Contractor and the County for each submittal package. This log shall include the following items:
1. Submittal description and number assigned.
 2. Date to County.
 3. Date returned to Contractor (from County).
 4. Status of Submittal (No exceptions taken, returned for confirmation or resubmittal, rejected).
 5. Date of Resubmittal and Return (as applicable).
 6. Date material released (for fabrication).
 7. Projected date of fabrication.
 8. Projected date of delivery to site.
 9. Projected date and required lead time so that product installation does not delay contact.
 10. Status of O&M manuals submitted.

1.03 CONTRACTOR'S RESPONSIBILITY

- A. It is the duty of the Contractor to check all drawings, data and samples prepared by or for the Contractor before submitting them to the County for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the County without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the contract Documents.
- B. The Contractor shall ensure that all submitted cut sheets, product sheets, product documentation, etc. are current versions of the product information and are not older than three (3) years. Product certification(s) shall be no older than three (3) years. Any submitted documents found to be beyond the acceptable date ranges shall be rejected.

- C. 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.
- D. The Contractor shall furnish the County a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment. This schedule shall indicate those that are critical to the progress schedule.
- E. 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 the Contractor, by the County, with No Exceptions Taken or Approved As Noted.
- F. The Contractor shall submit to the County all drawings and schedules sufficiently in advance of construction requirements to provide no less than twenty-one (21) calendar days for checking and appropriate action from the time the County receives them. Submittals are to be scheduled, submitted, reviewed, and approved prior to the acquisition of the material or equipment. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow time for potential resubmittal.
- G. No delay costs or time extensions will be allowed for time lost in late submittals or resubmittals.
- H. 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.
- I. The Contractor shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by County of the necessary Shop Drawings.

1.04 COUNTY'S REVIEW OF SHOP DRAWINGS AND WORKING DRAWINGS

- A. The County's review of drawings, data and samples submitted by the Contractor shall cover only general conformity to the Specifications, external connections and dimensions which affect the installation.
- B. The review of drawings and schedules shall be general and shall not be construed:
 - 1. As permitting any departure from the Contract requirements.
 - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions and materials.
 - 3. As approving departures from details furnished by the County, except as otherwise provided herein.

- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which the County finds to be in the interest of the County and to be so minor as not to involve a change in Contract Price or time for performance, the County may return the reviewed drawings without noting any exception.
- D. When reviewed by the County, each of the Shop and Working Drawings shall be identified as having received such review being so stamped and dated. Shop Drawings stamped "REJECTED" and with required corrections shown shall be returned to the Contractor for correction and resubmittal.
- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals, the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the County on previous submissions. The Contractor shall make any corrections required by the County.
- F. If the Contractor considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the County.
- G. The County shall review a submittal/resubmittal a maximum of three (3) times after which cost of review shall be borne by the Contractor. The cost of engineering shall be equal to the County's actual payroll cost.
- H. When the Shop and Working Drawings have been completed to the satisfaction of the County, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the County.
- I. No partial submittals shall be reviewed. Incomplete submittals shall be returned to the Contractor and shall be considered not approved until resubmitted.

1.05 SHOP DRAWINGS

- A. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean Contractor's plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop Drawings shall consist of fabrication, drawings, setting drawings, schedule drawings, manufacturer's scale drawings and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature and performance and test data, shall be considered only as supportive to required Shop Drawings as defined above.
- B. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the County and shall bear the Contractor's stamp of approval and original signature as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval and original signature shall be returned to the Contractor for resubmission.
- C. Each Shop Drawing shall have a blank area 3-1/2 inches by 3-1/2 inches, located adjacent to the title block. The title block shall display the following:

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

1.06 SUBMITTAL PREPARATION

- A. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.
- B. Collect required data for each specific material, product, unit of work, or system into a single submittal. Prominently mark choices, options, and portions applicable to the submittal. Partial submittals will not be accepted for expedition of construction effort. Submittal will be returned without review if incomplete.
- C. If available product data is incomplete, provide Contractor-prepared documentation to supplement product data and satisfy submittal requirements.
- D. All irrelevant or unnecessary data shall be removed from the submittal to facilitate accuracy and timely processing. Submittals that contain the excessive amount of irrelevant or unnecessary data will be returned with review.
- E. Provide a transmittal form for each submittal with the following information:

1. Project title, location and number.
 2. Construction contract number.
 3. Date of the drawings and revisions.
 4. Name, address, and telephone number of subcontractor, supplier, manufacturer, and any other subcontractor associated with the submittal.
 5. List paragraph number of the specification section and page number; and sheet number of the contract drawings by which the submittal is required.
 6. When a resubmission, the resubmittal document name shall remain the same, but shall add an alphabetic suffix on submittal description. For example, submittal 18 would become 18A, to indicate resubmission.
 7. Product identification and location in project.
- F. The Contractor is responsible for reviewing and certifying that all submittals are in compliance with contract requirements before submitting to the County for review.
- G. Stamp, sign, and date each submittal transmittal form indicating action taken.
- H. Stamp used by the Contractor on the submittal transmittal form to certify that the submittal meets contract requirements is to be similar to the following:

<p>CONTRACTOR (Firm Name)</p> <p>____ Approved</p> <p>____ Approved with corrections as noted on submittal data and/or attached sheet(s).</p> <p>I certify that the following document and information has been verified to be is not more than three (3) years old.</p> <p>SIGNATURE: _____</p> <p>TITLE: _____</p> <p>DATE: _____</p>
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1.07 WORKING DRAWINGS

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

by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the County, which review will be for general conformance and will not relieve the Contractor in any way from the Contractor's responsibility with regard to the fulfillment of the terms of the Contract. All risks of error are assumed by the Contractor; the County and Engineer shall not have responsibility therefor.

1.08 SAMPLES

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

1.09 APPROVED SUBMITTALS

- A. County approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.
- B. County approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.
- C. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.
- D. Retain a copy of all approved submittals at project site, including approved samples.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01370 SCHEDULE OF VALUES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the County a Schedule of Values allocated to the various portions of the work, within 10 days after date of Notice to Proceed.
- B. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.
- C. The Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Schedule of Values will be considered for approval by County upon Contractor's request. Identify schedule with:
 - 1. Title of Project and location.
 - 2. Project number.
 - 3. Name and address of Contractor.
 - 4. Contract designation.
 - 5. Date of submission.
- B. Schedule of Values shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the table of contents for the Contract Document as the format for listing component items for structures:
 - 1. Identify each line item with the number and title of the respective major section of the specification.
 - 2. For each line item, list sub values of major products or operations under item.
- D. 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 County at commercial rates applicable at time of purchase. Photographer shall also agree to participate as required in any litigation requiring the photographer as an expert witness.
- D. The Contractor shall pay all costs associated with the required photography and prints. Any parties requiring additional photography or prints shall pay the photographer directly.
- E. All project photographs shall be a single weight, color image. All finishes shall be smooth surface and glossy and all prints shall be 8 inches x 10 inches.

- F. Each print shall have clearly marked on the back, the name of the project, the orientation of view, the date and time of exposure, name and address of the photographer and the photographers numbered identification of exposure.
- G. All project photographs shall be taken from locations to adequately illustrate conditions prior to construction, or conditions of construction and state of progress. The Contractor shall consult with the County at each period of photography for instructions concerning views required.

1.04 VIDEO RECORDINGS

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01410 TESTING AND TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

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

1.03 CONTRACTOR'S RESPONSIBILITIES

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

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01510 TEMPORARY AND PERMANENT UTILITIES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. 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

- A. 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

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

2.03 TEMPORARY WATER

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

2.04 TEMPORARY SANITARY FACILITIES

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

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall maintain and operate systems to assure continuous service.
- B. The Contractor shall modify and extend systems as work progress requires.

3.02 REMOVAL

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

END OF SECTION

SECTION 01570 TRAFFIC REGULATION

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 TRAFFIC CONTROL

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

area during construction. The Contractor shall be responsible for coordinating this work with affected homeowners.

- F. When conditions require the temporary installation of signs, pavement markings and traffic barriers for the protection of workers and traffic, the entire array of such devices shall be depicted on working drawings for each separate stage of work. These drawings shall be submitted to the County for review and approval prior to commencement of work on the site.
- G. Precast concrete traffic barriers shall be placed adjacent to trenches and other excavations deeper than six inches below the adjacent pavement surface.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01580 PROJECT IDENTIFICATION AND SIGNS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 PROJECT IDENTIFICATION SIGN (COUNTY)

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

1.03 INFORMATIONAL SIGNS

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

1.04 QUALITY ASSURANCE

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

1.05 PUBLIC NOTIFICATION

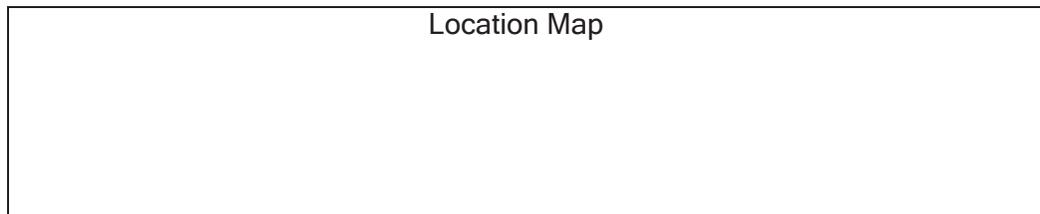
- A. Door Hangers: The Contractor shall generate and distribute door hangers to all residents who will be impacted by project construction.

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

EXAMPLE:

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

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



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

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

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

PART 2 PRODUCTS

2.01 SIGN MATERIALS

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

- D. Paint: Exterior quality, as specified in the Contract Documents.

PART 3 EXECUTION

3.01 PROJECT IDENTIFICATION SIGN

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

3.02 MAINTENANCE

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

3.03 REMOVAL

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

1.02 MANUFACTURER'S INSTRUCTIONS

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

1.03 TRANSPORTATION AND HANDLING

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

products are properly protected and undamaged.

- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.04 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. 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

- A. 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.

- A. Arrange storage in manner to provide easy access for inspection.

1.03 MAINTENANCE OF STORAGE

- A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:

- 1. State of storage facilities is adequate to provide required conditions.
- 2. Required environmental conditions are maintained on continuing basis.
- 3. Surfaces of products exposed to elements are not adversely affected. Any weathering of products, coatings and finishes is not acceptable under requirements of these Contract Documents.

- B. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.

- 1. Equipment shall not be shipped until approved by the County. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the County.
- 2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by the County until such time as the equipment is to be

installed.

3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
4. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.
5. Lubricants shall be changed upon completion of installation and as frequently as required, thereafter during the period between installation and acceptance.
6. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.04 PROTECTION AFTER INSTALLATION

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01700 CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. 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 County shall make an inspection to determine the status of completion.
- C. Project record documents and operations and maintenance manuals must be submitted before the project shall be considered substantially complete.
- D. If the County determines that the work is not substantially complete:
 - 1. The County shall notify the Contractor in writing, stating the reasons.
 - 2. The Contractor shall remedy the deficiencies in the work and send a second written notice of substantial completion to the County.
 - 3. The County shall reinspect the work.
- E. When the County finds that the work is substantially complete:
 - 1. The Engineer shall prepare and deliver to the County a tentative Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a tentative list of the items to be completed or corrected before final payment.
 - 2. The Engineer shall consider any objections made by the County as provided in Conditions of the Contract. When the Engineer considers the work substantially complete, the Engineer will execute and deliver to the County a definite Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a revised tentative list of items to be completed or corrected.

1.03 FINAL INSPECTION

- A. When the Contractor considered the work to be complete, the Contractor shall submit written certification stating that:
 - 1. The Contract Documents have been reviewed.
 - 2. The work has been inspected for compliance with Contract Documents.

3. The work has been completed in accordance with Contract Documents.
 4. The equipment and systems have been tested in the presence of the County's representative and are operational.
 5. The work is completed and ready for final inspection.
- B. The County shall make an inspection to verify the status of completion after receipt of such certification.
- C. If the County determines that the work is incomplete or defective:
1. The County shall promptly notify the Contractor in writing, listing the incomplete or defective work.
 2. The Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to County that the work is complete.
 3. The County shall reinspect the work.
- D. Upon finding the work to be acceptable under the Contract Documents, the County shall request the Contractor to make closeout submittals.
- E. For each additional inspection beyond a total of three (3) inspections for substantial and final completion due to the incompleteness of the work, the Contractor shall reimburse the County's fees.

1.04 CONTRACTOR'S CLOSEOUT SUBMITTALS TO COUNTY

- A. Project Record Documents (prior to substantial completion).
- B. Operation and maintenance manuals (prior to substantial completion).
- C. Warranties and Bonds.
- D. Evidence of Payment and Release of Liens: In accordance with requirements of General and Supplementary Conditions.
- E. Certification letter from Florida Department of Transportation and Manatee County Department of Transportation, as applicable.
- F. Certificate of Insurance for Products and Completed Operations.
- G. Final Reconciliation, Warranty Period Declaration, and Contractor's Affidavit (Manatee County Project Management Form PMD-9).

1.05 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the County.
- B. Statement shall reflect all adjustments to the Contract Sum:
 1. The original Contract Sum.
 2. Additions and deductions resulting from:

- a. Previous Change Orders
 - b. Unit Prices
 - c. Penalties and Bonuses
 - d. Deductions for Liquidated Damages
 - e. Other Adjustments
- 3. Total Contract Sum, as adjusted.
 - 4. Previous payments.
 - 5. Sum remaining due.
- C. Project Management shall prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.06 FINAL APPLICATION FOR PAYMENT

- A. 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

- A. Execute cleaning during progress of the work and at completion of the work, as required by the General Conditions.

1.02 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with all Federal, State and Local codes, ordinances, regulations and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulation of waste materials, rubbish and wind-blown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.

- B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- C. Prior to final completion or County occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire work is clean.

END OF SECTION

SECTION 01720 PROJECT RECORD DOCUMENTS

PART 1 STANDARDS

1.01 MINIMUM RECORD DRAWING STANDARDS FOR ALL RECORD DRAWINGS SUBMITTED TO MANATEE COUNTY

- A. Record drawings shall be submitted to at least the level of detail in the contract documents. It is anticipated that the original contract documents shall serve as at least a background for all record information. Original drawings in CAD format may be requested of the County.
- B. Drawings shall meet the criteria of paragraph 2.04 D above and as mentioned in Section 1.14 Record Drawings in the Manatee County Public Works Standards, Part I Utilities Standards Manual.

PART 2 STANDARDS

2.01 REQUIREMENTS INCLUDED

- A. Contractor shall maintain at the site for the County one record copy of:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. County's field orders or written instructions.
 - 6. Approved shop drawings, working drawings and samples.
 - 7. Field test records.
 - 8. Construction photographs.

2.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI format.
- C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by the County.

2.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by the County.

2.04 RECORDING DRAWINGS PREPARATION

- A. Record information concurrently with construction progress.
- B. Do not conceal any work until required information is recorded.
- C. Drawings; Legibly mark to record actual construction:
 - 1. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc. Locations of drainage ditches, swales, water lines and force mains shall be shown every 200 feet (measured along the centerline) or alternate lot lines, whichever is closer. Dimensions at these locations shall indicate distance from centerline of right-of-way to the facility.
 - 2. Field changes of dimension and detail.
 - 3. Changes made by Field Order or by Change Order.
 - 4. Details not on original contract drawings.
 - 5. Equipment and piping relocations.
 - 6. Locations of all valves, fire hydrants, manholes, water and sewer services, water and force main fittings, underdrain cleanouts, catch basins, junction boxes and any other structures located in the right-of-way or easement, shall be located by elevation and by station and offset based on intersection P.I.'s and centerline of right-of-way. For facilities located on private roads, the dimensioning shall be from centerline of paving or another readily visible baseline.
 - 7. Elevations shall be provided for all manhole rim and inverts; junction box rim and inverts; catch basin rim and inverts; and baffle, weir and invert elevations in control structures. Elevations shall also be provided at the PVI's and at every other lot line or 200 feet, whichever is less, of drainage swales and ditches. Bench marks and elevation datum shall be indicated.
 - 8. Slopes for pipes and ditches shall be recalculated, based on actual field measured distances, elevations, pipe sizes, and type shown. Cross section of drainage ditches and swales shall be verified.
 - 9. Centerline of roads shall be tied to right-of-way lines. Elevation of roadway centerline shall be given at PVI's and at all intersections.
 - 10. Record drawings shall show bearings and distances for all right-of-way and easement lines, and property corners.
 - 11. Sidewalks, fences and walls, if installed at the time of initial record drawing submittal, shall be located every 200 feet or alternate lot lines, whichever is closer. Dimensions shall include distance from the right-of-way line and the back of curb and lot line or easement line.
 - 12. Sanitary sewer mainline wyes shall be located from the downstream manhole. These dimensions shall be provided by on-site inspections or televising of the sewer following installation.
 - 13. Elevations shall be provided on the top of operating nuts for all water and force main valves.
 - 14. Allowable tolerance shall be ± 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 County.
- D. Specifications and Addenda; Legibly mark each Section to record:
1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 2. Changes made by field order or by change order.
- E. Shop Drawings (after final review and approval):
1. Five sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

2.05 SUBMITTAL

- A. Prior to substantial completion and prior to starting the bacteria testing of water lines, deliver signed and sealed Record Documents and Record Drawings to the County. These will be reviewed and verified by the inspector. If there are any required changes or additions, these shall be completed and the entire signed and sealed set resubmitted prior to final pay application.
- B. The Contractor shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings. Record drawings shall be certified by the professional(s) (Engineer or Surveyor licensed in Florida), as stipulated by the Land Development Ordinance and submitted on signed and sealed paper drawings, signed and dated mylar drawings together with an AutoCAD version on a recordable compact disk (CD).
- C. The CD shall contain media in AutoCad Version 2004 or later, or in any other CAD program compatible with AutoCad in DWG or DXF form. All fonts, line types, shape files, external references, or other pertinent information used in the drawing and not normally included in AutoCad shall be included on the media with a text file or attached noted as to its relevance and use.
- D. Accompany submittal with transmittal letter, containing:
1. Date.
 2. Project title and number.
 3. Contractor's name and address.
 4. Title and number of each Record Document.
 5. Signature of Contractor or their authorized representative.

Note: The data required to properly prepare these record drawings shall be obtained at the site, at no cost to the County by the responsible design professional or their duly appointed representative. The appointed representative shall be a qualified employee of the responsible design professional or a qualified inspector retained by the responsible design professional on a project-by-project basis.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01724 CONNECTIONS TO EXISTING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General Requirements
- B. Submittals
- C. Scheduling of Shutdown

1.02 RELATED SECTIONS

- A. Section 01010 - Summary of Work
- B. Section 01570 - Traffic Regulation
- C. Section 02575 - Pavement Repair and Restoration

1.03 GENERAL REQUIREMENTS

- A. Be responsible for all connections to existing systems, cutting, fitting and patching, including attendant 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.
- B. Coordination: Before connection is performed, verify and provide for any pipe restraint that may be required for the new connection. Perform all cutting, fitting or patching of the Work that may be required to make the several parts thereof join in accordance with the Contract Documents. Perform restoration with competent workmen skilled in the trade.
- C. Improperly Timed Work: Perform all cutting and patching required to install improperly timed work, to remove samples of installed materials for testing, and to provide for alteration of existing facilities or for the installation of new Work in the existing construction.
- D. Limitations: Except when the cutting or removal of existing construction is specified or indicated, do not undertake any cutting or demolition, which may affect the structural stability of the Work or existing facilities without the CONSULTANT's concurrence.

1.04 SUBMITTALS

- A. Submit a written request to the CONSULTANT well in advance of executing any cutting or alteration which affects:

1. Work of the County or any separate contractor.
2. Structural value or integrity of any element of the project or work.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance or safety of operational elements.
5. Visual qualities of sight-exposed elements.

B. Include in request:

1. Identification of the work.
2. Description of affected work.
3. The necessity for cutting, alteration or excavation.
4. Effect on work of the County or any separate contract, or on structural or weatherproof integrity of work.
5. Description of proposed work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
6. Alternatives to cutting and patching.
7. Cost proposal, when applicable.
8. Written permission of any separate contractor whose work will be affected.
9. MOT Plan

C. SUBMIT WRITTEN NOTICE TO THE CONSULTANT DESIGNATING THE DATE AND THE TIME THE WORK WILL BE UNCOVERED.

1.05 SCHEDULING OF SHUTDOWN

- A. Connections to Existing Facilities: If any connections, replacement, or other work requiring the shutdown of an existing facility is necessary, schedule such work at times when the impact on the County's normal operation is minimal. If shutdown involves the water distribution system, provide notice to the County at least two (2) weeks prior to the proposed shutdown, including date, time and anticipated length of interruption of service. Overtime, night and weekend work without additional compensation from the County, may be required to make these connections, especially if the connections are made at times other than those specified. The connection of new or existing pipelines is prohibited from starting until CONTRACTOR assures that the system can receive the new flow.
- B. Interruptions of Service: Perform cut-ins into lines at a time approved in writing by the County. Whenever it is required to turn off valves which may interrupt the water supply of residents or businesses, notify all concerned parties or agencies with personal contact, door hangers and written boil water notice at least forty-eight (48) hours in advance of such cut-off, after having obtained the approval of the County. CONTRACTOR is responsible for boil water notice. Provide a copy of the written notice to the County by email. ONLY COUNTY PERSONNEL MAY OPERATE COUNTY-OWNED VALVES. Maintain water service to existing connections during construction, under any and all conditions and at no

additional cost to the County. Thoroughly clean and swab all pipe and fittings for cut-ins with a concentrated solution of calcium hypochlorite.

- C. Request for Water System Shutdowns: When plans call for connection to existing water distribution facilities or the CONTRACTOR plans to shut down existing utilities or where damage to such facilities is likely in order to complete construction of items under this contract, furnish the County with a written request for connection and shutdown valving plan. The County will identify the locations of all water valves needed to isolate the point of connection in the event that the existing facilities are damaged while making the connection. Identify in the request the valves, bypass piping, portable pumper trucks or any other means which the CONTRACTOR proposes to use in order to provide effective shutdown of the system. Include in a connection and shutdown schedule details of shutdown time and duration. Begin no connections, or construction where shutdown of or damage to existing utilities may occur, prior to County approval of the connection and shutdown plan and schedule.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of projects, 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 the work.
- C. Report unsatisfactory or questionable conditions to the County and the Engineer in writing; do not proceed with work until the Engineer has provided further instructions.

3.02 PREPARATION

- A. In cases where service to utility customers is interrupted, provide adequate equipment with backup onsite to assure prompt restoration of service.
- B. Provide adequate temporary support as necessary to assure structural value or integrity or affected portion of work.
- C. Provide devices and methods to protect other portions of project from damage.
- D. Provide protection from elements for that portion of the project that may be exposed by cutting and patching work, and maintain excavations free from water.
- E. Material Removal: Cut and remove all materials to the extent shown or as required to complete the Work. Remove materials in a careful manner with no

damage to adjacent facilities. Remove materials that are not salvageable from the site.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods that 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. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- E. Restore work, which has been cut or removed; install new products to provide completed work in accord with requirements of contract documents.
- F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

3.04 PAVEMENT RESTORATION

- A. Restore all pavement or roadway surfaces in accordance with Section 02575 - Pavement Repair and Restoration.
- B. Restore, replace or rebuild existing street paving, including underdrains, if any are encountered, where damaged, using the same type of construction as was in the original. Be responsible for restoring all such work, including subgrade, base courses, curb and gutter or other appurtenances where present. Obtain and pay for at CONTRACTOR's expense such local or other governmental permits as may be necessary for the opening of streets and be satisfied as to any requirements other than those herein set forth which may effect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.
- C. This section does not describe the construction of new road surfaces or the complete resurfacing of existing pavements.

END OF SECTION

SECTION 01730 OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile product data and related information appropriate for County's maintenance and operation of products furnished under Contract.

Prepare operating and maintenance data as specified in this and as referenced in other pertinent sections of Specifications.

- B. Instruct County's personnel in maintenance of products and equipment and systems.
- C. Provide three (3) sets of operating and maintenance manuals for each piece of equipment provided within this Contract.

1.02 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional manual for use by County's personnel.

- B. Format:

1. Size: 8-1/2 inch x 11 inch
2. Paper: 20 pound minimum, white, for typed pages
3. Text: Manufacturer's printed data or neatly typewritten
4. Drawings:
 - a. Provide reinforced punched binder tab, bind in with text.
 - b. Fold larger drawings to size of text pages.
5. Provide fly-leaf for each separate product or each piece of operating equipment.
 - a. Provide typed description of product and major component parts of equipment.
 - b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structures as applicable.
 - c. Identity of general subject matter covered in the manual.

- C. Binders:

1. Commercial quality three-ring binders with durable and cleanable plastic covers.
2. Maximum ring size: 1 inch.

3. When multiple binders are used, correlate the data into related consistent groupings.

1.03 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit three copies of complete manual in final form.
- B. Content for each unit of equipment and system, as appropriate:
 1. Description of unit and component parts.
 - a. Function, normal operating characteristics and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Operating Procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
 3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
 4. Servicing and lubricating schedule.
 - a. List of lubricants required.
 5. Manufacturer's printed operating and maintenance instructions.
 6. Description of sequence of operation by control manufacturer.
 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. List of predicted parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
 8. As installed control diagrams by controls manufacturer.
 9. Each contractor's coordination drawings.
 - a. As installed color coded piping diagrams.
 10. Charts of valve tag numbers, with location and function of each valve.
 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
 12. Other data as required under pertinent sections of specifications.

- C. Content, for each electric and electronic system, as appropriate:
1. Description of system and component parts.
 - a. Function, normal operating characteristics and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories of panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As-installed color coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
 5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
 6. Manufacturer's printed operating and maintenance instructions.
 7. List of original 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 County's personnel.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction on County's personnel.
- E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.04 SUBMITTAL SCHEDULE

- A. Submit one copy of completed data in final form fifteen days prior to substantial completion.
 1. Copy will be returned after substantial completion, with comments (if any).
- B. Submit two copies of approved data in final form. Final acceptance will not be provided until the completed manual is received and approved.

1.05 INSTRUCTION OF COUNTY'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct County's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01740 WARRANTIES AND BONDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to County for review and transmittal.

1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for County's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. Contractor, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 inch x 11 inch punched sheets for standard 3-ring binder. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.

- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.04 TIME OF SUBMITTALS

- A. Make submittals within ten days after date of substantial completion and prior to final request for payment.
- B. For items of work, where acceptance is delayed materially beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.05 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, service and maintenance contracts as specified in respective sections of Specifications.
- B. Approval by the County of all documents required under this section is a prerequisite to requesting a final inspection and final payment

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01900 PERMITS

PART 1 GENERAL

1.01 GENERAL

- A. The Contractor shall obtain all permits necessary to complete Work under this Contract.
- B. Where permits require that certain work is to be performed only in the presence of a representative of the permitting entity, the Contractor shall provide all coordination and notification required to assure the permit conditions are not violated.

1.02 PERMITS

- A. The County has obtained / will obtain permits from the following agencies where required for the construction of the work included in the project.
- B. All other permits and licenses required to perform the work included in the contract are the complete and total responsibility of the Contractor including but not limited to the following:
 - 1. FDEP - NOI including preparation of SWPPP
 - 2. FDEP - Generic Permit for the Discharge of Produced Groundwater
 - 3. Manatee County Building Permit (Signed and Sealed Drawings will be provided to Contractor by McKim & Creed).

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, items to be abandoned in place and items to be salvaged as indicated on the Drawings and as specified herein.
- B. Demolition items may include, but may not be limited to the following:
 - 1. Removal of electrical and mechanical equipment, including hatches.
 - 2. Removal of equipment pads.
 - 3. Pump removal
 - 4. Piping, valves, meters, vaults, conduit and duct banks.
 - 5. All other items required, whether or not shown on the Drawings or specified herein.
- C. Additional items to be salvaged may be identified 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 the Contractor's 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 the higher cost of: 1) Materials specified or shown in the Contract Documents; or 2) items identical or equal to the materials used in existing work when new.

2.02 PIPE ABANDONMENT GROUT

- A. Pipe abandonment grout shall conform to the “Non-Excavatable” flowable fill described in FDOT Specification Section 121.

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 and patch flooring as needed.

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, except for wiring which has to be completely removed, 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 County shall be moved to a location within the project site designated by the County.
- B. All removed equipment, piping, and materials not specifically designated to remain on the property of the County shall become the property of the Contractor and shall be removed from the site and properly disposed of.
- 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 Landfill for disposal, the Contractor shall be required to pay a tipping fee when crossing the landfill weighing 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 02220- Excavation, Backfill, Fill and Grading for Structures.
- 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

- A. Furnish all labor, materials, equipment and incidentals required to modify, alter and/or convert existing structures as shown or specified and as required for the installation of piping, mechanical equipment and appurtenances. Existing piping and equipment shall be removed and dismantled as necessary for the performance of facility alterations in accordance with the requirements herein specified.

PART 2 PRODUCTS

- A. Epoxy mortar shall be fiberglass fiber mixed with an epoxy filler.
- B. Non-shrink grout shall be a sand-cement, non-metallic formulation, having a 28-day strength of 4,000 psi and 0.0 percent shrinkage per ASTM C1090.

PART 3 EXECUTION

3.01 GENERAL

- A. Cut, repair, reuse, excavate, demolish or otherwise remove parts of the existing structures or appurtenances, as indicated on the construction drawings, or as necessary to complete the work as required. Dispose of surplus materials resulting from the above work in an approved manner. The work shall include all necessary cutting and bending of reinforcing steel, structural steel, or miscellaneous metal work found embedded in the existing structures.
- B. Dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the work. Where called for or required, cut existing pipelines for the purpose of making connections thereto.
- C. Anchor bolts for equipment and structural steel to be removed shall be cut off one inch below the concrete surface. Surfaces shall then be refinished using non-shrink grout or epoxy mortar or as indicated on the construction drawings. Repairs to be made on other existing concrete surfaces using non-shrink grout shall be made using a bonding agent such as Acrylbond by Concrete Producers Solutions or an equal approved by the County. Remove all dirt, curing compounds, sealers, paint, rust or other foreign material, and etch with muriatic acid solution. Flush with clean water and while still damp, apply a coating of the bonding agent. Place the new grout patch onto the treated area immediately.
- D. At the time that a new connection is made to an existing pipeline, additional new piping, extending to and including a new valve, shall be installed. Pipe restraint devices, if required, shall also be installed as required. At the time when a new potable or reclaimed water service is installed, a pipe locator tracer wire shall be installed and connected to the tracer wire at the main.

- E. No existing structure, equipment, or appurtenance shall be shifted, cut, removed, or otherwise altered except with the express approval of and only to the extent approved by the County. All existing valve boxes, fire hydrants, air release valve and cabinets shall be relocated to meet the new finished grade elevations after construction.
- F. When removing materials or portions of existing utility pipelines or structures or when making openings in walls and partitions, take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work, and not to damage the structures or contents by falling or flying debris. Unless otherwise approved by the County, saw-cutting, rotary core-boring, or line drilling will be required in removing material from existing concrete structures or pipes.
- G. Materials and equipment removed in the course of making alterations and additions shall remain the property of the County, except that items not salvageable, as determined by the County, shall be disposed of off the work site.
- H. All alterations to existing utility pipes and structures shall be done at such time and in such a manner as to comply with the approved time schedule. Before any part of the work is started, all tools, equipment, and materials shall be assembled and made ready so that the work can be completed without delays.
- I. All cutting of existing concrete or other material to provide suitable bonding to new work shall be done in a manner to meet the requirements of the respective section of these Standards covering the new work. When not covered, the work shall be carried on in the manner and to the extent directed by the County or per the construction drawings.
- J. Surfaces of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.
- K. Non-shrink cementitious grout shall be used for setting wall castings, sleeves, leveling pump bases, doweling anchors into existing concrete and elsewhere as shown on the construction drawings. The surface to which grout is to be applied shall be wetted to facilitate good bonding.
- L. Where necessary or required for the purpose of making connections; cut existing pipelines in a manner to provide an approved joint. Where required, use flanges, couplings, or adapters, all as required.
- M. Provide flumes, hoses, piping, pumps and well points, and other related items to divert or provide suitable plugs, bulkheads, or other means to hold back the flow of water or other liquids, all as required in the performance of the work.
- N. Care shall be taken not to damage any part of existing buildings or foundations or outside structures.

3.02 CONNECTING TO EXISTING PIPING AND EQUIPMENT

- A. The Contractor shall verify exact location, material, alignment, joint, etc. of existing piping and equipment prior to making the connections called out in the Drawings.

The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection. A County Inspector must be present for all tie-ins for a visual inspection.

3.03 REMOVAL AND ABANDONMENT OF ASBESTOS CEMENT PIPE AND APPURTENANCES

- A. All work associated with the removal or abandonment of existing asbestos cement pipe and appurtenances shall be performed by a licensed asbestos removal Contractor registered in the State of Florida.
- B. The asbestos Contractor shall contact the appropriate regulatory agencies prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices. The cost for all fees associated with permits, licenses and notices to the governing regulatory agencies shall be borne by the asbestos Contractor.
- C. All work associated with removal or abandonment of asbestos cement pipe and appurtenances shall be performed in accordance with the standards listed below and all other applicable local, State, or Federal standards.
 - (1) Florida Administrative Code, Chapter 62-257, ASBESTOS PROGRAM
 - (2) Title 40 CFR, Part 61, Subpart M, NATIONAL EMISSION STANDARD FOR ASBESTOS
 - (3) Occupational Safety and Health Act, Title 29 CFR
 - (4) Title 40 CFR, Part 763, ASBESTOS
 - (5) Florida Statute Title XXXII, Chapter 469, ASBESTOS ABATEMENT
- D. All asbestos cement pipe sections indicated on the construction drawings to be removed, and all related tees, valves, fittings and appurtenances shall be removed in their entirety and disposed of by the asbestos Contractor in accordance with this Section. Asbestos cement nipples between tees and valves shall be replaced. After removal of the pipelines, all excavations shall be backfilled in accordance with the applicable provisions of the Trenching and Excavation Section of these Standards. The cost of disposing of the removed materials shall be borne by the asbestos Contractor.
- E. The cutting of existing asbestos-cement (A/C, a.k.a. "Transite") pipe shall be by hand tools only. No powered machine cutting is allowed. Removal of all fragments of pipe shall be double bagged prior to shipment. Longer sections of pipe removed may be shipped without double bagging. An asbestos manifest form must accompany each shipment of such pipe or pipe material waste to the Manatee County Lena Road Landfill. Prior to each shipment, a minimum of 24 hours notice to the Landfill field office (telephone (941) 748-5543) is required.

3.04 IN-PLACE GROUTING OF EXISTING PIPE

- A. Where water and wastewater utility pipes are to be abandoned in place, they shall be filled with a nonshrinking sand-cement grout. When such pipes are made of asbestos-cement materials, the abandonment activities shall be performed by a licensed asbestos Contractor. It is completely the Contractor's responsibility to obtain all regulatory clearances and provide documentation in cases where they

have determined that an asbestos-cement pipe abandonment activity by in-place grouting does not require a licensed asbestos Contractor.

- B. The ends of the pipe sections to be grout-filled shall be capped or plugged with suitable pipe fittings. The grout material shall be of suitable properties and the pumping pressure shall be such that the pipe sections are filled completely with grout. All above ground features shall be removed: hydrants, meters, valve & meter boxes, pads, vaults, etc. Existing tees, crosses, and valves left in service shall be plugged and restrained.
- C. The County shall be given timely notice so that the County's representative may be present to monitor all pipe grouting operations. Provide standpipes and/or additional means of visual inspection as required to determine if adequate grout material has filled the entire pipe sections.
- D. All tees, crosses, and valves left in service shall be plugged and restrained.

END OF SECTION

SECTION 02110 CLEARING AND GRUBBING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

Traffic. Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

Protection. Provide temporary fences, barricades, coverings, or other protection to preserve existing items indicated to remain and to prevent injury or damage to persons or property. Provide protection for adjacent properties as required.

- A. Restore damaged work to condition existing prior to start of Work.
- B. Protect existing trees and vegetation that are indicated to remain from physical damage. Do not store materials or equipment within tree drip line. Use licensed arborist for tree damage repair. Replace damaged trees that cannot be restored to full growth, as determined by arborist, unless otherwise acceptable to the Engineer.
- C. Existing Services: Locations indicated are approximate; determine exact location before commencing Work. Coordinate with local utility service requirements and comply with their instructions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

Site Clearing. Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions as indicated or that interfere with new construction. Removal includes digging out stumps and roots, together with subsequent off-site disposal.

- A. Strip and stockpile topsoil that will be reused in the Work.
- B. Remove existing improvements, both above-grade and below-grade, to extent indicated or as otherwise required to permit new construction.
- C. Salvable Items: Carefully remove items indicated to be salvaged and store on the County's premises where indicated or directed.
- D. Control air pollution caused by dust and dirt; comply with governing regulations.
- E. Fill depressions and voids resulting from site-clearing operations. Using satisfactory soil materials, place in maximum 6-inch-deep horizontal layers and compact each layer to density of surrounding original ground.
- F. Grade ground surface to conform to required contours and to provide surface drainage.

- G. Dispose of waste materials, including trash, debris, and excess topsoil, off the County's property.
- H. Burning waste materials on site is not permitted.

END OF SECTION

SECTION 02220 EXCAVATION, BACKFILL, FILL AND GRADING FOR STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Structural excavation shall consist of the removal of material for the construction of foundations for structures and other excavation designated on the drawings or in these specifications.
- B. Structural excavation and backfill shall consist of furnishing material, if necessary and placing and compacting backfill material around structures to the lines and grades designated on the drawings, as specified or directed by the County.
- C. Structural excavation and backfill shall include the furnishing of all materials, equipment and other facilities which may be necessary to perform the excavations, place and compact the backfill, install sheeting and bracing, and carry out any necessary dewatering. It shall also include the wasting or disposal of surplus excavated material in a manner and in locations approved by the County.
- D. The Contractor is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the County. This includes, but is not limited to, protecting the root systems and adjusting grades as necessary for tree/root protection.

1.02 QUALITY ASSURANCE

- A. Testing Agency:
 - 1. In place soil compaction tests shall be performed by a qualified testing laboratory.
 - 2. Compaction tests shall be taken every 500 feet, except in the road crossings or road shoulders. Tests are to be taken according to current FDOT Standards.
- B. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM D1557, Moisture-Density Relations of Soils Using 10-lb. (4.5-kg) Rammer and 18-in. (457-mm) Drop.

1.03 JOB CONDITIONS

- A. The Contractor shall provide, operate and maintain all necessary pumps, discharge lines, well points, etc., in sufficient number and capacity to keep all excavation, bases, pits, etc., free from seepage, standing or running water at all times throughout the period of construction.

- B. The Contractor shall assume all responsibility for the security of the excavation required, employing bracing, lining or other accepted means necessary to accomplish same.
- C. Excavated areas shall be cleared of all debris, water, slush, muck, clay and soft or loose earth and shall be conditioned to the entire satisfaction of the County.
- D. All excavated material unsuitable for use or which will not be used shall be disposed of in a manner consistent with State and County regulation.
- E. All unsuitable organic materials, roots, logs, etc., found during excavation shall be removed by the Contractor and the trench shall be refilled with suitable material.

PART 2 PRODUCTS

2.01 MATERIAL FOR CONTROLLED FILL

- A. Composition: Only approved material free from organic matter and lumps of clay, shall be used for backfill. Excavated earth free from debris or organic material may be used for backfilling foundations or fill.
- B. Crushed stone and shell shall meet or exceed current FDOT Standards.

2.02 UNSUITABLE MATERIAL

- A. Unsuitable material shall be defined as highly organic soil per ASTM D2487 Group PT. This includes, but is not limited to, such items as topsoil, roots, vegetable matter, trash, debris, and clays that cannot be dried sufficiently to obtain specified compaction.

PART 3 EXECUTION

3.01 INSPECTION

- A. The Contractor shall verify that work preceding the affected work of this Section has been satisfactorily completed.
- B. Conditions adversely affecting the work of this Section shall be corrected to the satisfaction of the County.

3.02 REMOVAL OF UNSUITABLE MATERIALS

- A. The Contractor shall remove unsuitable material from within the limits of the Work.
- B. Materials meeting requirements for controlled fill shall be stockpiled as necessary and in such a manner satisfactory to the County.
- C. All material excavated shall be placed so as to minimize interference with public travel and to permit proper access for inspection of the work.

3.03 EXCAVATION

- A. When concrete or shell subbase footing is to rest on an excavated surface, care shall be taken not to disturb the natural soil. Final removal and replacement of the foundation material and subbase compaction to grade shall not be made until just before the concrete or masonry is placed.
- B. When any structural excavation is completed, the Contractor shall notify the County who will make an inspection of the excavation. No concrete or masonry shall be placed until the excavation has been approved by the County.
- C. The elevations of the footing bottom and the base slab as shown on the Drawings, shall be considered as approximate and the County may order in writing, such changes in dimensions or elevations of the footings and slab base as necessary to secure satisfactory foundations.
- D. All excavation shall be made within an area bounded by lines five feet outside and parallel to the exterior walls of the structure to allow for correct forming, shoring and inspection of foundation work. Pouring of concrete against earth side walls shall not be permitted.
- E. If the ground is excavated below the grade called for by the Drawings or becomes unstable due to the Contractor's carelessness or operations, the ground shall be excavated to undisturbed native soil before continuing concreting operations.
- F. If in the opinion of the County, the material at or below the normal grade of the bottom of the trench is unsuitable for pipe or structure foundation, it shall be removed to the depth directed by the County and if so directed, replaced by crushed stone or washed shell.

3.04 STRUCTURAL BACKFILL

- A. Structural backfill shall not be placed until the footings or other portions of the structure or facility have been inspected by the County and approved for backfilling.
- B. A minimum of 1-1/2" layer of lean concrete shall be placed as a working mat for the concrete base slabs and footings if required by the County.
- C. Fill shall be placed in uniform layers not more than 12" thick and compacted to a minimum of 98 percent of the maximum density determined by ASTM D1557, Method A or C, or as directed by the County. The Contractor shall securely tamp the backfill with pneumatic rammer around all wall foundations. The method of compaction shall be satisfactory to the County.
- D. Compaction of structural backfill by ponding and jetting may be permitted when, as determined by the County: the backfill material is of such character that it will be self-draining when compacted; foundation materials will not soften or be otherwise damaged by the applied water; no damage from hydrostatic pressure will result to the structure. Ponding and jetting within two feet below finished subgrade shall not be permitted in roadway areas. At the discretion of the County, ponding and jetting may be permitted with compaction layers not to exceed four feet.

- E. Surplus material not used on-site shall be removed and disposed of off-site by the Contractor. In no case shall surplus material be deposited on adjacent lands. Fill used for grading shall be placed in layers not to exceed 12 inches in thickness and shall be compacted to a density equal or greater to that of the surrounding natural ground.

3.05 BACKFILLING AROUND STRUCTURES

- A. Common fill and structural fill are specified for use as backfill against the exterior walls of the structures. Fill shall be placed in layers having a maximum thickness of eight (8) inches in loose state and shall be compacted sufficiently to prevent settlement. If compaction is by rolling or ramming, material shall be wetted down as required. Where material can be suitably compacted by jetting or puddling, the Contractor may use one of these methods. No boulders shall be allowed to roll down the slopes and hit the walls.
- B. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. A variation of two (2) feet in elevation will be the maximum allowable. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength. Backfilling shall be subjected to approval by the County.
- C. In locations where pipes pass through building walls, the Contractor shall take the following precautions to consolidate the refill up to an elevation of at least one foot above the bottom of the pipes:
 - 1. Place structural fill in such areas for a distance of not less than three feet either side of the center line of the pipe in level layers not exceeding 6-inches in depth.
 - 2. Wet each layer to the extent directed and thoroughly compact each layer with a power tamper to the satisfaction of the County.
 - 3. Structural fill shall be of the quality specified under Part 2 of this Section.
- D. The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan. No soft spots or uncompacted areas shall be allowed in the work.
- E. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

3.06 FIELD QUALITY CONTROL

- A. The density of soil in place shall be a minimum of 95 percent in accordance with ASTM test 1557-70T, Method A or C.

END OF SECTION

SECTION 02221 TRENCHING, BEDDING AND BACKFILL FOR PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all dewatering, excavation, backfill, fill, grading, trench protection or other related work required to complete the piping work shown on the Drawings and specified herein. The work shall include, but not be limited to: vaults; duct conduit; pipe; roadways and paving; backfilling; required fill or borrow operations; grading; disposal of surplus and unsuitable materials; and all related work such as sheeting, bracing and dewatering.
- B. Prior to commencing work, the Contractor shall examine the site and review test borings if available, or undertake their own subsurface investigations and take into consideration all conditions that may affect their work.
- C. The Contractor is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the County. This includes, but is not limited to protecting the root systems and adjusting grades as necessary for tree/root protection.

1.02 PROTECTION

- A. Sheeting and Bracing in Excavations:
 - 1. In connection with construction of underground structures, the Contractor shall properly construct and maintain cofferdams. These shall consist of: sheeting and bracing as required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing yard pipe and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
 - 2. Trench sheeting for pipes: no sheeting is to be withdrawn if driven below, mid-diameter of any pipe and no wood sheeting shall be cut off at a level lower than one foot above the top of any pipe unless otherwise directed by the County. During the progress of the work, the County may direct the Contractor in writing to leave additional wood sheeting in place. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given for an alternate method of removal.
 - 3. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. Unless otherwise approved or indicated on the Drawings or in the Specification, all sheeting and bracing shall be removed after completion of the piping or structure, care being taken not to disturb or otherwise injure the pipeline or finished masonry. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by

- ramming with tools specifically made for that purpose, by watering, or as may otherwise be directed.
4. The Contractor shall construct, to the extent the Contractor deems it desirable for the Contractor's method of operation, the cofferdams and sheeting outside the neat lines of the pipeline trench or foundation unless otherwise indicated on the Drawings or directed by the County. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing and cofferdams shall be adequate to withstand all pressures to which the pipeline or structure will be subjected. Pumping, bracing and other work within the cofferdam shall be done in a manner to avoid disturbing any construction of the pipeline or the enclosed masonry. Any movement or bulging which may occur shall be corrected by the Contractor at the Contractor's own expense so as to provide the necessary clearances and dimensions.
 5. Drawings of the cofferdams and design computations shall be submitted to the County and approved prior to any construction. However, approval of these drawings shall not relieve the Contractor of the responsibility for the cofferdams. The drawings and computations shall be prepared and stamped by a Registered Professional Engineer in the State of Florida and shall be in sufficient detail to disclose the method of operation for each of the various stages of construction, if required, for the completion of the pipeline and substructures.

B. Dewatering, Drainage and Flotation

1. The Contractor shall construct and place all pipelines, concrete work, structural fill, bedding rock and limerock base course, in-the-dry. In addition, the Contractor shall make the final 24" of excavation for this work in-the-dry and not until the water level is a minimum of 18" below proposed bottom of excavation.
2. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavation and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations. At all times during the construction operations, the groundwater levels shall be maintained at an elevation 18" below the lowest level where structures are being installed.
3. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
4. Wellpoints may be required for dewatering the soil prior to final excavation for deeper in-ground structures or piping and for maintaining the lowered groundwater level until construction has been completed to avoid the structure, pipeline, or fill from becoming floated or otherwise damaged. Wellpoints shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from wellpoints shall be continuous and standby pumps shall be provided.
5. The Contractor shall furnish all materials and equipment to perform all work required to install and maintain the proposed drainage systems for handling

- groundwater and surface water encountered during construction of structures, pipelines and compacted fills.
6. Where required, the Contractor shall provide a minimum of two operating groundwater observation wells at each structure to determine the water level during construction of the pipeline or structure. Locations of the observation wells shall be at structures and along pipelines as approved by the County prior to their installation. The observation wells shall be extended to 6" above finished grade, capped with screw-on caps protected by 24" x 24" wide concrete base and left in place at the completion of this Project.
 7. Prior to excavation, the Contractor shall submit the Contractor's proposed method of dewatering and maintaining dry conditions to the County for approval. Such approval shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The Contractor shall be responsible for correcting any disturbance of natural bearing soils for damage to pipeline or structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
 8. As part of their request for approval of a dewatering system, the Contractor shall demonstrate the adequacy of the proposed system and wellpoint filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one quart sample. Discharge water shall not flow directly into wetlands or Waters of the State as defined by FDEP and SWFWMD.
 9. During backfilling and construction, water levels shall be measured in observation wells located as directed by the County.
 10. Continuous pumping will be required as long as water levels are required to be below natural levels.

PART 2 PRODUCTS

2.01 MATERIALS

A. General

1. Materials for use as fill and backfill shall be described below and shall be from an FDOT certified pit. For each material, the Contractor shall notify the County of the source of the material and shall furnish the County, for approval, a representative sample weighing approximately 50 pounds, at least ten calendar days prior to the date of anticipated use of such material.
2. Additional materials shall be furnished as required from off-site sources and hauled to the site.

B. Bedding - shall conform to FDOT Standard Specifications for Road and Bridge Construction, Section 901 Coarse Aggregate, and shall be either coarse aggregate of Size No. 57 or coarse sand of Size No. 9. Washed shell size No.57 may be used as an alternate bedding material.

C. Structural Fill

1. Structural fill in trenches shall be used below spread footing foundations, slab-on-grade floors and other structures as backfill within three feet of the

- below grade portions of structures.
2. Shall be either soil classification A-1, A-2 or A-3, per AASHTO M-145, and shall be free of organic matter, lumps of clay or marl, muck, compressible materials, and rock exceeding 2.5" in diameter. Broken concrete, masonry, rubble or other similar materials shall not be used as backfill. Minimum acceptable density shall be 98 percent of the maximum density as determined by AASHTO T-180.
- D. Selected Common Fill - shall have the same material classification and requirements as Structural Fill, as described above.
- E. Common Fill
1. Shall be either soil classification A-1, A-2, A-3, A-4, A-5 or A-6, per AASHTO M-145, and shall be free of organic matter, lumps of clay or marl, muck, compressible materials and rock exceeding 2.5" in diameter. Broken concrete, masonry, rubble or other similar materials shall not be used as backfill.
 2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the County, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials by the Contractor.
- E. Unsuitable Material - soil classification A-7 and A-8, per AASHTO M-145, shall not be used as backfill material.

PART 3 EXECUTION

3.01 EXCAVATION

- A. Excavate trenches and pits for structures to the elevations indicated on the construction drawings. Take special care to avoid over-excavating or disturbing the bottom of the trench or pit, so that the soil at the bottom of the hole remains in a naturally compacted condition. Excavate to widths sufficient to provide adequate working room to install the required structures. Do not excavate the final layer of soil to the designed grade until just before placing the bedding, foundation, pipe, structure, or masonry work required. Remove boulders, rocks, logs or any unforeseen obstacles encountered.
- B. In case the foundation soil found at the bottom of the trench or pit is soft, plastic or mucky, or does not conform to the soils classification specified as suitable foundation material, over-excavation to a greater depth will be required. Soils not meeting the classification required for foundation material shall be removed to a depth at least 4" below the bottom of the pipe, bedding or structure bottom elevation. Rock, boulders or other hard or lumpy material shall be removed to a depth 12" below the bottom of the pipe, bedding or structure bottom elevation. Remove muck, clay or other soft material to a depth as needed to establish a firm foundation.
- C. Where possible, the sides of trenches should be vertical up to at least the spring line of the installed pipe.

- D. Trench excavation shall be performed in accordance with Florida Statute Title XXXIII, Chapter 553, Part III, Trench Safety Act.

3.02 BACKFILLING

- A. Backfill materials shall be placed on solid, firm, naturally compacted or compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, dry or dewatered in place soil foundations.
- B. Where over-excavation is required due to nonconforming soil classification or rocky, unstable, or otherwise undesirable soil conditions, place Structural Fill or Selected Common Fill in the over-excavated zone up to the base of the bedding material layer. Compact the over-excavated zone to 98 percent of the maximum dry density of the material as determined by AASHTO T-180.
- C. When backfilling in an over-excavated zone where moist or watery conditions exist, backfill shall be coarse No. 9 sand or a mixture of No. 57 coarse aggregate with either No. 9 coarse sand, A-1, or A-3 material.
- D. After compaction, backfill material in the over-excavation zone shall form a solid and firm foundation on which to build up successive layers of backfill and structures.
- E. Bedding materials shall be placed on solid, firm soil foundations and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180.
- F. Concrete and masonry structures shall be backfilled using Structural Fill. Backfilling and compaction shall be underneath the structure and carried up evenly on all walls of an individual structure simultaneously. The maximum allowable difference in backfill elevations shall be two feet. No backfilling shall be allowed against concrete or masonry walls until the walls and their supporting slabs have been in place at least seven days or until the specified 28-day strength has been attained. Compaction of Structural Fill underneath the base and along the walls shall be 98 percent of the maximum dry density of the material as determined by AASHTO T-180. The Structural Fill shall be either dried or shall have water added so that the moisture content of the material is within a range that will allow the required density to be achieved.
- G. Trenching backfill for pipe installation shall be Selected Common Fill for the pipe bedding zone. The pipe bedding envelope shall begin at the level 4", 6" or 9", depending on pipe diameter, below the bottom of the pipe, and shall extend vertically up to a level 12" above the top of the pipe. Where the in-place soil material within the 4", 6" or 9" pipe bedding zone beneath the bottom of the pipe meets the soil classification for Selected Common Fill, undercutting of the trench below the bottom of the pipe will not be required. In this case, loosen the soil in the bottom of the trench immediately below the middle third of the pipe diameter, and place the pipe upon it. Where the in-place soil material within the pipe bedding zone does not meet the soil classification for Selected Common Fill, undercutting shall be required, and the bedding zone shall be backfilled with Selected Common Fill. In this case, place the pipe bedding material and leave it in a moderately firm uncompacted condition under the middle third of the pipe diameter, and compact

the outer portions of the trench bottom to 98 percent of the maximum dry density. Soils that were over-excavated due to rocky, soft or otherwise unsuitable soil foundation conditions shall also be replaced with Selected Common Fill. Compaction of Selected Common Fill shall be 98 percent of the maximum dry density as determined by AASHTO T-180. Such backfill material shall have an optimized moisture content that will allow the required density to be achieved.

- H. Pipe sections for gravity flow systems shall be laid with spigots downstream and bells upstream. Excavate for pipe bells before laying pipe. Lay pipe true to the lines and grades indicated on the construction plans. Place backfill material on both sides of the pipe and compact to 98 percent of the maximum dry density of the material as determined by AASHTO T-180. Take special care to effectively fill and compact the material in the haunch areas under the sides of the pipe.
- I. For pipes that are not installed under roadways or driveways, trenching backfill for pipe installation shall be Common Fill above the pipe envelope zone, and shall be compacted to 95 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density. For pipes that are installed under roadways or driveways, trenching backfill for pipe installation shall be Selected Common Fill above the pipe envelope zone, and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density. Selected Common Backfill shall be placed in layers not to exceed 6". Common Backfill shall be placed in layers not to exceed 12".
- J. Backfill compaction tests shall be performed every 500 feet in pipe line trenches and for every utility structure. Test reports shall be presented to the County Inspector.

3.03 GRADING AND CLEAN UP

- A. Surplus and unsuitable soil materials not used on-site shall be removed and disposed of off-site in a manner that is consistent with state and local regulations. In no case shall surplus or unsuitable material be deposited on-site or on adjacent lands.
- B. The surface of backfilled areas shall be graded smooth and true to the lines and grades indicated on the construction plans. No soft spots or uncompacted areas shall be allowed in the work.
- C. Upon completion of the work, leave the work areas and all adjacent areas in a neat and presentable condition, clear of all temporary structures, rubbish and surplus materials. Pile any salvageable materials that have been removed in neat piles for pickup by County crews, unless otherwise directed.

END OF SECTION

**SECTION 02223 EXCAVATION BELOW GRADE AND CRUSHED STONE
OR SHELL REFILL**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. If in the opinion of the County, the material at or below the normal grade of the bottom of the trench is unsuitable for pipe or structure foundation, it shall be removed to the depth directed by the County and replaced by crushed stone or washed shell.

PART 2 PRODUCTS (NOT USED)

PART 3 MATERIALS

3.01 EXCAVATION AND DRAINAGE

- A. Whatever the nature of unstable material encountered or the groundwater conditions, trench stabilization shall be complete and effective.
- B. Should the Contractor excavate below the grade shown on the Contract drawings because of negligence or for the Contractor's own convenience; due to failure in properly dewatering the trench; disturbs the subgrade before dewatering is sufficiently complete; the Contractor shall be directed by the County to excavate below grade. The work of excavating below grade and furnishing and placing the approved refill material shall be performed at the Contractor's expense.

3.02 REFILL

- A. Soils not meeting the classification required for foundation material shall be removed to a depth at least four inches below the bottom of the pipe, bedding or structure bottom elevation. Rock, boulders or other hard or lumpy material shall be removed to a depth 12" below the bottom of the pipe, bedding or structure bottom elevation. Remove muck, clay or other soft material to a depth as needed to establish a firm foundation.

END OF SECTION

SECTION 02260 FINISH GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall finish grade sub-soil.
- B. The Contractor shall cut out areas to receive stabilizing base course materials for paving and sidewalks.
- C. The Contractor shall place, finish grade and compact top soil.

1.02 PROTECTION

- A. 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 County.

PART 2 PRODUCTS

- A. Topsoil: Shall be friable loam free from subsoil, roots, grass, excessive amount of weeds or other organics, stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter. The Contractor may use topsoil stockpiles on site if they conform to these requirements.

PART 3 EXECUTION

3.01 SUB-SOIL PREPARATION

- A. The Contractor shall rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Uneven areas and low spots shall be eliminated. Debris, roots, branches or other organics, stones, and sub-soil shall be removed by the Contractor and disposed of in a manner consistent with the latest Manatee County Standards as well as any affected regulatory agency. Should contaminated soil be found, the Contractor shall notify the County.
- B. The Contractor shall cut out areas to sub-grade elevation to stabilize base material for paving and sidewalks and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density.
- C. The Contractor shall bring sub-soil to required profiles and contour grades gradually; and blend slopes into level areas.
- D. The Contractor shall slope the structure grade a minimum of two (2) inches in ten (10) feet unless indicated otherwise on the Drawings.
- E. The Contractor shall cultivate sub-grade to a depth of 3 inches where the topsoil is to be placed. The Contractor 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. The Contractor shall place from the following minimum depths, up to finished grade elevations:
 - 1. 6 inches for seeded areas
 - 2. 4-1/2 inches for sodded areas
 - 3. 24 inches for shrub beds
 - 4. 18 inches for flower beds
- B. The Contractor shall use topsoil in a dry state as determined by the County. The Contractor shall place the material during dry weather.
- C. The Contractor shall use fine grade topsoil eliminating rough and low areas to ensure positive drainage. The Contractor 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 the Contractor's expense.
- B. The Contractor shall leave stockpile areas and entire job site clean and raked, ready for landscaping operations.

END OF SECTION

SECTION 02276 TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work specified in this Section consists of the design, provision, maintenance and removal of temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls include, but are not limited to: grassing, mulching, netting, watering, and the reseeding of on-site surfaces and spoil and borrow area surfaces, interceptor ditches at ends of berms and other such work at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the County.
- C. Temporary sedimentation controls include, but are not limited to: silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which shall ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the County.
- D. The Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

1.02 REFERENCE DOCUMENTS

- A. Florida Building Code.
- B. FDEP/COE Dredge and Fill Regulations and/or Permit as applicable.
- C. SWFWMD Permit Regulations and/or Permit as applicable.
- D. Florida Stormwater, Erosion and Sedimentation Control Inspector's Manual.

PART 2 PRODUCTS

2.01 EROSION CONTROL

- A. Netting - fabricated of material acceptable to the County.
- B. Seed and sod.

2.02 SEDIMENTATION CONTROL

- A. Bales - clean, seed free cereal hay type.
- B. Netting - fabricated of material acceptable to the County.
- C. Filter stone - crushed stone conforming to Florida Dept of Transportation specifications.

- D. Concrete block - hollow, non-load-bearing type.
- E. Concrete - exterior grade not less than one inch thick.

PART 3 EXECUTION

3.01 EROSION CONTROL

- A. Minimum procedures for grassing shall be:
 - 1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
 - 2. Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
 - 3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2 inches.
 - 4. Apply netting over mulched areas on sloped surfaces.
 - 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02 SEDIMENTATION CONTROL

- A. The Contractor shall install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Deteriorated hay bales and dislodged filter stone shall be replaced by the Contractor at their expense.

3.03 PERFORMANCE

- A. The Contractor, at their 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 02315 EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work included under this Section consists of clearing, excavating, grading, backfilling and compacting as required for the construction of the structures, piping and appurtenances as shown on the Drawings and specified herein.
- B. Related Work Described Elsewhere:
1. Section 02110 - Clearing and Grubbing
 2. Section 02220 - Excavation, Backfill, Fill and Grading for Structures
- C. Definitions:
1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
 2. Optimum Moisture: Percentage of water in a specific material at maximum density.
 3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
 4. Suitable: Suitable materials for fills shall be non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt or muck. The Contractor shall furnish all additional fill material required.
 5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7 and A-8 in accordance with AASHTO Designation M-145.
- D. Plan For Earthwork: The Contractor shall be responsible for having determined to their satisfaction, prior to the submission of the Contractor's bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of their proposed operations to the County/Engineer for review. The Contractor shall consider, and the Contractor's plan for excavation shall reflect, the equipment and methods to be employed in the excavation. No claims for extras based on substrata or groundwater table conditions will be allowed.

1.02 SUBMITTALS

- A. Submit six (6) copies of a report from a testing laboratory verifying that any off-site borrow material conforms to the gradation specified.

1.03 QUALITY ASSURANCE

- A. A Testing Laboratory employed by the Contractor will make such tests as are specified. The Contractor shall schedule their work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of their progress. The Contractor shall keep a complete record and provide a map of all test locations.
- B. Determination of laboratory moisture-density relationship and maximum density shall be by modified Proctor method of ASTM D-1557. At least one (1) test per soil type shall be made.
- C. Compaction shall be deemed to comply with the Specifications when no tests are below the specified relative compaction.
- D. Tests will be made in locations reviewed and approved by the County/Engineer. If any tests are unsatisfactory, re-excavate and recompact the fill or backfill until the specific compaction is obtained. The Contractor shall make additional compaction tests on each side of unsatisfactory test, at locations approved by the County/Engineer, to determine the extent of re-excavation and recompaction necessary.

1.04 JOB CONDITIONS

- A. Site Information: Subsurface exploration and geotechnical engineering evaluation where provided is for the Contractor's information only. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil bearings. It is expressly understood that the County will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data, where provided, are made available for convenience of the Contractor.
 - 1. Test borings and other exploratory operations may be made by the Contractor at no cost to the Owner.
- B. If, in the opinion of the County/Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the Contract price, as provided in the Schedule of Cost for Changes in Quantities.

1.05 PROTECTION

- A. Sheeting and Bracing (if required):
 - 1. Furnish, install in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, power poles, etc. from undermining, and to protect workers from hazardous conditions of other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other methods. Care shall be taken to prevent voids outside of the sheeting, but if voids are

formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the County.

2. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems is desirable for their method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at the Contractor's own expense so as to provide the necessary clearances and dimensions.
3. Where sheeting and bracing is required to support the sides of excavations of structures, the Contractor shall engage a Geotechnical Professional Engineer, registered in the State of Florida, to design the sheeting and bracing.
4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures due to sheeting installation.
5. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings for the purpose of preventing injury to structures, utilities, or property, whether public or private. The County/Engineer may direct that timber used for sheeting and bracing be cut off at any specified elevation.
6. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the County/Engineer.
7. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed suborder foundation. This condition shall continue until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall engage a Geotechnical Professional Engineer registered in the State of Florida, to design the temporary dewatering systems for all structures. The dewatering system installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Geotechnical Professional Engineer. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the suborder soils at proposed bottom of

- excavation and to preserve the integrity of adjacent structures. Well or sump installation shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.
3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a pit bottom free from standing water.
 4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
 5. The conveying of water in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the County/Engineer or the authority having jurisdiction, at no cost to the County.
 6. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
 7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system shall be removed by the Contractor.
 8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 1. All fill and backfill material shall be subject to the approval of the County/Engineer.
 2. All fill and backfill material shall be free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.
- B. Common Fill Material: Common fill shall be sand and shall not contain stones, rock, concrete or other rubble larger than 2 inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.
- C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

<u>U.S. Sieve Size</u>	<u>Percent Passing by Weight</u>
1 inch	100
No. 4	75-100
No. 40	15-80
No. 100	0-30
No. 200	0-12

D. Class I Soils: Manufactured angular, granular material, 3/8 to 3/64 inches (9.5 mm to 1 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately:

1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C-33 stone size No. 89 and with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing by Weight</u>
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

2. Soils defined as Class I materials are not defined in ASTM D-2487.

E. Class II Soils:

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on No. 4 sieve. More than 95 percent (95%) retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on No. 4 sieve. More than 95 percent (95%) retained on No. 200 sieve. Clean.
3. SW: Well-graded sands and gravelly sands, little or no fines. More than 50 percent passes No. 4 sieve. More than 95 percent (95%) retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 percent passes No. 4 sieve. More than 95 percent (95%) retained on No. 200 sieve. Clean.
5. In accordance with ASTM D-2487, less than 5 percent (5%) pass No. 200 sieve.

F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S.
Sieve Size

Percent Passing
by Weight

3/8 inch

100

No. 10

85-100

No. 40

20-40

No. 200

0-12

- G. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the County/Engineer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clearing:
1. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth, within 10 feet of the lines of the excavation.
 2. Strip and stockpile topsoil on the site at the location to be determined by the County/Engineer.

3.02 EXCAVATION

- A. General: Excavations for roadways, structures and utilities must be carefully executed in order to avoid interruption of existing utilities.
- B. Excavating for Roadways/Structures/Utilities:
1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.
 - a. Excavation for precast or prefabricated structures shall be carried to an elevation 2 feet lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be sounded, if not dewatered, using a rigid pole to indicate the satisfaction of the County that excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.
 - b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavation shall be replaced with 3,000 psi concrete.
 - c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation. Forming for footing sides is specified elsewhere.

2. Immediately document the location, elevation, size, material type and function of all new subsurface installation, and utilities encountered during the course of construction.
3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of work.
4. Encounters with subsurface obstructions shall be hand excavated.
5. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of suborder soils. Suborder soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the County/Engineer at the Contractor's expense.
6. The bottom of excavations shall be rendered firm and dry before placing any structure. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.
7. All pavements shall be cut for removal, with saws and approved power tools.
8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.
9. All locations and elevations as required herein must be permanently documented by the Contractor, on the Record Drawings prior to the County/Engineer approval of the Application for Payment for that work.
10. When force main pipe or pipe conveying other than non-potable liquid is less than 10 feet from a potable water main, the depth of cover shall be increased to 5 feet or 18 inches below the water main, whichever is greater.

3.03 DRAINAGE

- A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed suborder foundation condition. The dewatering method used shall prevent disturbance of earth below grade.
- B. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.
- C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24 hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from their failure to do so.
- D. The Contractor will be required at their expense to excavate below grade and refill with approved fill material if the County determines that adequate drainage has not been provided.

3.04 UNDERCUT

- A. If the bottom of any excavation is below that shown on the Drawings or specified because of the Contractor's error, convenience, or unsuitable suborder due to the

Contractor's excavating method, he shall refill to normal grade with fill at their own cost. Fill material and compaction method shall be as directed by the County.

3.05 FILL AND COMPACTION

- A. Compact and backfill excavations and construct embankment according to the following schedule:

STRUCTURES AND ROADWORK

<u>Area</u>	<u>Material</u>	<u>Compaction</u>
Utility trenches, backfill beneath structures	Structural Fill	8 inch lifts, compacted backfill beneath to 95 percent (95%) by Modified Proctor Method
Roadways	Common Fill	6 inch lifts, compacted backfill beneath to 98 percent (98%) by Modified Proctor Method.
Around structures	Structural Fill	8 inch lifts, 95 percent (95%) of Modified Proctor Method. Use light rubber-tired or vibratory plate compactors.
From cleared existing surface to subgrade for paved and gravel surfaces	Common Fill	12 inch lifts, 98 percent (98%) of Modified Proctor Method.

- B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.
- C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.
- D. Embankments shall be constructed true to lines, grades and cross sections shown on the plans or ordered by the County/Engineer. Embankments shall be placed in successive layers of not more than 8 inches in thickness, loose measure, for the full width of the embankment. As far as practical, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.
- E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified here, such request shall be in writing to the County/Engineer. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The County's approval will be in writing.

END OF SECTION

SECTION 02485 SEEDING AND SODDING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials and equipment necessary to satisfactorily return all construction areas to their original conditions or better.
- B. Work shall include furnishing and placing seed or sod, fertilizing, planting, watering and maintenance until acceptance by County.

1.02 RELATED WORK NOT INCLUDED

- A. 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 County until a satisfactory stand is obtained. For purposes of grassing, a satisfactory stand of grass is herein defined as a full lawn cover over areas to be sodded or seeded, with grass free of weeds, alive and growing, leaving no bare spots larger than 3/4 square yard within a radius of 8 feet.
- B. All previously grassed areas where pipelines are laid shall be sodded. All sodding and grassing shall be installed in accordance with these Specifications or as directed by the County.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fertilizer: The fertilizer shall be of the slow-release type meeting the following minimum requirements: 12 percent nitrogen, 8 percent phosphorus, 8 percent potassium; 40 percent other available materials derived from organic sources. At least 50 percent of the phosphoric acid shall be from normal super phosphate or an equivalent source which will provide a minimum of two units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container. Fertilizer shall be uniform in composition, dry and free flowing delivered to sites in original unopened containers bearing manufacturer's statement or guarantee.
- B. Seeding/Grassing: The Contractor shall grass all unpaved areas disturbed during construction which do not require sod. All grassing shall be completed in conformance with FDOT Specifications, Sections 570 and 981. The grassed areas shall be mulched and fertilized in accordance with FDOT Specifications, except that no additional payment will be made for mulching, fertilizing and/or watering.

- C. Sodding: Sod shall be provided as required on the construction drawings or at locations as directed by the County in accordance with Florida Department of Transportation, Specifications Section 575 and 981. The Contractor shall furnish bahia grass sod or match existing sod. Placement and watering requirements shall be in accordance with FDOT Specifications Section 575, except that no additional payment will be made for placement and/or watering. This cost shall be included in the Contract price bid for sodding.
- D. Topsoil: Topsoil stockpiled during excavation may be used as necessary. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the County. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants and grassing specified herein.
- E. Water: It is the Contractor's responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. The Contractor shall make whatever arrangements that may be necessary to ensure an adequate supply of water to meet the needs for the Contractor's work. The Contractor shall also furnish all necessary hose, equipment, attachments and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

PART 3 EXECUTION

3.01 INSTALLATION

- A. When the trench backfill has stabilized sufficiently, the Contractor shall commence work on lawns and grassed areas, including fine grading as necessary and as directed by the County.
- B. Finish Grading: Areas to be seeded or sodded shall be finish graded, raked, and debris removed. Soft spots and uneven grades shall be eliminated. The County shall approve the finish grade of all areas to be seeded or sodded prior to seed or sod application.
- C. Areas to be sodded shall be excavated or cut-down to accept the approximate 2" thick sod, so finish grade matches existing. Sod shall not be thrown over top of existing sod or debris.
- D. Protection: Seeded and sodded areas shall be protected against traffic or other use by placing warning signs or erecting barricades as necessary. Any areas damaged prior to acceptance by the County shall be repaired by the Contractor as directed by the County.

3.02 CLEANUP

- A. Soil or similar materials spilled onto paved areas shall be removed promptly, keeping those areas as clean as possible at all times. Upon completion of seeding and sodding operations, all excess soil, stones and debris remaining shall be removed from the construction areas.

3.03 LANDSCAPE MAINTENANCE

- A. Any existing landscape items damaged or altered during construction by the Contractor shall be restored or replaced as directed by the County.
- B. Maintain landscape work for a period of 90 days immediately following complete installation of work or until County accepts project. Watering, weeding, cultivating, restoration of grade, mowing and trimming, protection from insects and diseases, fertilizing and similar operations as needed to ensure normal growth and good health for live plant material shall be included at no additional cost to the County.

3.04 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATORS

- A. Lawn areas planted under this Contract and all lawn areas damaged by the Contractor's operation shall be repaired at once by proper soil preparation, fertilizing and sodding, in accordance with these Specifications.

END OF SECTION

SECTION 02513 ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials and equipment necessary to complete all milling asphalt pavement and asphalt concrete paving (including restoration of driveways) as called out on the Contract Documents or as shown on the Drawings.

1.02 QUALITY ASSURANCE

- A. Qualifications of Asphalt Concrete Producer: The only materials permitted shall be furnished by a bulk asphalt concrete producer exclusively engaged in the production of hot-mix, hot-laid asphalt concrete.
- B. Qualification of Testing Agency: The County may employ a commercial testing laboratory to conduct tests and evaluations of asphalt concrete materials and design. The Contractor shall:
1. Provide asphalt concrete testing and inspection service acceptable to County.
 2. Include sampling and testing asphalt concrete materials proposed, and tests and calculations for asphalt concrete mixtures.
 3. Provide field testing facilities for quality control testing during paving operations.
- C. Requirements of Regulatory Agencies: The Contractor shall comply with the applicable requirements of:
1. Manatee County Utility Operations Department
 2. Manatee County Transportation Department
 3. State of Florida Dept. of Transportation

1.03 PAVING QUALITY REQUIREMENTS

- A. General: In addition to other specified conditions, the Contractor shall comply with the following minimum requirements:
1. In-place asphalt concrete course shall be tested for compliance with requirements for density, thickness and surface smoothness.
 2. Final surface shall be provided of uniform texture, conforming to required grades and cross sections.
 3. A minimum of four inch diameter pavement specimens for each completed course shall be taken from locations as directed by the County.
 4. Holes from test specimens shall be repaved as specified for patching defective work.

- B. Density:
 - 1. When subjected to 50 blows of standard Marshall hammer on each side of an in place material specimen, densities shall be comparable to a laboratory specimen of same asphalt concrete mixture.
 - 2. The minimum acceptable density of in-place course material shall be 98% of the recorded laboratory specimen density.
- C. Thickness: In-place compacted thicknesses shall not be acceptable if less than the minimum thicknesses shown on the Drawings.
- D. Surface Smoothness:
 - 1. Finished surface of each asphalt concrete course shall be tested for smoothness, using a 10 ft. straightedge applied parallel to and at right angles to centerline of paved areas.
 - 2. Surface areas shall be checked at intervals directed by County.
 - 3. Surfaces shall not be acceptable if they exceed the following:
 - a. Base Course: 1/4 in. in 10 ft.
 - b. Surface Course: 3/16 in. in 10 ft.
 - c. Crowned Surfaces:
 - (1) Test crowned surfaces with a crown template, centered and at right angles to the crown.
 - (2) Surfaces will not be acceptable if varying more than 1/4 in. from the template.

1.04 SUBMITTALS

- A. Samples: The Contractor may be required to provide samples of materials for laboratory testing and job-mix design.
- B. Test Reports: The Contractor shall submit laboratory reports for following materials tests:
 - 1. Coarse and fine aggregates from each material source and each required grading:
 - a. Sieve Analysis: ASTM C 136 (AASHTO T 27).
 - b. Unit Weight of Slag: ASTM C29 (AASHTO T 19).
 - c. Soundness: ASTM C 88 (AASHTO T 104) for surface course aggregates only.
 - d. Sand Equivalent: ASTM D 2419 (AASHTO T 176).
 - e. Abrasion of Coarse Aggregate: ASTM C131 (AASHTO T 96),for surface course aggregates only.
 - 2. Asphalt cement for each penetration grade:
 - a. Penetration: ASTM D5 (AASHTO T49).
 - b. Viscosity (Kinematic): ASTM D2170 (AASHTO T 201).
 - c. Flash Point: ASTM D92 (AASHTO T 48).

- d. Ductility: ASTM D 113 (AASHO T 51).
 - e. Solubility: ASTM D 4 (AASHO T 44).
 - f. Specific Gravity: ASTM D 70 (AASHO T 43).
3. Job-mix design mixtures for each material or grade:
- a. Bulk Specific Gravity for Coarse Aggregate: ASTM C 117(AASHO T 85).
 - b. Bulk Specific Gravity for Fine Aggregate: ASTM C 128(AASHO T 84).
4. Uncompacted asphalt concrete mix: Maximum Specific Gravity: ASTM D 2041 (AASHO T 209).
5. Compacted asphalt concrete mix:
- a. Bulk Density: ASTM D 1188 (AASHO T 166).
 - b. Marshall Stability and Flow: ASTM D 1559.
6. Density and voids analysis:
- a. Provide each series of asphalt concrete mixture test specimens, in accordance with A.I. MS-2 "Mix Design Methods for Asphalt Concrete".
 - b. Use Marshall method of mix design unless otherwise directed or acceptable to the County.
 - c. Report the quantity of absorbed asphalt cement in pounds of dry aggregate, percent air voids, and percent voids in mineral aggregate.
7. Sampling and testing of asphalt concrete mixtures for quality control during paving operations:
- a. Uncompacted asphalt concrete mix.
 - (1) Asphalt Cement Content: ASTM D 2172 (AASHO T 164).
 - (2) Penetration of Recovered Asphalt Cement: ASTM D 5(AASHO T 49).
 - (3) Ductibility of Recovered Asphalt Cement: ASTM D 113(AASHO T 51).
 - b. Compacted asphalt concrete mix:
 - (1) Bulk Density: ASTM D 1188 (AASHO T 166).
 - Marshall Stability and Flow: ASTM D1559).
 - c. Perform at least one test for each day's paving.
8. Asphalt plant inspection: ASTM D 290.
9. Additional testing:
- a. Retesting shall be required if previous tests indicate insufficient values, or if directed by the County.

- b. Testing shall continue until specified values have been attained.
10. Asphalt concrete materials which do not comply with specified requirements shall not be permitted in the work.

1.05 JOB CONDITIONS

- A. Weather Limitations:
- 1. Apply bituminous prime and tack coats only when the ambient temperature in the shade is 50 degrees F. and when the temperature has not been below 35 degrees F. for 12 hours immediately prior to application.
 - 2. Do not apply when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.
 - 3. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees F., when the underlying base is dry, and when weather is not rainy.
 - 4. Base course may be placed when air temperature is not below 30 degrees F. and rising, when acceptable to the County.
- B. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.
- C. Traffic Control: Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Soil Cement or Shell Base Course: as specified in FDOT Section 270, "Material for Base and Stabilized Base", and as called for in the Contract Documents.
- B. Aggregate for Asphalt Concrete, General:
- 1. Sound, angular crushed stone, crushed gravel, or crushed slag: ASTM D 692.
 - 2. Sand, stone, or slag screening: ASTM D 1073.
 - 3. Provide aggregate in gradations for various courses to comply with local highway standards.
- C. Surface Course Aggregates:
- 1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
- D. Asphalt Cement: Comply with ASTM D 946 for 85-100 penetration grade.
- E. Prime Coat:
- 1. Cut-back liquid asphalt.

2. Medium-Curing type: ASTM D 2027, Grade MC-70.

2.02 ASPHALT-AGGREGATE MIXTURES

A. Job-mix criteria:

1. Provide job-mix formulas for each required asphalt-aggregate mixture.
2. Establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to aggregate, and a single temperature at which asphalt concrete is to be produced.
3. Comply with the mix requirements of local governing highway standards.
4. Maintain material quantities within allowable tolerances of the governing standards.

2.03 TRAFFIC AND PARKING MARKING MATERIALS

- A. Traffic lane marking paint with chlorinated rubber base.
- B. Factory mixed, quick drying and non bleeding, FS TT-P-115C, Type III.
- C. Color: Driving Lane Dividers - White
No Parking Zone - Yellow
Parking Dividers - White

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Subbase Preparation:

1. The Contractor shall remove from the area all organic substance encountered to a depth of six or eight inches (6" or 8"), or to such depth and width as directed by the County. The entire area shall be plowed and dragged prior to placing a stabilizing additive, if required to meet minimum bearing value.
2. Subbase shall be compacted to a minimum density of 98 percent of the maximum as determined by the Modified Proctor Density AASHTO T180, and shall have a minimum bearing value of 40 pounds per square inch as determined by the Florida Bearing Test.

B. Base Course:

1. Check subgrade for conformity with elevations and section immediately before placing base material.
2. Place base material in compacted layers not more than 6 inches thick, unless continuing tests indicate the required results are being obtained with thicker layers.
3. In no case will more than 8-inches of compacted base be placed in one lift.
4. Spread, shape, and compact all base material deposited on the subgrade during the same day.
5. Compact base course material to be not less than 98% of maximum density: ASTM D 1557, Method D (98 percent maximum density: AASHTO

T-180).

6. Test density of compacted base course: ASTM D 2167.
7. Conduct one test for each 250 sq. yds. of in-place material, but in no case not less than one daily for each layer.

C. Loose and Foreign Material:

1. Remove loose and foreign material from compacted subbase surface immediately before application of paving.
2. Use power brooms or blowers, and brooming as required.
3. Do not displace subbase material.

D. Prime Coat:

1. Uniformly apply at rate of 0.20 to 0.5 gal. per sq. yd. over compacted and cleaned subbase surface.
2. Apply enough material to penetrate and seal, but not flood the surface.
3. Allow to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than 24 hours unless otherwise acceptable to the County.
4. Blot excess asphalt with just enough sand to prevent pick-up under traffic.
5. Remove loose sand before paving.

E. Tack Coat:

1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or portland cement concrete and similar surfaces.
2. Apply at rate of 0.05 to 0.15 gal. per sq. yd. of surface.
3. Apply tack coat by brush to contact surfaces of structures projecting into or abutting asphalt concrete pavement.
4. Allow surfaces to dry until material is at condition of tackiness to receive pavement.

3.02 MANHOLE FRAME / VALVE BOX ADJUSTMENTS (IF APPLICABLE)

A. Placing Manhole frames:

1. Surround manhole frames set to elevation with a ring of compacted asphalt concrete base prior to paving.
2. Place asphalt concrete mixture up to 1 in. below top of frame, slope to grade, and compact by hand tamping.

B. Adjust manhole frames to proper position to meet paving.

C. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.

D. Set cover manhole frames to grade, flush with surface of adjacent pavement.

3.03 PREPARING THE MIXTURE

- A. Comply with ASTM D 995 for material storage, control, and mixing, and for plant equipment and operation.
- B. Stockpiles:
 - 1. Keep each component of the various-sized combined aggregates in separate stockpiles.
 - 2. Maintain stockpiles so that separate aggregate sizes shall not be intermixed.
- C. Heating:
 - 1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture
 - 2. Use lowest possible temperature to suit temperature-viscosity characteristics of asphalt.
 - 3. Do not exceed 350 degrees F. (176.6 degrees C.).
- D. Aggregate:
 - 1. Heat-dry aggregates to reduce moisture content to not more than 2.0%.
 - 2. Deliver dry aggregate to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
 - 3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.
- E. Mix aggregate and asphalt cement to achieve 90-95% of coated particles for base mixtures and 85-90% of coated particles for surface mixture, when tested in accordance with ASTM D 2489.
- F. Transporting:
 - 1. Transport asphalt concrete mixtures from mixing site in trucks having tight, clean compartments.
 - 2. Coat hauling compartments with a lime-water mixture to prevent asphalt concrete mixture from sticking.
 - 3. Elevate and drain compartment of excess solution before loading mix.
 - 4. Provide covers over asphalt concrete mixture when transporting to protect from weather and to prevent loss of heat.
 - 5. During periods of cold weather or for long-distance deliveries, provide insulation around entire truck bed surfaces.

3.04 EQUIPMENT

- A. Provide size and quantity of equipment to complete the work specified within project time schedule.
- B. Bituminous Pavers: Self-propelled that spread hot asphalt concrete mixtures without tearing, shoving or gouging surfaces, and control pavement edges to true

lines without use of stationary forms.

C. Rolling Equipment:

1. Self-propelled, steel-wheeled and pneumatic-tired rollers that can reverse direction without backlash.
2. Other type rollers may be used if acceptable to the County.

D. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified.

3.05 PLACING THE MIX

A. Place asphalt concrete mixture on prepared surface, spread and strike-off using paving machine.

B. Spread mixture at a minimum temperature of 225 degrees F. (107.2 degrees C.).

C. Inaccessible and small areas may be placed by hand.

D. Place each course at thickness so that when compacted, it will conform to the indicated grade, cross-section, finish thickness, and density indicated.

E. Paver Placing:

1. Unless otherwise directed, begin placing along centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.
2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
3. Complete base courses for a section before placing surface courses.
4. Place mixture in continuous operation as practicable.

F. Hand Placing:

1. Spread, tamp, and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to County.
2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.

G. Joints:

1. Carefully make joints between old and new pavements, or between successive days' work, to ensure a continuous bond between adjoining work.
2. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
4. Offset transverse joints in succeeding courses not less than 24 inches.
5. Cut back edge of previously placed course to expose an even, vertical

surface for full course thickness.

6. Offset longitudinal joints in succeeding courses not less than 6 inches.
7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

3.06 COMPACTING THE MIX

- A. Provide sufficient rollers to obtain the required pavement density.
- B. Begin rolling operations as soon after placing when the mixture will bear weight of roller without excessive displacement.
- C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
- D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- F. Do not roll centers of sections first under any circumstances.
- G. Breakdown Rolling:
 1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
 2. Operate rollers as close as possible to paver without causing pavement displacement.
 3. Check crown, grade, and smoothness after breakdown rolling.
 4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- A. Second Rolling:
 1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
 2. Continue second rolling until mixture has been thoroughly compacted.
- I. Finish Rolling:
 1. Perform finish rolling while mixture is still warm enough for removal of roller marks.
 2. Continue rolling until roller marks are eliminated and course has attained specified density.
- J. Patching:
 1. Remove and replace defective areas.
 2. Cut-out and fill with fresh, hot asphalt concrete.
 3. Compact by rolling to specified surface density and smoothness.

4. Remove deficient areas for full depth of course.
5. Cut sides perpendicular and parallel to direction of traffic with edges vertical.
6. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

3.07 MARKING ASPHALT CONCRETE PAVEMENT

A. Cleaning:

1. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
2. Do not begin marking asphalt concrete pavement until acceptable to the County.

B. Apply paint with mechanical equipment.

1. Provide uniform straight edges.
2. Not less than two separate coats in accordance with manufacturer's recommended rates.

3.08 CLEANING AND PROTECTION

A. Cleaning: After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the County.

B. Protection:

1. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case sooner than 6 hours.
2. Provide barricades and warning devices as required to protect pavement.
3. Cover openings of structures in the area of paving until permanent coverings are placed (if applicable).

END OF SECTION

SECTION 02575 PAVEMENT REPAIR AND RESTORATION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. 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 lines and appurtenances as shown on the Contract Drawings.

1.02 GENERAL

- A. The Contractor shall take before and after photographs.
- B. The Contractor shall repair in a manner satisfactory to the County or State, all damage done to existing structures, pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basin, flagstones, or stabilized areas or driveways and including all obstructions not specifically named herein, which results from this Project.
- C. The Contractor shall keep the surface of the backfilled area of excavation in a safe traffic bearing condition and firm and level with the remaining pavement until the pavement is restored in the manner specified herein. All surface irregularities that are dangerous or obstructive to traffic are to be removed. The repair shall conform to applicable requirements of Manatee County Transportation Department requirements for pavement repair and as described herein, including all base, subbase and asphalt replacement.
- D. All materials and workmanship shall meet or exceed the County requirements and as called for in the Contract Documents and nothing herein shall be construed as to relieve the Contractor from this responsibility.
- E. All street, road and highway repair shall be made in accordance with the FDOT and County details indicated on the Drawings and in accordance with the applicable requirements and approval of affected County and State agencies.

PART 2 PRODUCTS

2.01 PAVEMENT SECTION

- A. Asphaltic concrete shall consist of asphalt cement, coarse aggregate, fine aggregate and mineral filler conforming to FDOT Type S-III Asphalt. Pavement replacement thickness shall match that removed but in no case shall be less than 1-1/2" compacted thickness. All asphalt concrete pavement shall be furnished, installed and tested in accordance with FDOT Specifications for Road and Bridge Construction.
- B. Asphalt or crushed concrete or approved equal base material shall be furnished and installed under all pavement sections restored under this Contract. Asphalt base shall have a minimum 6" compacted thickness, meet requirements for FDOT

ABC III (Minimum Marshall Stability of 1000) and be furnished, installed and tested in accordance with the requirements of the FDOT Standards. Crushed concrete base shall be 10" minimum compacted thickness. Crushed concrete aggregate material shall have a minimum LBR of 140 compacted to 98% T-180 AASHTO density. Asphalt base and crushed concrete base are acceptable. Other bases shall be submitted for approval.

- C. Prime and tack will be required and applied in accordance with Section 300 - FDOT Specifications: Prime and Tack Coat for Base Courses.

PART 3 EXECUTION

3.01 CUTTING PAVEMENT

- A. The Contractor shall saw cut in straight lines and remove pavement as necessary to install the new pipelines and appurtenances and for making connections to existing pipelines.
- B. Prior to pavement removal, the Contractor shall mark the pavement for cuts nearly paralleling pipe lines and existing street lines. Asphalt pavement shall be cut along the markings with a rotary saw or other suitable tool. Concrete pavement shall be scored to a depth of approximately two (2) inches below the surface of the concrete along the marked cuts. Scoring shall be done by use of a rotary saw, after which the pavement may be broken below the scoring with a jackhammer or other suitable equipment.
- C. The Contractor shall not machine pull the pavement until it is completely broken and separated along the marked cuts.
- D. The pavement adjacent to pipe line trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the Contractor shall remove and replace the pavement. In addition, the base and sub-base shall be restored in accordance with these Specifications, Florida Dept. of Transportation Standard Specifications and as directed by the County.

3.02 PAVEMENT REPAIR AND REPLACEMENT

- A. The Contractor shall repair, to meet or exceed original surface material, all existing concrete or asphaltic pavement, driveways, or sidewalks cut or damaged by construction under this Contract. The Contractor 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 FDOT.
- 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 asphaltic concrete repairs shall be in accordance with the Manatee County Public Works Standards, Part I Utilities Standards Manual, Detail UG-12. The asphaltic concrete repairs shall extend the full width and length of the excavation or to the limits of any damaged section. The edge of the pavement to be left in place shall be cut to a true edge with a saw or other approved method so as to provide a clean edge to abut the repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities. The existing asphalt beyond the excavation or damaged section shall be milled 25' back from the saw cut. Final overlay shall match existing with no discernable "bump" at joint.

3.03 MISCELLANEOUS RESTORATION

- A. 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

- A. 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

- A. 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

- A. All wearing surfaces shall be maintained by the Contractor in good order suitable for traffic prior to completion and acceptance of the work.

END OF SECTION

SECTION 02615 DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment and incidentals required, install, and test ductile iron pipe and fittings for the piping as shown on the Drawings and as specified herein.
- B. Piping shall be located substantially as shown on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference between pipes, conduits, utilities or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve the Contractor from installing and jointing different or additional items where required to achieve a complete piping system.
- C. Where the word "pipe" is used it shall refer to pipe, fittings, or appurtenances unless otherwise noted.

1.02 RELATED WORK

1.03 SUBMITTALS

- A. Submit copies of design calculations in accordance with Paragraph 2.02 below.
- B. The location of all pipes shall conform to the locations indicated on the Drawings. Pipe shall not be supplied from inventory.
- C. Submit anticipated production and delivery schedule.
- D. Prior to shipment of pipe, submit a certified affidavit of compliance from the Manufacturer stating that the pipe, fittings, gaskets, linings and exterior coatings for this project have been manufactured and tested in accordance with AWWA and ASTM standards and requirements specified herein.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - 2. ASTM A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
 - 3. ASTM C150 Standard Specification for Portland Cement.
- B. American Water Works Association (AWWA)
 - 1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C105 - AWWA Standard for Polyethylene for Ductile Iron Pipe Systems

3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3 In Through 48 In for Water and Other Liquids.
 4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 5. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
 7. AWWA C153 - Ductile- Iron Compact Fittings, 3-In Through 16-In for Water and Other Liquids.
 8. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Each length of ductile iron pipe supplied for the project shall be hydrostatically tested at the point of manufacture to 500 psi for a duration of 10 seconds per AWWA C151. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture of the pipe wall. Certified test results shall be furnished in duplicate to the Engineer prior to time of shipment.
- B. All ductile-iron pipe and fittings to be installed under this project 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 Engineer sworn certificates of such tests and their results prior to the shipment of the pipe.
- C. All pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory selected by the County at the County's expense.
- D. Inspection of the pipe and fittings will also be made by the Engineer or representative of the County after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job.
- E. All pipe and fittings shall be permanently marked with the following information:
 1. MANUFACTURER, date.
 2. Size, type, class, or wall thickness.
 3. Standard produced to (AWWA, ASTM, etc).

1.06 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe. Under no circumstances shall the pipe be dropped or skidded against each other. Slings, hooks, or pipe tongs shall be used in pipe handling.

- B. Materials, if stored, shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.
- C. Pipe shall not be stacked higher than the limits recommended by its Manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Stacking shall conform to Manufacturer's recommendations.
- D. Gaskets for mechanical and push-on joints to be stored 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.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe
 - 1. Ductile iron pipe shall conform to AWWA C151 and ANSI A21.51. Pipe shall be supplied in standard lengths as much as possible. All pipe materials used in potable water systems shall comply with NSF Standard 61.
 - 2. Thickness design shall be per AWWA C150, except provide minimum Class 350 for piping 12-in and smaller, provide minimum Class 250 for piping 14-inch and larger. All flanged ductile iron pipe used in above ground applications shall be Special Thickness Class 53.
 - 3. Ductile iron pipe shall be by U.S. Pipe and Foundry Company, Inc.; American Cast Iron Pipe Company or equal.
- B. Mechanical Joints
 - 1. Ductile iron pipe shall have rubber-gasket push-on joint, rubber-gasket mechanical joint, or flanged joints as shown on the Drawings. Rubber-gasket joints shall conform to AWWA C111. Gasket shall conform to AWWA C111 and ANSI A21.1 and shall be Ethylene Propylene Diene Monomer (EPDM) rubber for potable water and reclaimed water applications. "EPDM" shall be embossed and/or etched into the gasket material. Acrylonitrile butadiene (NBR) gaskets shall be used for all ductile iron pressure pipe that are located in soil that is contaminated with low molecular-weight petroleum products or non-chlorinated organic solvents or non-aromatic organic solvents. Fluorocarbon (FKM) gaskets shall be used for all ductile iron pressure mains that are located in soil that is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons. Fluorocarbon (FKM) gaskets shall be used where both classes of contaminants are found.
 - 2. Restrained joints shall be suitable for the specified pipe test pressure. All piping within the limits of project site under pressure shall be provided with restrained joints.
 - a. Joint restraint devices for ductile iron mechanical joint pipe and ductile iron mechanical joint fittings or ductile iron pipe shall be as follows. Mechanical joint glands shall be ductile iron in accordance with ANSI/AWWA C111/A 21.11. When reference is made to

ANSI/AWWA Standards, the latest revisions apply. Only those fittings and accessories that are of domestic (USA) manufacture will be acceptable.

- b. Restrained push-on joints for push joint pipe shall be US Pipe and Foundry TR Flex, McWane Inc, Super-Lock, American Cast Iron Pipe Company, Lock-Ring or Flex Ring.
 - c. Where shown on the Drawings or specified herein, restrained joints on existing pipe joints shall be a case by case basis to be submitted and reviewed for approval by the Engineer.
3. Bolts and nuts on mechanical joint or flange joint pipe and fittings shall be 304 stainless steel conforming to ANSI B16.1.
 4. Lubricant furnished for lubricating the push-on joints in potable water pipes shall be nontoxic, water soluble, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to the water, and shall be an approved substance per NSF 61.

C. Flanged Joints

1. Connecting pieces with one end flanged and the other end either plain-end or mechanical joint, shall conform to ANSI/AWWA Standard C110/A21.10-93 as specified hereinabove. Joint material for the flanged end shall be furnished by the Contractor and mechanical joint accessories for connecting pieces with a mechanical joint end shall be furnished as specified for mechanical joints above.
2. Other types of flanged fittings, and flanged pipe, shall conform to the following requirements unless otherwise stated in the order.
3. Flanged fittings shall conform to ANSI/AWWA Standard C110/A21.10-93, as specified hereinabove.
4. Flanged ductile-iron pipe with integrally cast flanges shall be manufactured in accordance with ANSI/AWWA Standard C151/A21.51-96, and with provisions contained above for centrifugally cast ductile iron pipe, and shall be furnished with ANSI Standard Class 125 flanges, plain faced and drilled, conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", latest revision. Hollow back flanges are not acceptable.
5. Flanged ductile-iron pipe with threaded flanges shall be manufactured in accordance with ANSI/AWWA Standard C115/A21.15-94, "Flanged Ductile-Iron Pipe with Threaded Flanges", and shall be rated for a working pressure of 250 psi, minimum. The nominal thickness of flanged ductile-iron pipe, 6-inch and larger, shall not be less than those shown in Table 1 of ANSI/AWWA Standard C115/A21.15-94. The nominal thickness of 4-inch flanged ductile-iron pipe shall be Class 54 (min.) conforming to Tables 3 and 4 of ANSI/AWWA Standard C151/A21.51-96. The pipe shall be furnished with ANSI Standard Class 125 flanges, plain faced and drilled, conforming to ANSI Standard B16.1, latest revision. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer, and shall not be interchangeable in the field. Pipe lengths shall be as ordered. Removal of flanges, cutting and re-threading the pipe, and reinstalling the flanges will not be permitted in any case.
6. All flanges on ductile-iron pipe and fittings shall be of ductile iron. Joint materials for flanged pipe and fittings shall be ANSI-sized and approved

with 1/8-inch-thick full-faced gaskets. Gaskets for sanitary sewer and force main applications shall be SBR. Gaskets for water service shall be EPDM.

7. Joint materials for flanged pipe and fittings shall be furnished by the Contractor.

D. Fittings

1. Pipe fittings shall be ductile iron with pressure rating of 350 psi for 24-in and smaller piping and 250 psi for 30-in and larger piping. Fittings shall meet the requirements of AWWA C110 or AWWA C153 as applicable. Fittings shall have the same pressure rating, as a minimum, of the connecting pipe.
2. Closures shall be made with mechanical joint ductile iron solid sleeves and shall be located in straight runs of pipe. Location of closures shall be subject to approval of the Engineer.

E. Interior Lining

1. Water Main and Reclaimed Water Main Coatings: All buried ductile iron pipe shall have a standard thickness cement lining on the inside in accordance with AWWA C104 and a standard 1-mil asphaltic exterior coating per AWWA C151 or as defined in the Approved Products List. All above-ground ductile iron pipe shall have a standard thickness cement lining on the inside in accordance with AWWA C104 and have an exterior coating factory-applied epoxy primer.
2. All ductile iron fittings shall have double the standard thickness cement linings on the inside per AWWA C104. Buried ductile iron fittings shall have a standard 1-mil asphaltic exterior coating per AWWA C151. Above-ground ductile iron fittings shall have a factory-applied epoxy primer.
3. Interior lining shall be certified under ANSI/NSF International Standard 61 for potable water immersion service for the size pipe required for the project.

F. Exterior Coating

1. Buried pipe shall be coated on the exterior with a 1.0 mils thick bituminous coat in accordance with ANSI A21-51. All buried ductile iron pipe, fittings and restrained joints shall have a polyethylene wrap with a minimum 8 mils thickness and shall conform to ASTM specification D-1248. Wrap for water main shall be blue and imprinted "WATER MAIN". When imprinted color coated polyethylene wrap is not available, color-coded polyethylene wrap can be used in conjunction with pipe ID tape.

2.02 DUCTILE IRON PIPE DESIGN

- A. Ductile iron pipe shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi. Design shall be done for external and internal pressures separately using the larger of the two for the net design thickness. Additional allowances shall be made for service allowance and casting tolerance per AWWA C150. The pipe classes determined for various sizes and

conditions shall provide the total calculated thickness at a minimum or conform to minimum pipe class specified in Paragraph 2.01A2 above, whichever is greater.

- B. Design for the net thickness for external loading shall be taken as the greater of the following conditions:
 - 1. 2-1/2-ft of cover with AASHTO H-20 wheel loads, with an impact factor of 1.5.
 - 2. Depth from existing ground level of future proposed grade (whichever is greater) to top of pipe as shown on the Drawings, with truck load.
 - 3. Soil Density: 120 lbs/cu ft.
 - 4. Laying Conditions; AWWA C150, Type 2.
- C. Design for the net thickness shall be based upon the following design internal pressure conditions:
 - 1. Total internal Pressure design: 500 psi (includes 100 psi surge allowance and 2.0 safety factor)
 - 2. Soil Modulus E.: 300 psi
- D. Copies of design calculations showing that the pipe meets all requirements specified herein shall be furnished to the Engineer for approval during shop drawing review. A yield strength of 42,000 psi shall be used during design calculations.

PART 3 EXECUTION

3.01 GENERAL

- A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe and fittings shall not be dropped. All pipe and fittings shall be examined before laying and no piece shall be installed which is found to be defective. Damage to the pipe coatings shall be repaired per Manufacturer's recommendations.
- B. 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. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work and when installed or laid, shall conform to the lines and grades required.

3.02 INSTALLING DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA C600, except as otherwise specified herein. A firm, even bearing throughout the length of the pipe shall be provided by digging bell holes at each joint and by tamping backfill materials at the side of the pipe to the springline per details shown on the Drawings. Blocking will not be permitted.
- B. All pipe shall be sound and clean before laying. When laying is not in progress, open ends of the pipe shall be closed by a watertight plug or other approved means. Sufficient backfill shall be placed to prevent flotation. The deflection at

joints shall not exceed 75 percent of allowable deflection recommended by Manufacturer.

- C. All ductile iron pipe laid underground shall have a minimum of 3-ft of cover unless otherwise shown on the Drawings or as specified herein. Pipe shall be laid such that the invert elevations shown on the Drawings are not exceeded.
- D. Fittings, in addition to those shown on the Drawings shall be provided, where required, in crossing utilities which may be encountered upon opening the trench. Solid sleeve closures shall be installed at locations approved by the Engineer.
- E. The pipe interior shall be maintained dry and broom clean throughout the construction period.
- F. Polyethylene encasement shall be installed in compliance with AWWA C105.
- G. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged. Field cut ends shall be sealed with approved epoxy in accordance with Manufacturer's instructions. Cutting of restrained joint pipe will not be allowed, unless approved at specific joints in conjunction with the use of restrainer glands by EBAA Iron or field adaptable restrained joints.
- H. Jointing Ductile-Iron Pipe
 - 1. Mechanical joints shall be assembled in strict accordance with the Manufacturer's instructions and AWWA C600. Pipe shall be laid with bell ends looking ahead. To assemble the joints in the field, thoroughly clean and lubricate the joint surfaces and rubber gasket. Bolts shall be tightened to the specified torques. Under no condition shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.
 - 2. Bolts in mechanical or restrained joints shall be tightened alternately and evenly.
 - 3. Restrained joints shall be installed according to pipe Manufacturer's instructions.
- I. All blow-offs, outlets, valves, fittings, and other appurtenances required shall be set and jointed as indicated on the Drawings in accordance with the Manufacturer's instructions.
- J. Link Seals
 - 1. All link seals shall be a standard type, seal element- EDPM rubber (black) or (blue), 20psig (40 ft of head) pressure resistant, oil resistant- EDPM (black), and temperature resistant-silicone rubber (gray).
 - 2. Low durometer shall be used for fragile pipe- EDPM rubber (blue) shore 40 \pm 5.
 - 3. Nuts and bolts shall be S316 Stainless Steel with 2-part Zinc Dichromate per ASTM B633, with an additional corrosion inhibiting proprietary organic coating (1470 hour salt spray test).

3.03 CONNECTIONS TO STRUCTURES

- A. Wall pipes shall have a thrust collar located at mid-depth of wall.
- B. Piping underneath structures shall be concrete encased.

3.04 TESTING

- A. After installation, the pipe shall be tested for compliance as specified herein. Furnish all necessary equipment and labor for the pressure test and leakage test on the pipelines.
- B. Submit detailed test procedures and method for Engineer's review. In general, testing shall be conducted in accordance with AWWA C600.
- C. Force main piping shall be subjected to a hydrostatic pressure of 150 psi. This test pressure shall be maintained for a minimum of 2 hours. The leakage rate shall not exceed those indicated in AWWA C600. Provide suitable restrained bulkheads as required to complete the hydrostatic testing specified.
- D. All valves and valve boxes shall be properly located and installed and operable prior to testing. Bulkheads shall be provided with a sufficient number of outlets for filling and draining the line and for venting air.
- E. Hydrostatic pressure and leakage tests shall conform with Section 4 of AWWA C600. Furnish gauges, meters, pressure pumps and other equipment needed to fill the line slowly and perform the required hydrostatic pressure leakage tests.
- F. The line shall be slowly filled with water and the specified test pressure shall be maintained in the pipe for the entire test period by means of a pump furnished by the Contractor. Provide accurate means for measuring the quantity of water required to maintain this pressure. The amount of water required is a measure of the leakage.
- G. Submit plan for testing to the Engineer for review at least 10 days before starting the test.

3.05 CLEANING

- A. At the conclusion of the work, thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal

END OF SECTION

SECTION 02616 DISINFECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Scope of Work: The work covered by this Section includes furnishing all labor, equipment and materials required for the disinfection of all potable and raw water mains; tanks; and the collection and testing of water samples for bacteriological analysis and regulatory approval. This work includes all disinfection required for the complete bypass piping/pumping system described in Section 01040, Coordination with County's Operations. If necessary, this work shall be conducted in phases, with separate regulatory clearances for each phase of the work. Phasing of the work shall be done at no additional cost to the County.
- B. Related Work:
 - 1. Section 02615: Ductile Iron Pipe and Fittings

1.02 REFERENCE STANDARDS

- A. The disinfection shall be performed in accordance with AWWA C651 "Disinfecting Water Mains".

1.03 SUBMITTALS

- A. The Contractor shall submit planned procedures to Engineer for review prior to beginning work. Submit certificates of compliance with specified standards for all materials to be used. The Contractor shall obtain sterile sample containers, collect samples, and submit to the approved laboratory. Provide six copies of laboratory test reports to Engineer.

1.04 QUALITY CONTROL

- A. Laboratories used for bacteriological testing of samples shall be certified by the Florida Department of Environmental Protection (FDEP) as acceptable to that agency.
- B. All disinfection and bacteriological sampling and testing shall comply with Rule 62-555-F.A.C. A letter of clearance must be issued by the FDEP prior to placing any temporary or permanent construction into service.

PART 2 PRODUCTS

2.01 MATERIALS FOR DISINFECTION

- A. The disinfecting agent shall be liquid chlorine conforming to AWWA B301 or sodium hypochlorite or calcium hypochlorite conforming to the requirements of AWWA B300.
- B. Testing and chlorination shall be furnished and paid for by the Contractor.

PART 3 EXECUTION

3.01 DISINFECTION OF WATER MAINS

A. Flushing

1. New Mains

- a. Flush mains prior to application of disinfecting agent. Flush with sufficient clear water to provide a full cross section of flow in the pipe at a cleansing velocity (minimum of 2.5 feet per second). Where insufficient water is available to provide cleansing velocity, 10-inch diameter and larger mains shall be cleaned during flushing by using a polyurethane bare swab. The swab shall be a light density, open-cell urethane foam body, base coated with urethane elastomer. The swab shall be able to reduce itself a minimum of 35 percent of its original cross-sectional area, negotiate mitered bends, short radius elbows, pass through tees and crosses and shall be abrasion resistant.
- b. Flushing shall continue until clear water flows from the nearest available point closest to the end of the line.

2. Existing Mains (Maintenance, Rehabilitation)

- a. The cleaning of the existing 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 in-line 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 County.

B. Disinfection

1. Disinfection of all piping, valves, and appurtenances shall be by the Continuous Feed Method in accordance with AWWA C651:
 - a. Continuous Feed Method: A solution containing not less than 75 mg/l of chlorine shall be applied to all piping, valves, fittings, hydrants and appurtenances. Solution shall remain in the pipelines for a minimum period of 24 hours. A free chlorine residual of 10 mg/l is required after the 24-hour holding period.
2. During the disinfection procedure, valves and hydrants shall be opened and closed several times during the contact period to insure that all parts are contacted by the disinfecting solution.

3. After disinfection has been completed, the main shall be flushed with potable water until the chlorine residual is stabilized and matches the chlorine residual of the flushing water. Chlorine residual determination shall be made in accordance with Standard Methods using the DPD Colormetric Method.

C. Sampling and Testing

1. Sample locations shall comply with the FDEP construction permit.
2. Samples of water shall be collected from the mains by the Contractor/County in sterile containers and delivered to an approved laboratory for bacteriological testing. Sampling and testing shall be continued until satisfactory results are obtained on two consecutive days.
3. The interior of pipe, fittings, valves, and appurtenances used for cutting into or repairing existing mains shall be swabbed or sprayed with a one-percent hypochlorite solution before being installed.
4. Tapping sleeves shall be cleaned and disinfected in accordance with Section 4.7 of AWWA C651.

3.02 DISINFECTION OF TANKS

A. Cleaning

1. Tanks shall be thoroughly cleaned in accordance with requirements of AWWA C652.

B. Disinfection

1. After completion of cleaning, tanks shall be disinfected in accordance with the requirements of Chlorination Method 1, 2 or 3 of AWWA C652.

C. Sampling and Testing

1. After completion of disinfection, samples shall be collected by the Contractor/County in sterile containers and submitted to an approved laboratory for bacteriological testing. Sampling and testing shall be continued until satisfactory results are obtained on two consecutive days.
2. In addition to bacteriological testing, the water in the storage facility shall also be tested to ensure that no offensive odor exists due to chlorine reaction or excess chlorine residual.

3.03 DISINFECTION OF PROCESS UNITS

A. Cleaning

1. Process units shall be thoroughly cleaned prior to disinfection in accordance with requirements of AWWA C653.

B. Flushing

1. All surfaces which will come in contact with potable water shall be thoroughly washed with chlorine water and scrubbed with stiff brooms to

remove all dirt, cuttings and other foreign matter. During this operation, the workmen shall wear rubber boots which have been thoroughly cleaned and which shall not be worn outside of the unit during the scrubbing operation.

C. Disinfection

1. After completion of cleaning and flushing, the process units shall be disinfected in accordance with the requirements of Chlorination Method [1] [2] [3] of AWWA C652.
2. Filters shall be disinfected in accordance with Section 4.4.3, AWWA C653.
3. Piping valves and appurtenances shall be disinfected in accordance with AWWA C651.

D. Sampling and Testing

1. After completion of flushing, the unit shall be filled with clean water and samples shall be collected by the Contractor in sterile containers and submitted to an approved laboratory for bacteriological testing. Sampling and testing shall be continued until satisfactory results are obtained on two consecutive days.

3.04 REDISINFECTION

A. General

1. If consistently unsatisfactory bacteriological test results are reported, the facilities shall be re-cleaned and re-disinfected.

3.05 DISPOSAL OF HEAVILY CHLORINATED WATER

A. Passive Non-Chemical Methods

1. Discharge to Sanitary Sewers (not allowed)
2. Discharge to Storm Sewers
 - a. Determine whether storm sewer from inlet connects/discharges to a receiving stream or waters leading to streams.
 - b. Determine distance to nearest inlet; the farther the chlorinated water has to travel (over paved surfaces), the more chlorine is removed from the water.
3. Retention in Holding Tanks
 - a. Determine approximate volume of discharge water so appropriate storage vessel may be utilized.
 - b. Monitor chlorine concentration in holding tank; release chlorinated water when it has met regulatory discharge limits.

4. Land Application

- a. Organic and inorganic impurities in soil and pavements exert a significant amount of chlorine demand and rapidly neutralize chlorine in waters.
- b. Spraying chlorinated water onto soils is an effective method for neutralizing chlorine in waters.
- c. Determine if water will percolate or will flow to receiving waters. If volume is sufficient to carry flow to waters, use a field test kit to determine chlorine residual and take the following action:
 - 1) If at or below regulatory discharge limits, allow to discharge to stream.
 - 2) If above regulatory limits, addition of chemical is necessary in order to reduce chlorine concentration.

B. Chemical Dechlorination

- 1. Chemicals used to dechlorinate water (Also refer to AWWA C651, Appendix C, or C652, Appendix B for listing)
 - a. Sulfur Dioxide
 - 1) Reacts instantaneously with free chlorine.
 - 2) Toxic chemical—not best suited for field applications.
 - b. Sodium Thiosulfate
 - 1) Skin, eye, nose, and throat irritant.
 - 2) Reacts slowly with chlorine and requires more time for dechlorination than most other dechlorination chemicals.
 - 3) Not toxic to aquatic species.
 - c. Sodium Sulfite
 - 1) Is available in tablet form, unlike most other dechlorinating chemicals.
 - 2) Effective for dechlorinating constant, low flow rate chlorinated releases.
 - d. Sodium Bisulfite
 - 1) Skin, eye, and respiratory tract irritant.
 - 2) Highly corrosive and caution must be used when handling.
 - e. Sodium Metabisulfite
 - 1) Eye, throat, skin, and lung irritant.
 - f. Calcium Thiosulfate
 - 1) Not toxic to aquatic species.

- 2) Extremely long time required for dechlorination to occur.
- g. Ascorbic Acid (Vitamin C)
 - 1) Eye, skin, and lung irritant.
 - 2) Does not scavenge dissolved oxygen.
- h. Sodium Ascorbate
 - 1) Does not scavenge dissolved oxygen
 - 2) Stable compound as solid; once mixed, degrades within a day or two.

2. Dechlorination Chemical Summary

- a. Choice of Chemical Depends Upon:
 - 1) Nature of water release.
 - 2) Strength of chlorine.
 - 3) Volume of water release.
 - 4) Distance from receiving waters.
- b. Use field test kit to measure chlorine strength prior to any discharge to streams, lakes, or other bodies of water.

END OF SECTION

SECTION 02617 INSTALLATION AND TESTING OF PRESSURE PIPE

PART 1 GENERAL

- A. Reference Section 1.8, Installation of Pipelines in the Manatee County Public Works Utility Standards Part 1-Utility Standards Manual.

1.01 GENERAL

- A. Furnish and install pipe, fittings, valves, fire hydrants, services, and all other appurtenances and incidentals complete and in-place as required by the construction drawings.
- B. Where potable or reclaimed water mains are to be installed under pavement, in parking lots, etc., the main shall be DI or protected by a steel casing pipe.
- C. All pipe crossing state or federal roads or local arterials & thoroughfares shall be installed in a casing pipe.
- D. Services under any kind of pavement shall be Type "L" copper or Schedule 40 stainless steel.
- E. Water mains 16-inches and larger shall be ductile iron. High density polyethylene or PVC (for 16" only). The use of HDPE pipe must be authorized by the County prior to ordering and installation.
- F. Soil testing in accordance with AWWA C105 shall be performed during the design phase to determine if the soil is corrosive to ductile iron pipe. One (1) soil test shall be performed for pipe lengths under 500 lineal feet, with an additional soil test every 500 of additional ductile iron pipe to be installed. The soil testing shall be performed by a Florida licensed geotechnical engineering and signed and sealed report shall be supplied to the County for review prior to installation of the ductile iron pipe for evaluation. The soil testing results shall be used to determine if additional requirements for the installation of ductile iron pipe and/or the restrained joints is warranted.
- G. Ductile iron pipe, with gasket materials as required in these Standards, shall be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents.
- H. Trees shall not be planted or located within 10 feet of any potable water main, reclaimed water main, sanitary force main or gravity sanitary sewer main that is owned and maintained by County. With prior approval, an approved root barrier may be used with 5 feet of clearance.
- I. All distribution waterlines that enter private property become private lines and shall have a back-flow preventer installed at the right-of-way. BFP can be part of a meter assembly or a BFP / detector check assembly.

J. Installation tolerances of Pipe Lines:

1. Direct Bury:

- a. Vertical Alignment = ± 0.5 feet
- b. Horizontal Alignment = ± 1.0 feet

2. Horizontal Directional Drill (Trenchless Technologies):

a. Vertical Alignment:

- 1) max. slope shall not exceed 2% (2.0 feet within a length of 100 feet).
- 2) No reverse curvature within 200 feet
- 3) No vertical deviation greater than ten (10) percent of the proposed depth of cover at that specific station.

b. Horizontal Alignment:

- 1) max. rate of deviation shall not exceed 1.5% (1.5 feet within a length of 100 feet
- 2) No reverse curvature
- 3) Total deviation not to exceed 2.0 feet

1.02 HANDLING AND STORAGE

- A. Prior to installation, all pipe and fittings shall be inspected. Cracked, broken, or otherwise defective materials not in compliance with these standards shall not be used and shall be removed from the project site.
- B. The pipeline installer shall take care in the handling, storage and installation of the pipe and fittings to prevent injury to the materials or coatings. Use proper implements, tools and facilities for the safe and proper protection of the work. Lower the pipe and fittings from the truck to the ground and from the ground into the trench in a manner to avoid any physical damages. Under no circumstances shall the pipe or fittings be dropped onto the ground or into the trenches.
- C. The pipeline installer shall not distribute material on the job site faster than it can be used to good advantage. Unless otherwise approved by the County, installer shall not distribute more than one week's supply of material in advance of laying. Any materials not to be installed within two weeks of delivery shall be protected from the sunlight, atmosphere and weather by suitable enclosures or protective wrapping until ready for installation. Stored PVC pipe shall be placed on suitable racks with bottom tiers raised above the ground to avoid damage. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's written instructions.

1.03 SURVEY MARKINGS

- A. As a marker for the Surveyor, a PVC pipe marker or 2" x 4" marker shall be inserted by the Contractor on the top of pipe for potable water mains, reclaimed water mains

and sanitary force mains at intervals no greater than 200 feet apart and at locations where there is a substantial grade change. The pipe markers shall indicate the pipe diameter and shall be labeled PWM in "safety" blue, RWM in purple, and FM in green, for potable water mains, reclaimed water mains and sanitary force mains, respectively. The Contractor is responsible for making the aforementioned markers available to the Surveyor. The Contractor shall field locate the mains and fittings when markers are not made available to the Surveyor.

- B. As a marker for the Surveyor, a PVC pipe marker or 2" x 4" marker shall be inserted by the Contractor on the top of all pipe fittings (other than sanitary sewer service wyes, potable water saddles and reclaimed water saddles). The markers for fittings shall indicate the type of fitting and shall be labeled PWF in "safety" blue, RWF in purple, and FMF in green, for potable water fittings, reclaimed water fittings, and sanitary force main fittings, respectively. The Contractor is responsible for making the aforementioned markers available to the Surveyor. The Contractor shall field locate the mains and fittings when markers are not made available to the Surveyor.
- C. A PVC pipe marker or 2" x 4" marker shall be inserted by the Contractor at the beginning and end of each horizontal directional drill (HDD). The HDD Contractor shall provide a certified report and bore log indicating the horizontal and vertical location every 25 linear feet or less along the pipe.
- D. A 2" PVC pipe marker with a painted end cap shall be inserted by the Contractor at the ROW line indicating each individual new service location or stub out. The marker shall be a 6 foot length of PVC pipe inserted 2 feet into the ground and shall be painted "safety" blue for potable water, purple for reclaimed water, and green for sewer.

1.04 PROCEDURE FOR TESTING WATER LINES, FORCE MAINS AND RECLAIMED WATER LINES

- A. A 48-hour notice is needed prior to testing. A letter stating the reasons testing should be scheduled ahead of other jobs must accompany all emergency testing requests.
- B. County and Contractor must be present for all testing, except for testing tapping valves and sleeves.
- C. HYDROSTATIC TESTING
 - 1. Refer to Manatee County Public Works Utility Standards Part 1-Utility Standards Manual Section 1.8.7.

1.05 INSPECTION/TESTING PROCEDURE COVERING BORED PIPE LINES OR CASING AND CONDUITS INSTALLED ACROSS PREVIOUSLY TESTED AND/OR COUNTY ACCEPTED WATER AND SEWER PIPE WITHIN DEVELOPMENT PROJECTS UNDER ACTIVE CONSTRUCTION

- A. Prior to testing water and sewer lines, every effort will be made to install sleeves for underground utilities that will cross these water and sewer lines or services.
- B. Where it has not been possible to pre-install sleeves prior to testing and bores or

conduits are required, it is the responsibility of the utility company and/or their Contractor performing the work to provide Manatee County Utility Operations Department or the Engineer of Record with accurate horizontal and vertical as-built information of the sleeves, bores and conduits installed by said utility company. This applies to all bores and conduits crossing water and sewer lines.

- C. Procedures to be followed for installation of conduits, pipe lines and bores that will cross, or be closer than 5'-0" horizontally and 18 inches vertically to, previously tested water and sewer lines that are still under the ownership of the developer/contractor.
1. Notify the County and obtain the best as-built information available. Allow sufficient time for the County to field locate the existing pipe lines.
 2. Submit drawings of proposed location to the County and Manatee County Utility Operations Dept. Utility Locations Section for review.
 3. Obtain a County Right-of-Way Use Permit if the work area is within a dedicated area of right-of-way.
 4. Perform installation in the presence of a County representative. Call (941) 792-8811, ext. 5061 or ext. 5069 with at least two (2) working days notice.
 5. Submit two (2) copies of as-built information to the County to incorporate into the record drawings to be submitted to the County.
 6. Failure to follow steps 2) thru 5) will result in additional charges for retesting the previously tested water and sewer lines.
- D. Procedures to be followed for installation of conduits, pipe lines and bores crossing or closer than 5'-0" horizontally and 18 inches vertically to previously tested water and sewer lines that have been previously accepted by Manatee County:
1. Obtain record drawing information from the County.
 2. If roadway has been dedicated to Manatee County, obtain Right-of-Way Use Permit and copy the Project Management Department Locations Section with proposed location drawing.
 3. Follow procedures in "Sunshine State One-Call", paying special attention to the requirements of Section VII.
- E. Should water or sewer lines be damaged during the bore pipe line or casing installation, the cost of any repairs and retesting will be paid for by the utility company that installed the bore. The actual clearance between a bored casing crossing a water or sewer pipe should not be less than 18 inches.

1.06 DETECTION

- A. Direct buried pipe shall have 3" detectable metallic tape of the proper color placed directly above the pipe and 12" below finished grade or 6" detectable tape between 12" and 24" below finished grade.
- B. Direct buried or horizontal directional drilled non-metallic pipe shall also have tracer wire installed along the pipe alignment. The tracer wire to be used shall be a solid, 10 gauge, high strength, copper clad steel wire with a polyethylene jacket of appropriate color manufactured by Copperhead Industries or Manatee County approved equal.

END OF SECTION

SECTION 02640 VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. All of the types of valves and appurtenances shall be products of well-established reputable firms who are fully experienced and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these standards as applicable. Valves used in waterworks applications shall comply with Section 8 of NSF Standard 61 for mechanical devices.
- C. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of potable water, reclaimed water, wastewater, etc., depending on the applications.
- D. All valves and appurtenances shall be of the size shown on the drawings and, to the extent possible, all equipment of the same type on the project shall be from a single manufacturer.
- E. All valves and appurtenances shall have the name of the manufacturer, year of the valve and the working pressure for which they are designed cast in raised letters upon some visible part of the body.
- F. Special tools, if required for the normal operation or maintenance, shall be supplied with the equipment.
- G. All hand actuated buried valves shall have three-piece adjustable valve boxes and 2-inch square AWWA operating nuts. Provide stainless steel extension stems and alignment rings where needed to bring the operating nut to within 4 feet below the box lid.
- H. Water and reclaimed water system isolation valves shall be gate valves for sizes 2-inch through 12-inch and shall be butterfly valves for sizes 16-inch and larger.
- I. Valves shall open when turning the operating nut or wheel counterclockwise and shall close when turning clockwise.
- J. All bonnet bolts, gland bolts, flange connection bolts, nuts, washers, and other trim hardware exposed to the outside environment shall be stainless steel. Thrust collar tie-rod bolts shall be stainless steel. All MJ-type underground bolts, nuts, and washers shall be COR-TEN or stainless steel.
- K. All valves shall have a factory applied, holiday free, fusion bonded epoxy coating on the interior and exterior unless otherwise noted in the plans or the following

specification. All other painted items exposed to sunlight, including field painted box lids, etc., shall be painted the appropriate color with an epoxy type paint.

- L. No valves with a break-way stem shall be allowed.
- M. The equipment may include, but may not be limited to, the following:
 - 1. Gate valves (Sec. 2.01)
 - 2. Combination Pressure Reducing and Pressure Sustaining with Check Valves Option (Sec. 2.02)
 - 3. Ball Valves (Sec. 2.03)
 - 4. Butterfly Valves (Sec. 2.04)
 - 5. Plug Valves (Sec. 2.05)
 - 6. Electronic Metering and Flow Control (Sec 2.06)
 - 7. Electronic Valve Control Panel (Sec. 2.07)
 - 8. Valve Actuators (Sec. 2.08)
 - 9. Air Release Valves (Sec. 2.09)
 - 10. Valves Boxes (Sec. 2.10)
 - 11. Corporation Stops and Saddles (Sec. 2.11)
 - 12. Flange Adapters and Plain End Couplings (Sec. 2.12)
 - 13. Hose Bibs (Sec. 2.13)
 - 14. Swing Check Valves (Sec. 2.14)
 - 15. Hydrants (Sec. 2.15)
 - 16. Restrained Joints (Sec. 2.16)
 - 17. Tapping Sleeves and Tapping Valves (Sec. 2.17)
 - 18. Tracer Wire Boxes (Sec. 2.18)

1.02 SUBMITTALS

- A. Submit to the County within 30 days after execution of the contract a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
- B. Complete shop drawings of all valves and appurtenances shall be submitted to the County for approval in accordance with the Specifications.

1.03 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

PART 2 PRODUCTS

2.01 GATE VALVES

- A. Where indicated on the drawings or necessary due to locations, size, or inaccessibility, chain wheel operators shall be furnished with the valves. Such operators shall be designed with adequate strength for the valves with which they are supplied and provide for easy operation of the valve. Chains for valve operators shall be galvanized.

- B. Gate valves installed underground shall be provided with a box cast in a concrete pad and a box cover. Stainless steel or equivalent valve extension stems shall be provided to place the valve operating nut no more than 4 feet deep. One valve wrench, 6 feet in length, shall be provided for every 15 valves installed.
- C. Gate valves 2 inches to 14 inches in diameter shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509 or AWWA C515 and shall be UL listed and FM approved where applicable. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- D. The valves shall have a non-rising stainless steel stem to eliminate lead content. All bolts, nuts and washers shall be stainless steel to eliminate exterior corrosion and maintain fastener strength. Manufacturer shall use Never-Seez or equivalent during assembly of bolt and nut sets to prevent galling of similar metals. Stem seals shall be provided and shall be of the O-ring type, two above and one below the thrust collar. Valves that are located above grade and located in valve vaults shall be OS&Y with flanged joints.
- E. The wedge shall be ductile iron fully encapsulated with an EPDM rubber. The Elastomer type shall be permanently indicated on the disc or body of the valve. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
- F. The valve body, bonnet, and bonnet cover shall meet or exceed all the requirements of AWWA C515.
- G. Valves meeting AWWA C515 requirements shall be rated for an operating pressure of 250 psi and shall be tested in accordance with AWWA C515.
- H. The valves are to have 2-inch cast or ductile iron AWWA operating nuts and shall open left or counterclockwise.
- I. The valves shall be covered by a Manufacturer's 10 year warranty on manufacturer's defects and reasonable labor costs for replacement. Warranty shall become effective from the date of purchase by the end user and delivered within 30 days from the receipt of the purchase order. For publicly owned and maintained utilities, the end user is Manatee County Government.
- J. Gate valves shall be assembled and tested in a certified ISO 9001:2000 manufacturing facility within the United States and provide their certification of meeting internationally recognized quality control procedures.
- K. Acceptable manufacturers are limited to the following: American Flow Control, Series 2500 FL x FL, Kennedy, Model KS-RW/2638 FL x FL, Mueller, Model A-2361 FL x FL, and Clow, Model 2638 FL x FL.

2.02 12-INCH COMBINATION PRESSURE REDUCING & PRESSURE SUSTAINING WITH CHECK VALVE OPTION

- A. The 12-inch Combination Pressure Reducing and Pressure Sustaining Valve shall automatically perform two independent functions. The Valve shall maintain a

constant downstream pressure, regardless of fluctuation demand and shall sustain the upstream pressure to a pre-determined minimum.

- B. The valve shall be pilot / hydraulically operated, diaphragm type globe valve with 150# flanged ends.
- C. The valve shall be equipped with isolation valves to service the pilot system while permitting flow if necessary.
- D. The pilot system shall consist of two direct acting, adjustable, spring loaded diaphragm valves.
- E. Valve shall be ductile iron with main valve trim of brass and bronze. The pilot control valves shall be cast brass with 303 stainless steel trim. Basis of Design is Model 9201 as manufactured by CLA-VAL. The Valve shall include:
 - a. Main valve
 - b. Strainer and orifice
 - c. Pressure reducing control
 - d. Pressure relief control
 - e. Check valve flow control (opening)
 - f. Isolation valves
 - g. Check valves with isolation valve
 - h. Pressure gauge
 - i. Stainless steel pilot
 - j. NSF 61 approved fusion bonded epoxy, inside and outside

Acceptable manufacturers are limited to the following: CLA-VAL, American Flow Control, Kennedy, or Mueller.

2.03 BALL VALVES

- A. Ball valves for water and reclaimed water, in sizes 3/4-inch through 2-inch, shall be brass body, stem and ball per ASTM B 62, alloy 85-5-5-5, full port, full flow, 1/4-turn check, ball curb valves, rated for 300 psi, Mueller 300 (as specified in the table below), Ford B-Series, or approved equal, with compression, pack joint, flare, threaded or flanged ends as required. Ball valves for wastewater, 2-inch through 3-inch, shall be 316 stainless steel body, cap, stem and ball per ASTM A351, full port, full flow, 1/4-turn check, ball valves, steam rated for 150 psi, pressure rating 1,000 psi CWT, Apollo 76F or approved equal, with threaded or flanged ends as required.

Curb Stops for Water and Reclaimed Water

Pipe Material	Type of Connection	Model
HDPE	Compression x FIP	B-25170 *
HDPE	Pack Joint x FIP	P-25170 *
Copper	Compression x FIP	B-25170
Copper	Flare x FIP	B-25166
Stainless Steel	FIP x FIP Thread	B-20200
* Insert required, part number per manufacturer product information		

- B. All valves shall be mounted in such a position that valve position indicators are plainly visible. Above grade ball valves shall have a vinyl coated lever handle. Lever handle, handle nut, and lever packing gland shall be 304 or 316 stainless steel.
- C. Potable plastic service pipe material and compression and pack joint connectors shall not be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Appropriate service tubing shall apply.

2.04 BUTTERFLY VALVES

- A. Butterfly valves shall conform to AWWA C504, Class 250 B, Mueller Lineseal XP11, DeZurik AWWA, Pratt HP-250II, or an approved equal.
- B. Valve seats shall be an EPDM elastomer. Valve seats 24 inches and larger shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. Valves 20 inches and smaller shall have bonded or mechanically restrained seats as outlined in AWWA C504.
- C. All valves shall be subject to hydrostatic and leakage tests at the point of manufacture. The hydrostatic test for Class 250 valves shall be performed with an internal hydrostatic pressure equal to 500 psi applied to the inside of the valve body of each valve. During the hydrostatic test, there shall be no leakage through the metal, the end joints or the valve shaft seal. The leakage test for the Class 250 valves shall be performed at a differential pressure of 250 psi and against both sides of the valve. No adjustment of the valve disc shall be necessary after pressure test for normal operation of valve. All valves shall be leaktight in both directions.
- D. Butterfly valve actuators shall conform to AWWA C504. Gearing for the actuators shall be totally enclosed in a gear case. Actuators shall be capable of seating and unseating the disc against the full design pressure and shall transmit a minimum torque to the valve. Actuators shall be rigidly attached to the valve body.
- E. The valve shaft shall be constructed of 18-8, ASTM A-276, Type 304 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one piece unit extending full size through the valve disc and valve bearing or it may be of a stub shaft design. Shaft bearings shall be teflon or nylon, self-lubricated type.
- F. Gearing for the operators shall be totally enclosed in a gear case in accordance with paragraph 3.8.3 of the above mentioned AWWA Standard Specification.
- G. Operators shall be capable of seating and unseating the disc against the full design pressure of velocity, as specified for each class, into a dry system downstream and shall transmit a minimum torque to the valve. Operators shall be rigidly attached to the valve body.
- H. The manufacturer shall certify that the required tests on the various materials and on the completed valves have been satisfactory and that the valves conform with

all requirements of this Specification and the AWWA standard.

- I. Where indicated on the Drawings, extension stems, floor stands, couplings, stem guides, and floor boxes as required shall be furnished and installed.

2.05 PLUG VALVES

- A. Plug valves shall be eccentric, non-lubricating type with integral plug and shafts and shall be furnished with end connections and with actuating mechanisms as called for on the construction plans or as otherwise required. Valves shall seal bubble-tight or water drop-tight in both directions when tested according to the Leakage Test method of AWWA C504 with a hydrostatic pressure of 150 psi.
- B. Plug valves shall also be subjected to the internal, full body Hydrostatic Test of AWWA C504 at a pressure two times the rated pressure or a minimum pressure of 300 psi, whichever is greater. During the test, there shall be no leakage through the metal, or through the end joints or shaft seal, nor shall any part of the valve be deformed. Plug valves shall be Kennedy or Dezurik.
- C. Flanged valve ends shall be faced and drilled according to ANSI B 16.1, Class 125. Mechanical joint valve ends shall conform to AWWA C111. Threaded ends shall conform to the NPT requirements of ANSI B1.20.1.
- D. The plug valve body, bonnet and gland shall be ductile iron per ASTM A 126, Class B. The integral plug and shafts shall be cast iron ASTM A 126, Class B, or 316 stainless steel. The entire plug, except for the shafts, shall be covered with nitrile (Buna N) rubber. The rubber compound shall have been vulcanized to the metal plug and shall have a peel strength of not less than 75 pounds per inch when tested according to ASTM D 429, method B. The valve seat shall be at least 90 percent pure nickel, welded-in overlay into the cast iron body. The top and bottom bearings shall be 316 stainless steel.
- E. Plug valves shall have a full port area of 100 percent of the nominal pipe size area.
- F. Valves shall have worm gear type actuators with 2-inch square operating nuts.
- G. Plug valves shall be installed side-ways with plug shaft horizontal so that the plug rotates upward when it opens, with the flow entering the seat end of the valve.
- H. Plug valves shall be coated inside with Protecto 401 or amine-cured novolac ceramic epoxy or another two-part epoxy suitable for sanitary sewer service which has been approved by Manatee County.
- I. Acceptable manufacturers are limited to the following: Pratt, Series 600FP/601FP, Milliken, Series 600F/601F, or GA Industries, Figure 517 Eco-Centric.

2.07 ELECTRONIC VALVE CONTROL PANEL

A. GENERAL FUNCTION

The electronic valve control panel shall provide an enclosure which houses the electronic valve controller and necessary supporting equipment. Designed to allow

a wide range of control valves and SCADA systems to be connected to the electronic valve controller without the need for panel fabrication by a third party. Wired so that external cables from SCADA or the control valve can be landed on a single terminal block without the need to modify internal wiring. Provides a housing that shields internal components from outdoor environmental factors. Includes a quarter turn handle with padlock capability for security if desired. Allows easy access to electronic valve controller display and navigation buttons. Comes with adequate circuit protect for direct connection to a facility branch power circuit. Has a UL 508 rating to ensure industry standard panel requirements are met.

B. SOLENOID CONTROL

The panel includes solid state relays for solenoid control to extend the relay lifetime and reduce the change of relay failure. Pre-built with terminals to connect either DC or AC solenoids. Can support four solenoids on a single control valve.

C. MATERIALS

1. Material Specification for the Electronic Valve Controllers as follows:

<u>Component</u>	<u>Material</u>
Enclosure	
Enclosure Material	304 stainless steel
Environmental	NEMA 4X
Enclosure Dimensions	20" (508 mm) W x 24" (607 mm) H x 10" (254 mm) D
Enclosure Weight	55 lbs. (24.9 kg)
Handle	Quarter turn with optional padlock for access security
Power Requirement	
Voltage Input	120-240 VAC
Power Protection	5 Amp circuit breaker 5 Amp Fuse
Inputs	
Analog	(6) Inputs (4-20mA / 0-5 V / 0-10 V)
Digital	(6) digital inputs (Dry contact)
Outputs	
Analog	(4) Outputs (4-20mA)
Solenoid	(2) Solid State Relay, Zero Switching
Voltage for DC Solenoids	(2) Solid State Relay, Zero Switching
Voltage for AC Solenoids	
Relay	(2) Mechanical Relay for digital outputs

Controller	(See 2.02 section below)
Approvals	
Conformity Marking	UL 508A

2.08 ELECTRONIC VALVE CONTROLLER

A. GENERAL FUNCTION

The electronic valve controller shall provide the interface between a remote computer system and the hydraulic control valve with the ability to tie into SCADA Systems. Preinstalled with standard valve application templates allowing the Electronic Valve Controller to easily be configured to perform a wide range of control valve individual or multiple functions to match the single or multiple application(s) desired of the valve in the piping system. Designed to provide fully programmable monitoring and hydraulic valve control for rate of flow, pressure reducing, pressure sustaining, level control (altitude and modulating), valve position, blending, pressure management or select combinations of any of these applications. Custom valve applications can be programmed upon request.

B. ELECTRONIC TWO SOLENOID CONTROL

Solenoid pilot controls equipped onto the control valve are actuated by electrical signals received from the Electronic Valve Controller which enables remote computer control over the diaphragm valve operations. The solenoid pilots either add or relieve line pressure from the cover chamber of the valve, causing it to open or close as directed by the electronic valve controller. The electric solenoid pilot controls can also be combined with hydraulic or electronic motorized pilot controls to create dual function, or fail-safe capability. The electronic valve controller shall accept an analog 4-20mA feedback signal. Upon receiving the remote setpoint command from the computer system or local command from the operator, the electronic valve controller shall provide proper signals to modulate and maintain the valve at the desired setpoint value. When the feedback signal deviates from the setpoint, using a proprietary Cla-Val PID algorithm, the appropriate opening or closing solenoid on the valve will pulse. As the feedback signal approaches the setpoint, this on/off pulse time will gradually decrease to smoothly modulate the valve to setpoint. Each solenoid is controlled by a solid state relay with zero switching voltage. The total cycle time between each pulse shall be programmable. When the feedback signal is within a programmable dead band, the opening and closing solenoids will lock the cover and the valve will maintain position.

C. ELECTRONIC MOTORIZED PILOT CONTROL

Electronic valve control via direct / indirect positioning pilot control (CPC) or via electronic actuated hydraulic pilot control(s) (34 Series), the control valve is actuated using a DC powered 4-20 mA analog command signal received from the Electronic Valve Controller. The controller shall also accept an analog 4-20mA feedback signal. Upon receiving the remote setpoint command from SCADA or

local command from the operator, the electronic valve controller shall provide a 4-20 mA analog or digital signal to the electronic motorized pilot(s) to maintain the desired setpoint. This enables simple remote setpoint control over the electronic pilot actuator(s). Upon loss of power, the DC powered motor will become non-operational, leaving the hydraulic set point in its last position. The electronic motorized control scheme can also be combined with hydraulic solenoid pilot(s) and/or hydraulic controls to create dual function, or fail-safe capability.

D. CONTROLLER TECHNICAL INFORMATION

The electronic valve controller shall have remote communication capabilities. The controller shall include six (6) configurable 4-20mA analog inputs; six (6) dry contact digital inputs; four (4) 4-20mA analog outputs; two (2) solid-state relays and two (2) mechanical relays. All inputs and outputs shall have a configuration menu which programs signal name, scaling, engineering units, precision, & filtering. When a setpoint or feedback signal has been lost, the controller shall be configured to maintain some known value. When local mode is selected, the controller shall have the ability to output a signal & screen warning noting a local condition.

Controller shall include a maximum of four (4) PID loops for multi-function control, with local or remote set point inputs. Each loop shall have the ability to be broken into (4) different control zones with customizable PID parameters in each. The controller shall have a programmable set point ramping feature which linearly changes a set point over time until the desired value is achieved. The electronic valve controller shall have real time dynamic charting capability to compare set point vs feedback signals. Each PID loop shall have an independent output limiting feature which limits the duration a solenoid can remain energized, providing ultimate system protection. In the event of a signal loss, the PID shall have the ability to lock valve in last position, close valve, or open valve.

The electronic controller shall have relay outputs capable of Alarm indication to SCADA and shall be capable of generating and sending signal loss warnings and other configurable control actions. Actions (alarm) can include valve failures, other valves to open/close

The controller shall include a built in flow rate calculator. Using a valve position transmitter & DP transmitter (or inlet/outlet pressure transducers), the electronic controller shall calculate and display flow rate. A graphical menu allows the operator to easily select valve size and seat type. A built in totalizer keeps track of total volume as a function of time. Customizable units and reset functionality allow for simplified setup and configuration.

The electronic valve controller shall come equipped with Control Curves valuable in making relationships against other signals, internal variables, or time. Using a graphical function, coordinates can be added, removed or moved making relationship adjustments convenient.

The electronic valve controller shall have the ability to retransmit any input signal, variable, or calculation to a SCADA system.

The electronic valve controller shall have a high speed logging feature which captures all I/O at a maximum sample rate of 1Hz. Captured data shall be downloadable in .csv file format to a portable memory device such as a USB drive or FTP server.

The controller shall have a color TFT screen to graphically display the valve application with real-time system information. The controller display shall have the ability to show all I/O signal readings, PID settings, I/O configuration settings, along with customizable graphics for various warnings. . Each signal displayed on the "home" screen is color coded representing normal or lost signal. "Home" screen graphics shall have the ability to be customized.

An easy to use five press-button operator interface keypad provides simple navigation through software menus. Security key codes shall be provided to protect against unauthorized changes. An IP-68 rated enclosure shall be provided to house the controller for environmental protection.

Each controller enclosure and supporting AC/DC power supply conversion box enclosure (where required), shall be provided standard with an anodized aluminum universal mounting bracket(s), allowing for versatile installation to system piping (horizontally or vertically), wall mounting, panel / cabinet enclosures, unistrut, valves, & other configurations. Sufficient clearance around controller enclosure should be made for adequate access/wiring. Considerations should be made to comply with all the various local codes, standards and best practices.

E. MULTI FUNCTION CONTROL

The electronic valve controller shall have the ability to perform multiple functions (PID loops) at once. Ultimately there is only one PID loop in control at a given time, with the remaining loops computing in the background. Advanced Cla-Val algorithms provide seamless crossover between loops, simulating multiple hydraulic pilots. Additionally, using digital inputs or internal variables, PID loops can manually be selected to shift between various types of control.

F. COMMUNICATIONS

The electronic valve controller shall come standard with Modbus protocol. This protocol defines a message structure that PLC's will recognize and use, regardless of the type of networks over which they communicate. The valve controller can be configured to communicate on standard Modbus networks using either of two transmission modes: TCP/IP or RTU. Users shall have the ability to select the desired mode, along with communication parameters (IP address, subnet mask, baud rate, etc.). The electronic valve controller shall have a built in VNC server. A viewer/client uses TCP port 5900 to connect to a server (or 5800 for browser access), but can also be set to use any other port.

G. MATERIALS

1. Material Specification for the Electronic Valve Controllers as follows:

<u>Component</u>	<u>Material</u>
Display	
Display Type	4.3" Color TFT-LCD, 480 x 272 pixels with Polycarbonate screen, scratch resistant
Display Update Rate	500ms
Programming Method	Mechanical Push Button VNC
Password	5 digit
Mass Data Storage	
Type	4GB SD Card
Language	English
Temperature	14°F to 158°F (-10°C to 70° C)
Humidity	90% RH, non-condensing
Memory Protection	10 year life lithium battery
Inputs	
Analog	(6) Inputs (4-20mA / 0-5 V / 0-10 V)
Resolution	10 bit
Digital	(6) digital inputs (Dry contact)
Units	Configurable
Decimal Point	0 / 0.0 / 0.00
Signal Filter	Configurable 0 to 99 %
Totalizer	Configurable Input and Units
Totalizer Reset	Yes
I/O Connection	Screw Terminals
Outputs	
Analog	(4) Outputs (4-20mA)
Resolution	10 bit
Solenoid	(2) Solid State Relay, Zero Switching
Voltage	
Relay	(2) Mechanical Relay, Rated Voltage 250VAC, Rated Current 6A
Logging	
Configurable	Yes
Logging Speed	1 Second or Greater

Event Memory	128 Mbytes rolling memory up to 80,000,000 values capacity (extended to 4GB by SD card)
Output	CSV format suitable for exporting to

**MS Excel
Control Parameters**

Control Input	4-20mA full scale / digital (dry contact)
Proportional Band	0-100% (50% default) adjustable in 1% increments Independently for opening and closing
Dead band	Adjustable 0 to full scale of setpoint signal
Cycle Time	0 to 60 seconds in 1 sec. increments
Integral Band	Adjustable 0 to 60 seconds
Derivative Band	Adjustable 0 to 60 seconds
Loop Zoning	Adjustable up to (4) zones
PID Loops	4 Configurable
Control Curves	4
Retransmission	4 Analog (4-20mA signal)
Actions (Alarms)	4 (1 or 2 triggering conditions)

Communication

Local	Mechanical Push Button
Remote	VNC Server
Interfaces	GPRS Modem Quad Band / Ethernet / RJ-45 / RS-232 / RS-485
Protocols	ModbusTCP / ModbusRTU / VNC

H. MANUFACTURE

1. Each Electronic Valve Controller shall be factory assembled by the control valve manufacturer.
2. Each Electronic Valve Controls shall be provided with an identifying nameplate
3. Each Electronic Valve Controller shall undergo full factory functional and operational testing.

I. PRODUCT DATA

1. Electronic Valve Controller manufacturer's technical product data shall be provided.

MODEL INFORMATION

The Electronic Valve Controller manufacturer shall warrant the controller to be free of defects in material and workmanship for a period of one year from date of shipment provided the controller is installed and used in accordance with all applicable instructions.

The Electronic Valve Control Panel shall be the CLA-VAL Company Model No. UP-22D, as manufactured by Cla-Val Co., Costa Mesa, CA 92627-4416 or Engineer Approved Equal.

2.09 VALVE ACTUATORS

A. Butterfly valve and plug valve actuators.

Butterfly valve and plug valve actuators shall conform to the requirements for actuators presented in AWWA C 504 and shall be either manual or motor operated. Actuators shall be capable of seating and unseating the disc against the full design pressure and velocity, as specified for each class, into a dry system downstream, and shall transmit a minimum torque to the valve. Actuators shall be rigidly attached to the valve body.

B. Manual Actuators.

Manual actuators shall have permanently lubricated, totally enclosed gearing with handwheel and gear ratio sized on the basis of actual line pressure and velocities. Actuators shall be equipped with handwheel, position indicator, and mechanical stop-limiting locking devices to prevent over travel of the disc in the open and closed positions. They shall turn counter-clockwise to open valves. Manual actuators shall be of the traveling nut, self-locking type or of the worm gear type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Valves located above grade shall have handwheel and position indicator, and valves located below grade shall be equipped with a 2-inch square AWWA operating nut located at ground level and cast iron extension type valve box.

C. Motor Actuators (Modulating)

- 1) The motor actuated valve controller shall include the motor, actuator unit gearing, limit switch gearing, limit switches, position transmitter which shall transmit a 4-20 mA DC signal, control power transformer, electronic controller which will position the valve based on a remote 4-20 milliamp signal, torque switches, bored and key-wayed drive sleeve for non-rising stem valves, declutch lever and auxiliary handwheel as a self-contained unit.
- 2) The motor shall be specifically designed for valve actuator service using 480 volt, 60 Hertz, three phase power as shown, on the electrical drawings. The motor shall be sized to provide an output torque and shall be the totally enclosed, non-ventilated type. The power gearing shall consist of helical gears fabricated from heat treated alloy steel forming the first stage of reduction. The second reduction stage shall be a single stage worm gear. The worm shall be of alloy steel with carburized threads hardened and

ground for high efficiency. The worm gear shall be of high tensile strength bronze with hobbled teeth. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout. Preference will be given to units having a minimum number of gears and moving parts. Spur gear reduction shall be provided as required.

- 3) Limit switches and gearing shall be an integral part of the valve control. The limit switch gearing shall be made of bronze and shall be grease lubricated, intermittent type and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between fully opened valve and fully closed valve.
- 4) The speed of the actuator shall be the responsibility of the system supplier with regard to hydraulic requirements and response compatibility with other components within the control loop. Each valve controller shall be provided with a minimum of two rotor type gear limit switches, one for opening and one for closing. The rotor type gear limit switch shall have two normally open and two normally closed contacts per rotor. Gear limit switches must be geared to the driving mechanism and in step at all times whether in motor or manual operation. Provision shall be made for two additional rotors as described above, each to have two normally open and two normally closed contacts. Each valve controller shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. It shall operate during the complete cycle without auxiliary relays or devices to protect the valve, should excessive load be met by obstructions in either direction of travel. The torque switch shall be provided with double-pole contacts.
- 5) A permanently mounted handwheel shall be provided for manual operation. The handwheel shall not rotate during electric operations, but must be responsive to manual operation at all times except when being electrically operated. The motor shall not rotate during hand operation nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve operator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. This movement from motor operation to handwheel operation shall be accomplished by a positive declutching lever which will disengage the motor and motor gearing mechanically, but not electrically. Hand operation must be reasonably fast. It shall be impossible to place the unit in manual operation when the motor is running. The gear limit switches and torque switches shall be housed in a single easily accessible compartment integral with the power compartment of the valve control. All wiring shall be accessible through this compartment. Stepping motor drives will not be acceptable.
- 6) The motor with its control module must be capable of continuously modulating over its entire range without interruption by heat protection devices. The system, including the operator and control module must be able to function, without override protection of any kind, down to zero dead zone.
- 7) All units shall have strip heaters in both the motor and limit switch compartments. The actuator shall be equipped with open-stop-close push buttons, an auto-manual selector switch, and indicating lights, all mounted on the actuator or on a separate locally mounted power control station.

- 8) The electronics for the electric operator shall be protected against temporary submergence.
- 9) Actuators shall be Limitorque L120 with Modutronic Control System containing a position transmitter with a 4-20MA output signal or equal.

D. Motor Actuators (Open-Close)

- 1) The electronic motor-driven valve actuator shall include the motor, actuator gearing, limit switch gearing, limit switches, torque switches, fully machined drive sleeve, declutch lever, and auxiliary handwheel as a self-contained unit.
- 2) The motor shall be specifically designed for valve actuator service and shall be of high torque totally enclosed, nonventilated construction, with motor leads brought into the limit switch compartment without having external piping or conduit box.
- 3) The motor shall be of sufficient size to open or close the valve against maximum differential pressure when voltage to motor terminals is 10% above or below nominal voltage.
- 4) The motor shall be prelubricated and all bearings shall be of the anti-friction type.
- 5) The power gearing shall consist of helical gears fabricated from heat treated steel and worm gearing. The worm shall be carburized and hardened alloy steel with the threads ground after heat treating. The worm gear shall be of alloy bronze accurately cut with a hobbing machine. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout.
- 6) Limit switches and gearing shall be an integral part of the valve actuator. The switches shall be of the adjustable rotor type capable of being adjusted to trip at any point between fully opened valve and fully closed valve. Each valve controller shall be provided with a minimum of two rotor type gear limit switches, one for opening and one for closing (influent valves require additional contacts to allow stopping at an intermediate position). The rotor type gear limit switch shall have two normally open and two normally closed contacts per rotor. Additional switches shall be provided if shown on the control and/or instrumentation diagrams. Limit switches shall be geared to the driving mechanism and in step at all times whether in motor or manual operation. Each valve actuator shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. It shall operate during the complete cycle without auxiliary relays or devices to protect the valve should excessive load be met by obstructions in either direction of travel. Travel and thrusts shall be independent of wear in valve disc or seat rings.
- 7) A permanently mounted handwheel shall be provided for manual operation. The handwheel shall not rotate during electric operation except when being electrically operated. The motor shall not rotate during hand operation, nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve actuator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. Movement from motor operation to handwheel operation shall be accomplished by a positive declutching lever which will disengage the motor and motor gearing mechanically, but not electrically. Hand operation

must be reasonably fast. It shall be impossible to place the unit in manual operation when the motor is running.

- 8) Valve actuators shall be equipped with an integral reversing controller and three phase overload relays, Open-Stop-Close push buttons, local-remote-manual selector switch, control circuit transformer, three-phase thermal overload relays and two pilot lights in a NEMA 4X enclosure. In addition to the above, a close coupled air circuit breaker or disconnect switch shall be mounted and wired to the valve input power terminals for the purpose of disconnecting all underground phase conductors.
- 9) The valve actuator shall be capable of being controlled locally or remotely via a selector switch integral with the actuator. In addition, an auxiliary dry contact shall be provided for remote position feedback.
- 10) Valve A.C. motors shall be designed for operation on a 480 volt, 3-phase service. Valve control circuit shall operate from a fuse protected 120 volt power supply.
- 11) Motor operators shall be as manufactured by Limitorque Corporation, Type L120 or approved equal.

2.10 AIR RELEASE VALVES

- A. Air release valves shall be automatic float operated, GA Industries fig-929 for sewer applications, Fig-920 for water and reclaimed water application, or an approved equal, with inlet size and working pressure ratings as required and NPT connections.
- B. Valve bodies shall be ductile iron per ASTM A 126, Class B. The orifice, float and linkage shall be stainless steel. The seat shall be (Buna N) nitrile elastomer.

2.11 VALVE BOXES

- A. Buried valves shall have adjustable cast iron or HDPE valve boxes. Lids shall be cast iron drop type, and shall have "WATER", "SEWER", or "RECLAIM", as applicable, cast into the top. Lids will be painted "safety" blue for potable, purple for reclaimed, and green for sanitary sewer.
- B. Cast iron boxes shall be two-piece, or three-piece, as required, screw type, Tyler Pipe, 6850 Series, Box 461-S through 668-S, with extensions, as required to make the desired box length, or an approved equal. Bottom barrel shall be 5-1/4 inches inside diameter, with a flanged bottom with sufficient bearing area to prevent settling.
- C. HDPE boxes shall be two-piece, adjustable, 1/4-inch thick minimum heavy wall, high density polyethylene, with cast iron top and stainless steel adjustable stem, Trench Adapter, as manufactured by American Flow Control, or an approved equal. Bottom barrel shall have flanged bottom to prevent settling. All bolts, screws and pins shall be stainless steel.
- D. Reclaimed Valve Boxes shall be square 9-inch x 9-inch load bearing marked "Reclaimed Water" and painted Pantone 522C purple.
- E. All valves shall either have operating nuts within 4 feet below the top of the lid or shall have extension stems with centering guides to provide an extended operating

nut within 4 feet below the lid. Extension stems shall be fixed to the valve operating nut with a stainless steel fastener.

- F. All potable water, sewer, and reclaimed water grade-adjustment risers shall be cast iron material just like the valve box. No plastic or steel risers shall be allowed.
- G. A centering device BoxLok or equal shall be installed in the valve box.
- H. Stand pipe shall match color code of the system being installed, (blue for potable, Pantone purple 522 C for reclaimed, and green for sanitary sewer).

2.12 CORPORATION STOPS AND SADDLES

- A. Corporation stops for connections to ductile iron and PVC water and reclaimed water mains shall be all red brass, alloy 85-5-5-5, per ASTM B 62, and shall conform to AWWA C800. 1-inch through 2-inch corporation stops shall be ball type, 300 psi working pressure rated, with AWWA MIP threaded inlets and compression, pack joint, flare, or FIP threaded joint outlets, Mueller as shown in the table below, or an approved equal. All joints made to CTS size HDPE tubing shall use stainless steel insert stiffeners.

Corporation Stops

Pipe Material	Type of Connection	Mueller 300 Model
HDPE	Compression x AWWA IP Thread	B-25028 (Saddle) *
HDPE	Compression x AWWA Taper Thread	B-25008 (Direct Tap) *
HDPE	Pack Joint x AWWA IP Thread	P-25028 (Saddle) *
HDPE	Pack Joint x AWWA Taper Thread	P-25008 (Direct Tap) *
Copper	Compression x AWWA IP Thread	B-25028 (Saddle)
Copper	Pack Joint x AWWA Taper Thread	B-25008 (Direct Tap)
Copper	Pack Joint x AWWA IP Thread	P-25028 (Saddle)
Copper	Pack Joint x AWWA Taper Thread	P-25008 (Direct Tap)
Copper	Flare x AWWA IP Thread	B-25025 (Saddle)
Copper	Flare x AWWA Taper Thread	B-25000 (Direct Tap)
Stainless Steel	FIP Thread x AWWA IP Thread	B-20046 (Saddle)
Stainless Steel	FIP Thread x AWWA Taper Thread	B-20045 (Direct Tap)

* Insert required, part number per manufacturer product information

- B. Potable plastic service pipe material and compression and pack joint connectors shall not be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Appropriate service tubing shall apply.
- C. Water and reclaimed water service connections to PVC and DIP mains shall be made using red brass saddles, alloy 85-5-5-5, per ASTM B 62. Straps, washers and nuts shall be brass or stainless steel. No ductile iron, cast iron or steel saddles will be allowed. Saddles shall be Smith Blair 325 Bronze saddles with Stainless Steel or brass extra wide strap or equivalent.
- D. Connections to PVC sanitary force mains for services up to 2 inches shall be made using Romac Style 306 double bolt stainless steel service saddles or equivalent.

- E. Service and air release valve (ARV) connections to HDPE water, reclaimed water and sewer mains may be made using Romac Style 306H saddle or approved equal. All saddles shall be properly sized per the manufacturer product information and be installed according to the manufacturer's written instructions. Connections to HDPE mains shall not be made using narrower saddles similar to the Smith-Blair 325.

2.13 FLANGED ADAPTERS AND PLAIN END COUPLINGS

- A. Plain end couplings and adapters shall be fusion-bonded epoxy coated carbon steel with Ethylene Propylene Diene Monomer (EPDM) rubber gaskets and stainless steel nuts, bolts and spacers. Acrylonitrile butadiene (NBR) gaskets shall be used for potable water mains that are located in soil that is contaminated with low molecular-weight petroleum products or non-chlorinated organic solvents or non-aromatic organic solvents. Fluorocarbon (FKM) gaskets shall be used for potable water mains that are located in soil that is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons. Fluorocarbon (FKM) gaskets shall be used for potable water mains if the soil is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons, and is also contaminated with low molecular-weight petroleum products or organic solvents. Couplings shall be Dresser Style 38, or another approved equal. Flange adapters shall have a plain end compression seal similar to the style 38, with an ANSI 125 Class flange on the opposite end, and shall be Dresser Style 128W or an approved equal. Stainless steel backup rings shall be used for force mains that are located in corrosive environments including wetwells and valve vaults.

2.14 HOSE BIBS

- A. Hose bibs shall be 3/4" or 1" brass, polished chromium plated brass, with vacuum breaker as noted on the drawings.

2.15 SWING CHECK VALVES

- A. Check valves shall be swing type, weighted lever, conforming to AWWA C508. Valves shall be iron-body, bronze-mounted, single disk, 175 psi working pressure for 2- through 12-inch, 150 psi for 14- through 30-inch, with ANSI B16.1 Class 125 flanged ends, by Mueller; No. A-2600-6-01 (sewer), No. A-2602-6-01 (water), or AVK Series 41, or an approved equal.
- B. When there is no flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.
- C. Check valves shall have bronze seat and body rings, extended bronze or stainless steel hinge pins and stainless steel nuts and bolts on bolted covers.
- D. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an extended hinge arm with outside lever and weight.

2.16

HYDRANTS

- A. Hydrants shall be dry barrel, nostalgic style, and shall be AVK Series 2780, American Darling B-84-B, Mueller Super Centurian 250, or approved equal and shall conform to AWWA C502 and UL/FM certified, and shall in addition meet the specific requirements and exceptions which follow:
- B. Hydrants shall be according to manufacturer's standard pattern or nostalgic style and of standard size, and shall have one 5-inch Storz connection or equivalent with two 2½- inch hose nozzles.
- C. Hydrant inlet connections shall have mechanical joints for 6-inch pipe.
- D. Hydrant valve opening shall have an area at least equal to that area of a 5 1/4-inch minimum diameter circle and be obstructed only by the valve rod. Each hydrant shall be able to deliver 500 gpm minimum through its two 2 1/2 -inch hose nozzles when opened together with a loss of not more than 2 psi in the hydrant per AWWA C502.
- D. The upper and lower stem rod shall be stainless steel and shall have a breakable stem-rod coupling of stainless steel, or cast iron or ductile iron with a fusion bonded epoxy coating, with stainless steel pins and clips.
- F. Hydrants shall be hydrostatically tested as specified in AWWA C502 and shall be rated at 250 psi minimum.
- G. The operating nut shall be 1½ -inch pentagon shaped with a protective weather cover, and open counter clockwise.
- H. All nozzle threads shall be American National Standard.
- I. Each nozzle cap shall be provided with a Buna N rubber washer.
- J. All hydrants shall be traffic break away type and allow for 360 degree rotation to position the Storz connection/nozzle in the desired direction after installation.
- K. Hydrants must be capable of being extended without removing any operating parts.
- L. Hydrant extensions shall be fusion bonded epoxy coated inside and outside with a stainless steel stem. The breakaway coupling can be fusion bonded epoxy coated or stainless steel. Only one hydrant extension is allowed per hydrant.
- M. Weepholes shall be excluded from fire hydrants.
- N. Hydrant main valve closure shall be of the compression type opening against the pressure and closing with the pressure. The main valve shall be faced or covered with EPDM elastomer, which shall seat on a bronze ring.
- O. Hydrant bonnets, weather cover, nozzle section, caps and shoe shall be cast iron or ductile iron, and shall be holiday free fusion-bonded epoxy coated at the factory, per AWWA C550, inside and outside. Lower barrel shall be fusion bonded epoxy coated inside and outside. Aboveground parts shall also have a top coat of Sherwin-Williams Acrolon 218 HS acrylic polyurethane or approved equal; color

Safety Yellow for fire hydrants that are connected to the potable water system or Pantone 522C purple for fire hydrants that are connected to the reclaimed water system.

- O. Exterior nuts, bolts and washers shall be stainless steel. Bronze nuts may be used below grade.
- P. All internal operating parts shall be removable without requiring excavation.

2.17 RESTRAINED JOINTS

- A. Pipe joints shall be restrained by poured-in-place concrete thrust blocks or by other mechanical methods, including tie rods, Stargrip and Allgrip, as manufactured by Star Pipe Products or Megaflange and 2000 PV, as manufactured by EBAA Iron Sales. Flanged joints may be used above ground.
- B. All T-bolts, bolts, nuts, washers, and all thread rods shall meet ASTM A-588 requirements (Cor-ten or equivalent) “weathering steel” or be 316 stainless steel. The use of rebar with welded thread is prohibited.
A certification from the supplier shall be provided to the County during the shop drawing review process ensuring all T-bolts, bolts, nuts, washers, and all thread rods meet the A-588 requirements and shall state the project name and contractor in the certification letter. If stainless steel is to be used, no certification letter is required.
- C. Restrained joints may also be Lok-Ring, as manufactured by American Cast Iron Pipe Company, or an approved equal.
- D. Restrained joint designs, which require wedges and/or shims to be driven into the joints in order to disassemble the pipe shall not be allowed.

2.18 TAPPING SLEEVES AND VALVES

- A. Tapping valves shall meet the requirements of AWWA C509/C515 with ductile iron body and shall be rated for a pressure of 250 psi. The valves shall be flanged with alignment ring by mechanical joint with a nonrising stainless steel stem. All bolts, nuts and washers shall be stainless steel. Manufacturer shall use Never-Seez or equivalent during assembly of bolt and nut sets to prevent galling of similar metals. Stem seals shall be provided and shall be of the O-ring type, two above and one below the valve’s thrust collar. Valve shall be designed for vertical burial and shall open counterclockwise. Operating nut shall be AWWA standard 2-inch square for valves 2 inches and up. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve to accommodate full size shell cutter. Gaskets shall cover the entire area of the flange surface and be 1/8-inch minimal thickness of red rubber. The wedge shall be ductile iron fully encapsulated with EPDM rubber. All bolts, nuts and washers between the sleeve and valve shall be stainless steel.
- B. Tapping sleeves and saddles shall be stainless steel, seal to the pipe by the use of a gasket compounded for water or sewer, and shall be able to withstand a pressure test of 180 psi for water lines or 150 psi for sewer force mains for one hour with no leakage in accordance with AWWA C110. A stainless steel 3/4-inch

NPT test plug shall be provided for pressure testing. All bolts joining the two halves shall be stainless steel and shall be included with the sleeve or saddle; Romac SST III or Romac SST-H.

2.19 TRACER WIRE TEST STATION BOXES

- A. Tracer wire test station boxes shall be provided at plug valves, butterfly valves, blowoff valves, gate valves, fire hydrants and backflow preventers as indicated in these Standards. Tracer wire test station boxes for yard service shall be 2 ½ inch diameter, 15 inch length, ABS plastic with a cast iron rim and lid, P200NFGT as manufactured by Bingham & Taylor, or equal approved by Manatee County. Where test boxes will be in streets or subject to vehicular traffic, use B&T Model P525RD, 5 ¼ -inch diameter or equal, centered in a separate concrete pad similar to a valve box pad.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in the location shown, true to alignment and rigidly supported. Any damage occurring to the above items before they are installed shall be repaired to the satisfaction of the County.
- B. After installation, all valves and appurtenances shall be tested at least two hours at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the County.
- C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and the Contractor shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.
- D. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections.
- E. Flanged joints and mechanical joints shall be made with high strength, low alloy Corten or 316 stainless steel bolts, nuts and washers.
- F. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.
- G. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned

thoroughly for a distance of 8". Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6" from the end.

- H. Valve boxes with concrete bases shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and the top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

3.02 HYDRANTS

- A. Hydrants shall be set at the locations designated by the County and/or as shown on the Drawings and shall be bedded on a firm foundation. A drainage pit on crushed stone as shown on the Drawings shall be filled with gravel or crushed stone and satisfactorily compacted. During backfilling, additional gravel or crushed stone shall be brought up around and 6" over the drain port. Each hydrant shall be set in true vertical alignment and shall be properly braced. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the plans. Felt paper shall be placed around the hydrant elbow prior to placing concrete. CARE MUST BE TAKEN TO INSURE THAT CONCRETE DOES NOT PLUG THE DRAIN PORTS. Concrete used for backing shall be as specified herein.
- B. When installations are made under pressure, the flow of water through the existing main shall be maintained at all times. The diameter of the tap shall be a minimum of 2" less than the inside diameter of the branch line.
- C. The entire operation shall be conducted by workmen thoroughly experienced in the installation of tapping sleeves and valves, and under the supervision of qualified personnel furnished by the manufacturer. The tapping machine shall be furnished by the Contractor if tap is larger than 12" in diameter.
- D. The Contractor shall determine the locations of the existing main to be tapped to confirm the fact that the proposed position for the tapping sleeve will be satisfactory and no interference will be encountered such as the occurrence of existing utilities or of a joint or fitting at the location proposed for the connection. No tap will be made closer than 30" from a pipe joint.
- E. Tapping valves shall be set in vertical position and be supplied with a 2" square operating nut for valves 2" and larger. The valve shall be provided with an oversized seat to permit the use of full sized cutters.
- F. Tapping sleeves and valves with boxes shall be set vertically or horizontally as indicated on the Drawings and shall be squarely centered on the main to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping operation. Sleeves shall be no closer than 30" from water main joints. Thrust blocks shall be provided behind all tapping sleeves. Proper tamping of supporting earth around and under the valve and sleeve is mandatory. After completing the tap, the valve shall be flushed to ensure that the valve seat is clean.

3.03 SHOP PAINTING

- 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 shall be painted safety blue.

3.05 INSPECTION AND TESTING

- A. All pipelines shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipelines shall be subjected to hydrostatic pressure and leak testing. Refer to Manatee County Public Works Utility Standards Part 1-Utility Standards Manual Section 1.8.7. Prior to testing, the pipelines shall be supported in a manner approved by the County to prevent movement during tests.

All leaks shall be repaired and lines retested as approved by the County.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Code references
 - 1. Florida Building Code (FBC) 2023, 8th Edition.
 - 2. ACI 301-20, "Structural Concrete for Buildings."
 - 3. ACI 318-19, "Building Code Requirements for Reinforced Concrete."
 - 4. ACI 350-20, "Code Requirements for Environmental Engineering Concrete Structures"

1.02 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Minor equipment pads and pipe encasements.
 - 2. Structural Concrete - All other concrete.
- B. Related Sections:
 - 1. Division 02 – Site Works
 - 2. Division 03 - Concrete
 - 3. Division 07 – Thermal and Moisture Protection
 - 4. Division 09 – Finishes

1.03 DEFINITIONS

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

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submittals:

1. Design Mixtures: Submit concrete mixture proportions, characteristics and location for use for each concrete mixture. Submittal shall include documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than the required average compressive strength and shall consist of field strength records (field test data) or trial mixtures in accordance with ACI 301, 4.2.3.4.a or 4.2.3.4.b, respectively. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 2. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Engineer.
- F. Samples: None.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Waterstops.
 6. Curing compounds.
 7. Floor and slab treatments.
 8. Bonding agents.

9. Adhesives.
 10. Vapor retarders.
 11. Semi rigid joint filler.
 12. Joint-filler strips.
 13. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 3. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 4. ACI 350, "Environmental Engineering Concrete Structures."
 - 5. ACI 305, "Hot Weather Concreting."
 - 6. ACI 306, "Cold Weather Concreting."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Mockups: None.
- I. Pre-installation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement, if applicable.

- B. Waterstops: Store water stops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties for liquid containment structures that have an integral water stop that is tightly welded to the tie.
 4. Furnish ties for exposed concrete that are the cone-washer type. The cones shall be made of approved wood or plastic. Common wire will not be allowed for form ties

2.02 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Low-Alloy-Steel Reinforcing Bars: None.
- D. Galvanized Reinforcing Bars: None.
- E. Epoxy-Coated Reinforcing Bars: None.
- F. Stainless-Steel Reinforcing Bars: None.
- G. Steel Bar Mats: None.
- H. Plain-Steel Wire: ASTM A 82/A 82M. None.
- I. Deformed-Steel Wire: ASTM A 496/A 496M.
- J. Epoxy-Coated Wire: None.
- K. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- L. Deformed-Steel Welded Wire Reinforcement: None.
- M. Galvanized-Steel Welded Wire Reinforcement: None.
- N. Epoxy-Coated Welded Wire Reinforcement: None.

2.03 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel deformed bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type II, gray, no substituted are allowed. Cement replacement by weight can be up 20% of the total weight, replace with Fly Ash and/or Slag.
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Slag: ASTM 989, Grade 120
 - 2. Blended Hydraulic Cements: ASTM C595, Type IP (MS), specifically excluding type IS (≥ 70) which is not intended as principal cementing constituents in concrete. ASTM C595 cements that incorporate ASTM 1157 cements are not allowed.
- B. Normal-Weight Aggregates: ASTM C 33, Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement. Use Clean, sharp, natural silica sand free of loam, clay, lumps, and other deleterious substances. Dune sand, bank run sand, and manufactured sand are not acceptable.
 - 2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter. Coarse aggregate shall comply with the following:
 - a. Crushed stone, processed from natural rock or stone.
 - b. Washed gravel, either natural or crushed. Slag, pit gravel, and bank-run gravel are not allowed.

- c. Coarse Aggregate Size: ASTM C33/C33M, No. 57 stone, unless otherwise approved by ENGINEER.
- B. Water: ASTM C 94/C 94M and potable.

2.05 ADMIXTURES

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

2.06 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricated corners, intersections, and directional changes.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BoMetals, Inc.
 - b. Greenstreak.
 - c. Vinylex Corp.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 6 inches by 3/8 inch thick or 9 inches by 3/8 inch thick; nontapered.
- B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Adeka Ultra Seal/OCM, Inc.; Adeka Ultra Seal.
 - b. Greenstreak; Hydrotite.
 - c. Vinylex Corp.; Swellseal.
 - d. Sika; Sika Swell S-2.
- C. Self-sealing, non-swelling preformed joint sealant Waterstop: Shall provide a lasting, watertight bond on both fresh and cured concrete surfaces.
1. Products: Henry Company; Synko-Flex Waterstop.

2.07 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. Fortifiber Building Systems Group; Moistop Plus.
 - b. Raven Industries Inc.; Vapor Block 6.
 - c. Reef Industries, Inc.; Griffolyn Type-65 or Type-85.
 - d. Stego Industries, LLC; Stego Wrap, 10 mil Class C.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.08 LIQUID FLOOR TREATMENTS

- A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. ChemMasters; Chemisil Plus.
 - b. ChemTec Int'l; ChemTec One.
 - c. Conspec by Dayton Superior; Intraseal.
 - d. Curecrete Distribution Inc.; Ashford Formula.
 - e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
 - f. Edoco by Dayton Superior; Titan Hard.

- g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
- C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Floor Products; Retro-Plate 99.
 - b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
 - c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.09 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. Allowed for non-liquid containment structures.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Kure 200.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Conspec by Dayton Superior; W.B. Resin Cure.
 - d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - e. Edoco by Dayton Superior; Res X Cure WB.
 - f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - g. L&M Construction Chemicals, Inc.; L&M Cure R.
 - h. Meadows, W. R., Inc.; 1100-CLEAR.
 - i. SpecChem, LLC; Spec Rez Clear.
 - j. Symons by Dayton Superior; Resi-Chem Clear.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: Provide preformed expansion joint filler complying with ASTM D 1752, Type I (spong rubber) or Type II (cork).
- B. Semi rigid Joint Filler: Two-component, semi rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022 thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- G. Geofoam: ASTM D6817, Standard Specification for Rigid Cellular Polystyrene Geofoam, InsulFoam GF EPS15 or equivalent.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4500 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 4500 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301. Reference Section 1.04.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash and/or slag as needed to reduce the total amount of portland cement, which would otherwise be used. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash only: 20 percent by weight.
 2. Slag only: 20 percent by weight.
 3. Fly Ash + Slag: 20 percent by weight.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.42.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Color Pigment: If required by Architectural contract drawings, add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.13 CONCRETE MIXTURES

- A. Minor equipment pads and pipe encasements:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Concrete mixture proportions in accordance with accepted design mixes. Reference Section 1.04.

- B. Structural Concrete:
 - 1. Minimum Compressive Strength: Reference Design Criteria Sheet S-2.
 - 2. Concrete mixture proportions in accordance with accepted design mixes. Reference Section 1.04.
 - 3. Concrete mixes at exterior walls, foundations that are subjected to hydrostatic pressures and water bearing walls and slabs at containment structures shall have Xypex Admin C-500 Red Admixture with Red Oxide pigment for confirmation. Dosage rate shall meet the manufacturer's recommendation of 1% to 1.5% by weight of cement

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.

2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
 - F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
 - G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
 - H. Chamfer exterior corners and edges of permanently exposed concrete.
 - I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
 - J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
 - K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
 - L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturers recommended tape.
- B. Bituminous Vapor Retarders: if applicable.

3.05 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07920 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed water stops during progress of the Work. Field fabricate joints in water stops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.08 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.09 FINISHING FORMED SURFACES

- A. Reference Specification 03350 - Concrete Finishes.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 12-inch centers around the full perimeter of concrete base.
 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 4. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut

depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: The County will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
 8. Water levels for hydraulic structures.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each

- concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 10. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

3.15 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

SECTION 03301 ANCHOR SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.02 REFERENCES

A. Standards referenced in this Section are:

1. ACI 318-19, Building Code Requirements for Structural Concrete.
2. ANSI B212.15, Cutting Tools - Carbide-tipped Masonry Drills and Blanks For Carbide-tipped Masonry Drills.
3. ANSI/MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
4. ASTM A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
5. ASTM A276, Specification for Stainless Steel Bars and Shapes.
6. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
7. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
10. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
11. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
12. ASTM C307, Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
13. ASTM C881/C881M, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
14. ASTM 0695, Test Method for Compressive Properties of Rigid Plastics.
15. ASTM 0790, Test Methods for Flexural Properties of Unreinforced and reinforced Plastics and Electrical Insulating Materials.
16. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
17. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.

18. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
19. ASTM F594, Specification for Stainless Steel Bolts, Hex Cap Screws, and studs.
20. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
21. ICC-ES AC58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
22. ICC-ES AC60, Acceptance Criteria for Anchors in Unreinforced Masonry Elements.
23. ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
24. ISO 3506-1, Mechanical Properties of Corrosion-Resistant Stainless Steel Fasteners -- Part 1: Bolts, Screws and Studs.
25. NSF/ANSI 61, Drinking Water System Components- Health Effects.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Testing Laboratory: Shall comply with ASTM E329 and shall be experienced in tension testing of post-installed anchoring systems.
2. Post-installed Anchor Installer: Shall be experienced and trained by post-installed anchor system manufacturer in proper installation of manufacturer's products. Product installation training by distributors or manufacturer's representatives is unacceptable unless the person furnishing the training is qualified as a trainer by the anchor manufacturer.

1.04 SUBMITTALS

A. In accordance with Division 1 requirements, submit the following:

1. Shop Drawings:

- a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Project, and embedded lengths.

2. Product Data:

- a. Manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
- b. When required by Engineer, copies of valid ICC ES reports that presents load-carrying capacities and installation requirements for anchor systems.
- c. Post installed anchors shall be epoxy adhesive type. Mechanical wedge type anchors are not allowed.

B. Informational Submittals: Submit the following:

1. Certificates:

- a. For each type of anchor bolt or threaded rod, submit copies of laboratory test reports and other data required to demonstrate compliance with the Contract Documents.
 - 1) Reports shall demonstrate compliance with ductile steel element definition of ACI 350, Appendix D, Section D.1.
 - b. Post-installed anchor system manufacturer's certification that installer received training in the proper installation of manufacturer's products required for the Work.
 - c. For each adhesive anchor installer, submit ACI/CRSI Adhesive Anchor Installer Certification.
2. Manufacturer's Instructions:
- a. Installation instructions for each anchor system product proposed for use, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection:
 - 1. Keep materials dry during delivery and storage.
 - 2. Store adhesive materials within manufacturer's recommended storage temperature range.
 - 3. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.

PART 2 PRODUCTS

2.01 SYSTEM PERFORMANCE

- A. General:
 - 1. At all locations, provide stainless steel type 316 anchor systems.
 - 2. Stainless Steel Nuts:
 - a. For anchor bolts and adhesive anchors, provide ASTM A194/A194M, Grade SS stainless steel nuts for stainless steel anchors used for anchoring equipment, gates, and weirs, and other locations, if any, where the attachment will require future removal for operation or maintenance. Provide lock washer or double nuts on each anchorage device provided for equipment, as required by equipment manufacturer.
 - 3. Materials that can contact potable water or water that will be treated to become potable shall be listed in NSF/ANSI 61.

B. Design Criteria

1. Size, Length, and Load-carrying Capacity: Comply with the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated, provide the following:
 - a. Anchor Bolts: Provide size, length, and capacity required to carry design load based on values and requirements of Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor bolt embedment as shown or indicated in Paragraph 3.2.A of this Section apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.
 - b. Adhesive Anchors and Concrete Inserts: Provide size, length, type, and capacity required to carry design load. Anchor capacity shall be based on the procedures required by the building code in effect at the Site. Where Evaluation Service Reports issued by the ICC Evaluation Service are required in this Section, anchor capacities shall be based on design procedure required in the applicable ICC Evaluation Service Report.
 - 1) General: Determine capacity considering reductions due to installation and inspection procedures, embedment length, strength of base fastening materials, spacing, and edge distance, as indicated in the manufacturer's design guidelines. For capacity determination, concrete shall be assumed to be in the cracked condition, unless calculations demonstrate that the anchor system will be installed in an area that is not expected to crack under any and all conditions of design loading.
 - 2) Concrete Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by Engineer, provide minimum embedment depth, edge distance and spacing as recommended by the manufacturer.
 - 3) Concrete Masonry Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by Engineer, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
2. Design Loads. Comply with the Contract Documents. When design load of supported material, equipment, or system is not otherwise shown or indicated, provide the following:
 - a. Equipment Anchors: Use design load recommended by equipment manufacturer. When equipment can be filled with fluid, use loads that incorporate equipment load and load imposed by fluid.
 - b. Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.

- c. Hangers and Supports for Electrical Systems, and HVAC, Plumbing, and Fire Suppression Systems and Piping: Use the full weight of supported system that is tributary to the support plus the full weight of accessories located between the hanger or support being anchored and the next hanger or support. When piping or equipment is to be filled with fluid, anchor systems shall be sized to support such loads in addition to the weight of the equipment, piping, or system, as applicable.
- d. Delegated Design: When anchor systems are used for supporting materials, equipment, or systems delegated to a design professional retained by Contractor, Subcontractor, or Supplier, provide anchor system suitable for loads indicated in delegated design documents and consistent with the design intent expressed in the Contract Documents.

C. Application:

1. Anchor Bolts:

- a. Where anchor bolt is shown or indicated, use cast-in-place anchor bolt unless another anchor type is approved by Engineer.
- b. Provide anchor bolts as shown or indicated, or as required to secure structural element to appropriate anchor surface.

2. Concrete Adhesive Anchors:

- a. Use where adhesive anchors are shown or indicated for installation in concrete.
- b. Suitable for use where subject to vibration.
- c. Suitable for use in exterior locations or locations subject to freezing.
- d. Suitable for use in submerged, intermittently submerged, or buried locations.
- e. Do not use in overhead applications, unless otherwise shown or approved by Engineer.
- f. Do not use for pipe hangers, unless otherwise shown or approved by Engineer.

3. Concrete Masonry Adhesive Anchors:

- a. Use where adhesive anchors are shown or indicated for installation in grout-filled or hollow masonry units.
- b. Suitable for use where subject to vibration.
- c. Suitable for use in exterior locations or locations subject to freezing.
- d. Do not use for pipe hangers, unless otherwise shown or approved by Engineer.

4. Concrete Inserts:

- a. Use only where shown or indicated in the Contract Documents.

- b. Allowed for use to support pipe hangers and pipe supports for pipe size and loading recommended by the concrete insert manufacturer.

2.02 MATERIALS

A. Anchor Bolts:

1. All locations: Provide stainless steel straight threaded rods complying with ASTM F593, AISI Type 316, Condition A, with ASTM F594, AISI Type 316, stainless steel nuts. Embedded anchor bolts shall be headed type and hooked bolts are unacceptable.
 - a. Stainless steel straight threaded rod shall comply with ductility requirements of ACI 350 or ACI 318 Appendix D, Section 0.3.3.
2. Equipment: Provide anchor bolts complying with material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor bolt projection. Anchor bolts shall be straight threaded rods with washers and nuts as specified in this Section. Hooked bolts are unacceptable.
3. Anchoring of Structural Elements: Provide anchor bolts of size, material, and strength shown or indicated in the Contract Documents.

B. Concrete Adhesive Anchors:

1. General:
 - a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.
2. Products and Manufacturers: Provide one of the following:
 - a. HIT-HY 200 Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
 - b. C6 Adhesive Anchoring System by Red Head.
5. Adhesives
 - a. Epoxy adhesives shall comply with physical requirements of ASTM C881/C881M, Type IV, Grade 2 and 3, Class A, B, and C, except gel times.
 - b. Adhesives shall have a current evaluation report by ICC Evaluation Service for use in both cracked and uncracked concrete with seismic recognition for SOC A through F as tested and assessed in accordance with ICC-ES AC308.
4. Anchor:
 - a. Provide continuously-threaded, AISI Type 316 stainless steel adhesive anchor rod. Threaded rods shall comply with the concrete adhesive anchor manufacturer's specifications as included in the

ICC Service Evaluation Report for the anchor submitted. Nuts shall have specified proof load stresses equal to or greater than the minimum tensile strength of the stainless steel threaded rod used.

- b. Stainless steel threaded rod shall comply with ductility requirements of ACI 350 or ACI 318 Appendix D, Section D.3.3.

C. Concrete Masonry Adhesive Anchors:

1. General:

- a. Grout-filled concrete masonry adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
- b. Hollow concrete masonry adhesive anchors shall consist of threaded rods with a cylindrical mesh steel or plastic screen tube anchored into hollow concrete block masonry using an adhesive system.

2. Products and Manufacturers: Provide one of the following:

- a. HBU-38 Umbrella Insert with A7 Adhesive, by Red Head.
- b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Company, Inc.

3. Adhesive:

- a. Adhesive system shall use two-component adhesive mix.
- b. Hybrid adhesives shall comply with the following:
 - 1) ASTM D695 compressive yield strength greater than 7,200 psi on a seven-day cure.
- c. Adhesives shall have current ICC Evaluation Service Report for use in grout-filled concrete masonry, tested and assessed in accordance with ICC-ES AC 58 and TCC-ES AC 60.

4. Anchor:

- a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM F594, AISI Type 316 stainless steel nuts.

5. Mesh Screen Tube (for hollow masonry applications):

- a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.

D. Concrete Inserts:

1. Manufacturers: Provide products of one of the following:

- a. Unistrut Corporation
- b. Cooper B-Line, Inc.

- c. Anvil International, Inc.
- 2. Spot Concrete Inserts:
 - a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall comply with ANSI/MSS SP-58, malleable iron, Type 18. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Provide nuts compatible with insert and to suit threaded hanger rod sizes.
- 3. Continuous Concrete Inserts:
 - a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall be continuous type and shall be manufactured from minimum 2-gage cold-formed channel sections, complying with ASTM A1011/A1011M, stainless steel, Grade 33, complete with Styrofoam inserts, end caps, and means for attaching to forms. Provide channel nuts compatible with insert suitable for threaded hanger rod sizes.
- 4. Provide inserts with plain finish.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions under which materials will be installed and advise Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Anchor Bolts:
 - 1. Provide anchor bolts as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
 - 2. Locate and accurately set anchor bolts using templates or other devices as required, prior to placing concrete. Wet setting of anchor bolts is unacceptable.
 - 3. Protect threads and shank from damage during installation and subsequent construction operations.
- B. Adhesive Anchors-General:
 - 1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain Engineer's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.

C. Adhesive Anchors:

1. Comply with manufacturer's written installation instructions and the following.
2. Drill holes to adhesive system manufacturer's recommended drill bit diameter to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits that comply with the tolerances of ANSI B212.15. Core-drilled holes are unacceptable.
3. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
4. Before injecting adhesive, obtain Engineer's concurrence that hole is dry and free of oil and other contaminants.
5. Prior to injecting adhesive into the drilled hole, dispense to a location appropriate for such waste, an initial amount of adhesive from the mixing nozzle, until adhesive is uniform color.
6. Inject adhesive into hole through injection system mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
7. Twist anchors during insertion into partially-filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
8. Provide adequate curing in accordance to adhesive system manufacturer's requirements prior to continuing with adjoining Work that could place load on installed adhesive anchors. Do not begin adjoining Work until adhesive anchors are successfully tested or when allowed by Engineer.
9. Limitations:
 - a. At time of anchor installation, concrete shall have compressive strength (f'c) of not less than 2,500 psi.
 - b. At time of anchor installation, concrete shall have age of not less than 21 days.
 - c. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with anchor systems manufacturer's requirements during installation and curing of adhesive anchor system.
 - d. Oversized Holes: Advise Engineer immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by Contractor.
 - e. Embedment depths shall be based on installation in normal-weight concrete with compressive strength of 2,500 psi when embedded

in existing concrete, and 4,000 psi when embedded in new concrete.

F. Concrete Inserts:

1. Comply with concrete insert manufacturer's installation instructions.
2. Inserts shall be flush with slab bottom surface.
3. Protect embedded items from damage during concrete placing. Ensure that embedded items are securely fastened to prevent movement during concrete placing, and ensure that embedded items do fill with concrete during concrete placing.
4. Inserts intended for piping greater than four-inch diameter shall be provided with hooked rods attached to concrete reinforcing.

G. Anti-Seizing Compound:

1. Provide anti-seizing compound in accordance with anti-seizing compound manufacturer's installation instructions, at locations indicated in Paragraph 2.1.B of this Section.
2. Do not use anti-seizing compound at locations where anchor bolt or adhesive anchor will contact potable water or water that will be treated to become potable.

3.03 CLEANING

- A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.04 FIELD QUALITY CONTROL

A. Site Tests - Adhesive Anchors

1. Contractor will employ independent testing agency to perform field quality tensile testing of production adhesive anchors at the Site, unless otherwise specified.
 - a. Testing shall comply with ASTM E488.
 - b. Test at least ten percent of all types of adhesive anchors. If one or more adhesive anchors fail the test, Contractor shall pay cost of testing, or at Engineer's option Contractor may arrange for testing paid by Contractor, for all adhesive anchors of same diameter and type installed on the same day as the failed anchor. If anchors installed on the same day as the failed anchor also fail the test, Engineer may require retesting of all anchors of the same diameter and type installed in the Work. Contractor shall be responsible for retesting costs.
 - c. Engineer will direct which adhesive anchors are to be tested and indicate test load to be used.
 - d. Apply test loads with hydraulic ram.
 - e. Displacement of post-installed anchors shall not exceed $D/10$, where D is nominal diameter of anchor being tested.

B. Manufacturer's Services:

1. Provide at the Site services of qualified adhesive manufacturer's representative during initial installation of adhesive anchor systems to train Contractor 's personnel in proper installation procedures. Manufacturer's representative shall observe to confirm that installer demonstrates proper installation procedures for adhesive anchors and adhesive material.

END OF SECTION

SECTION 03350 CONCRETE FINISHES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. 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 County as provided in the Contract Documents, the proposed chemical hardener manufacturer's surface preparation and application procedures.

1.03 SCHEDULE OF FINISHES

- A. Concrete for the Project shall be finished in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another Section.
- B. The base concrete for the following conditions shall be finished as noted and as further specified herein:
 - 1. Exterior, exposed concrete slabs and stairs - broomed finish.
 - 2. Interior, exposed concrete slabs - steel trowel finish.
 - 3. Concrete on which process liquids flow or in contact with sludge - steel trowel finish.
 - 4. Concrete where not exposed in the finished work and not scheduled to receive an additional applied finish or material - off-form finish.
 - 5. Provide concrete surfaces to be left exposed such as walls, columns, beams and joists with smooth rubbed finish.

1.04 RESPONSIBILITY FOR CHANGING FINISHES

- A. The surface finishes specified for concrete to receive additional applied finishes or materials are the finishes required for the proper application of the actual products specified under other Sections. Where different products are approved for use, it shall be the Contractor's responsibility to determine if changes in finishes are required and to provide the proper finishes to receive these products.
- B. Changes in finishes made to accommodate product different from those specified shall be performed at no additional cost to the County. Submit the proposed new finishes and their construction methods to the County for approval.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland cement and component materials required for finishing the concrete surfaces shall be as specified in the Contract Documents.

- B. Hardener shall be Lapidolith as manufactured by Sonneborn Building Products or approved equal. Hardener shall be used on all floors, stair treads and platforms.

PART 3 EXECUTION

3.01 FORMED SURFACES

- A. Forms shall not be stripped before the concrete has attained a strength of at least 50 percent of the ultimate design strength. This is equivalent to approximately five "100 day-degrees" of moist curing.
- B. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications, or corners when removing the forms or doing any work adjacent thereto.
- C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the County.
- D. Off-form finish. Fins and other projections shall be removed as approved. Tie cone holes and other minor defects shall be filled with non-shrink grout specified under the Contract Documents.

3.02 FLOORS AND SLABS

- A. Floors and slabs shall be screeded to the established grades and shall be level with a tolerance of 1/8-inch when checked with a 10 foot straight edge, except where drains occur, in which case floors shall be pitched to drains as indicated. Failure to meet either of above shall be cause for removal, grinding, or other correction as approved by the County.
- B. Following screeding as specified above, power steel trowel as follows:
 - 1. Immediately after final screeding, a dry cement/sand shake in the proportion of 2-sacks of portland cement to 350-pounds of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 pounds per 1,000 square feet of floor. Neat, dry cement shall not be sprinkled on the surface. This shake shall be thoroughly floated into the surface with an approved disc type power compacting machine weighing at least 200 pounds if a 20-inch disc is used or 300 pounds if a 24-inch disc is used (such as a "Kelly Float" as manufactured by the Weisner-Rapp Corporation of Buffalo, New York). A mechanical blade-type float or trowel is not acceptable for this work.
NOTE: This operation (application of the cement/sand shake) may be eliminated at the discretion of the County if the base slab concrete exhibits adequate fattiness and homogeneity.
 - 2. In lieu of power steel troweling, small areas as defined by the County shall be compacted by hand steel troweling with the dry cement/sand shake as ordered.
 - 3. The floor or slab shall be compacted to a smooth surface and the floating operation continued until sufficient mortar is brought to the surface to fill all voids. The surfaces shall be tested with a straight edge to detect high and low spots which shall be eliminated.

4. Compaction shall be continued only until thorough densification is achieved and a small amount of mortar is brought to the surface. Excessive floating shall be avoided.
- C. After Paragraph 3.02 A and B procedures are accomplished, floors and slabs for particular conditions shall be completed as scheduled in one of the following finishes:
1. Wood float finish. Hand wood float, maintaining the surface tolerance to provide a grained, nonslip finish as approved.
 2. Broomed finish. Hand wood float maintaining the surface tolerance and then broom with a stiff bristle broom in the direction of drainage to provide a nonslip finish as approved.
 3. Steel trowel finish. Hand steel trowel to a perfectly smooth, hard even finish free from high or low spots or other defects as approved.
- D. Floors, stair treads and platforms shall be given a floor hardener. Application shall be according to manufacturer's instructions.

3.03 APPROVAL OF FINISHES

- A. All concrete surfaces will be inspected during the finishing process by the County.
- B. Surfaces which, in the opinion of the County, are unsatisfactory shall be refinished or reworked until approved by the County.

END OF SECTION

SECTION 03600 GROUTING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section includes grouting of equipment bases and such locations as shown on the Drawings and as specified.
- B. The types of grouting include the following:
 - 1. Portland Cement Grout
 - 2. Non-shrink, Non-expanding Grout

1.02 DELIVERY AND STORAGE

- A. Prevent damage to or contamination of grouting materials during delivery, handling and storage.
- B. Store all grouting materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 PREMIXED GROUTS

- A. Portland Cement Grout
- B. (For grouting CMU cells and similar items - $f'c=3000$ psi minimum)
 - 1. Portland Cement: ASTM C150, Type II
 - 2. Sand: ASTM C33, Fine Aggregate
 - 3. Water: Potable
 - 4. Pea Gravel: ASTM C33. Coarse aggregate, graded so that at least 90% passes 3/8-inch sieve and 90% is retained by a number 4 sieve.
- C. (Grout Mortar for use as fillets and leveling)
 - 1. Portland Cement: ASTM C150, Type II
 - 2. Sand: ASTM C33, Fine Aggregate (Marson's sand)
 - 3. Water: Potable
 - 4. Mix 1-part Portland cement to 3-parts sand.
- D. Pre-Mixed non-shrink, Non-expanding Grout (Nonmetallic). Non-shrink grout as shown on the Drawings shall be a mixture of selected silica sands, Portland cement, water reducing agents, plasticizing and shrinkage compensating agents.

Grout shall be nonmetallic non-corrosive, non-staining and comply with CRD-C-588, Type D.

- E. The grout shall be non-shrink in accordance with ASTM C827, ASTM C191, and ASTM C109. The water-grout ratio shall be approximately 8 to 10 quarts of water per cubic foot of grout adjustable for varying job conditions.
- F. Grout shall not contain calcium chloride or other salt; aluminum or other metals; chemical additives, gypsum or expansive cements. Grout shall not expand after set.
- G. Grout shall be used and applied in accordance with the manufacturer's written instructions.
- H. Subject to compliance with requirements provide from the following:
 - 1. L&M Construction Chemicals, Inc. - Crystex
 - 2. Grout Corp. - Five Star Non-shrink Grout or equivalent

2.02 NONSHRINK GROUT

- A. Non-shrink grout shall conform to the following requirements:
 - 1. Manufactured under rigid quality control specifically for grout used in transferring heavy loads.
 - 2. Contain nonmetallic aggregates specially graded to minimize bleeding.
 - 3. Have an initial setting time of approximately one hour at 70°F.
 - 4. Produce no settlement or drying shrinkage at 3 days or later.
 - 5. Have higher strength at all ages than plain cement grout of the same flowability.
 - 6. Resist attack by oil and water and have lower absorption than plain cement grout of the same flowability.
 - 7. Minimum compressive strength, in accordance with ASTM C-109, shall be 2500 psi after 1 day and 7000 psi after 28 days.

2.03 MIXES

- A. For less than 2-inch clearance, or where size or shape of space makes grouting difficult, grout mix shall consist of Portland cement, fine aggregate and water.
- B. For greater than 2-inch clearances where coarse aggregate will not obstruct free passage of the grout, extend grout by adding 50 pounds of pea gravel per 100 pounds grout material.
- C. Use minimum amount of water necessary to produce a flowable grout without causing either segregation or bleeding.
- D. Portland cement mortar for raked-out edges of non-shrink grout: one part Portland cement, two parts sand and 0.50 part water by weight.

2.04 MIXING

- A. Mix grout in accordance with manufacturer's printed specifications.

- B. Mix grouting materials and water in a mechanical mixer for no less than 3-minutes.
- C. Mix grout as close to the work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.
- D. After the grout has been mixed, do not add more water for any reason.

PART 3 EXECUTION

3.01 PROCEDURES

- A. Installation methods and procedures shall be approved by Engineer and shall be in accordance with manufacturer's printed specifications before work is begun.

3.02 SURFACE PREPARATION

- A. Surface preparation shall be in accordance with manufacturer's printed specifications.
- B. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by bush-hammering, chipping, or other similar means, until a sound, clean concrete surface is achieved.
- C. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout. Cover concrete areas with waterproof membrane until ready to grout. Immediately before grouting remove waterproof membranes and clean any contaminated surfaces.
- D. Remove foreign materials from metal surfaces in contact with grout. Align, level and maintain final positioning of all components to be grouted.
- E. Saturate concrete surfaces with clean water; remove excess water and leave none standing.

3.03 PLACING

- A. Placing shall be in accordance with manufacturer's printed specifications.
- B. Place non-shrink grouting material quickly and continuously by the most practical means permissible; pouring, pumping or under gravity pressure.
- C. Do not use either pneumatic-pressure or dry packing methods without written permission of the Engineer.
- D. Apply grout from one side only to avoid entrapping air.
- E. Final installation shall be thoroughly compacted and free from air pockets.
- F. Do not vibrate the placed grout mixture or allow it to be placed if the area is being vibrated by nearby equipment.

- G. Do not remove leveling shims for at least 48 hours after grout has been placed. After shims have been removed, fill voids with plain cement-sand grout.
- H. After non-shrink grout has reached initial set, rake out exposed edges approximately 1-inch into the grouted area and paint with Portland cement mortar.

3.04 CURING

- A. Cure grout for 3-days after placing by keeping wet and covering with curing paper or by another approved method.

END OF SECTION

SECTION 04200 MASONRY

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Contractor shall provide labor, materials, equipment, and incidentals as shown, specified and required for masonry Work, including:
 - a. Providing openings in unit masonry construction to accommodate the Work under this and other Specification Sections and building into unit masonry construction all items such as sleeves, anchorage devices, inserts and other items to be embedded in unit masonry construction for which placement is not specifically provided under other Specification Sections.
2. Extent of each type of unit masonry is shown.
3. Types of products and features required include:
 - a. Concrete unit masonry.
 - b. Masonry mortar and grout.
 - c. Masonry accessories.

B. Coordination:

1. Review installation procedures under other Specification Sections and coordinate the items that must be installed with unit masonry construction Work.
2. Unit masonry construction done without built-in flashings and other built-in Work shall be removed and rebuilt at no additional cost to the Owner, even if discovered after apparent completion of unit masonry construction.
3. Coordinate Work under other Specification Sections to avoid delay of masonry construction.

1.02 REFERENCES

A. Referenced Standards: Standards referenced in this Section are:

1. Florida Building Code (FBC) 2023, 8th Edition.
2. TMS 402-16, Building Code Requirements for Masonry Structures.
3. TMS 602-16, Specification for Masonry Structures.
4. ASTM A36, Standard Specification for Carbon Structural Steel.
5. ASTM A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
6. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM C90, Standard Specification for Hollow Load-Bearing Concrete Masonry Units.

8. ASTM C91, Standard Specification for Masonry Cement.
9. ASTM C140, Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
10. ASTM C150, Standard Specification for Portland Cement.
11. ASTM C270, Standard Specification for Mortar for Unit Masonry.
12. ASTM C331, Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
13. ASTM C387, Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
14. ASTM C404, Standard Specification for Aggregates for Masonry Grouts.
15. ASTM C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
16. ASTM C1019, Standard Test Method for Sampling and Testing Grout.
17. NCMA, Guide Specifications and Technical Bulletins.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Installer: Hire a single installer regularly engaged in preformed unit masonry installation and with successful and documented experience in erecting unit masonry of scope and type of Work required; and employs only tradesmen with specific skill and successful experience in this type of Work. Submit name and qualifications to Owner with the following information for at least three successful, completed projects:
 - a. Names and telephone numbers of owners, architects or engineers responsible for project.
 - b. Approximate contract cost of unit masonry for which installer was responsible.
 - c. Amount (square feet) of unit masonry installed.
2. Laboratory Qualifications:
 - a. Testing Laboratory: In accordance with ASTM C1093.

B. Component Supply and Compatibility:

1. Obtain each type of concrete masonry unit from one Supplier, cured by one process and of uniform texture and color, or in an established uniform blend thereof.
2. Do not change source or brands of mortar products during the Project.
3. Where question of compliance to requirements of this Section arise, mortar properties Specification will take precedence over mortar proportion Specification.
4. Do not change proportions established for mortar accepted under property Specifications, and do not use products with different physical characteristics in mortar used in the Work, unless compliance with requirements of property Specifications is re-established by submitting acceptable data to Owner.
5. Do not combine two air-entraining materials in mortar.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Submit the following:
 - a. Shop Drawings showing location, extent and accurate configuration and profile of all items shown, specified, and required by this and other Specification Sections included in unit masonry construction.
 - b. Shop Drawing for fabrication, bending, and placement of reinforcing bars. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabricating and placing reinforcing for unit masonry Work.
2. Product Data: Submit the following:
 - a. Copies of manufacturer's specifications and test data for each type of concrete masonry unit specified, including certification that concrete masonry unit complies with Contract Documents. Include instructions for handling, storage, installation and protection of each type of concrete masonry unit.

B. Informational Submittals:

1. Source Quality Control Submittals: Submit the following:
 - a. Pre-construction laboratory test results, per ASTM C140.
2. Qualifications: Submit the following:
 - a. Testing laboratory.
 - b. Installer.

1.05 JOB CONDITIONS

- A. Temporary Facilities: Provide supplemental heat sources and equipment as required should Contractor desire to continue unit masonry Work in cold weather. Pay for fuel for supplemental heat.
- B. Environmental Requirements:
 1. Do not perform unit masonry Work when air temperature is below 28 degrees F on a rising temperature, or below 36 degrees F on falling temperatures without providing temporary, heated enclosures, or without providing temporary heating or other precautions to prevent freezing.
 2. Do not use frozen products, and do not build upon frozen unit masonry Work.
 3. Remove and replace all unit masonry Work damaged by cold.
- C. Hot Weather Unit Masonry Work: Protect unit masonry Work by methods acceptable to Owner from direct exposure to wind and sun when surrounding air temperature is 99 degrees F in the shade with relative humidity less than 50 percent.

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

- A. Portland Cement: Provide the following for Portland cement-lime mortars:
1. ASTM C150, Type I.
 2. Use ASTM C150, Type III high-early strength, for laying masonry when air temperature is less than 50 degrees F.
 3. Provide non-staining Portland cement of natural color.
- B. Masonry Cement: Provide the following for masonry cement mortars:
1. ASTM C91 Type S, proportioned to comply with ASTM C270.
 2. Maximum Air Content, ASTM C91: 12 percent.
 3. Non-staining.
- C. Hydrated Lime: ASTM C207 Type S, or lime putty ASTM C5.
- D. Sand Aggregates:
1. ASTM C144, except for joints less than ¼-inch, use aggregate graded with 100 percent passing the No. 16 sieve.
 2. White Mortar Aggregates: Provide natural white sand or ground white stone for Portland cement-lime mortars.
 3. Colored Mortar Aggregates: Provide ground marble, granite, or other sound stone as required to match the sample approved by Owner for Portland cement-lime mortars.
 4. Fine Aggregate for Grout: Sand, ASTM C404, Size No. 1.
 5. Course Aggregate for Grout: ASTM C404, Size No. 8 or Size No. 89.
- E. Ready-mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified for mortar materials, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C270 and C387.
- F. Water: Free from injurious amounts of oils, acids, alkalis, or organic matter, and clean, fresh, and potable.

2.02 MORTAR MIXES

- A. General:
1. Anti-freeze Admixture or Agents: Not allowed.
 2. Calcium Chloride: Not allowed.
- B. Mortar for Unit Masonry: Comply with ASTM C270, Table 2, except limit materials to those specified in this Section, do not substitute ASTM C91 masonry cement for ASTM C150 Portland cement without a submittal approval by Owner, and limit cement to lime ratio by volume as follows:
1. Type S:

- a. Provide the following proportions by volume:
 - 1) Portland Cement: 1/2 part.
 - 2) Masonry Cement: One part.
 - 3) Aggregate Ratio (measured in a damp loose condition): Not less than 2-1/4 and not more than three times the sum of the volumes of cementitious materials.
- b. Properties:
 - 1) Average Compressive Strength, ASTM C 270: 1800 pounds per square inch.
 - 2) Minimum Water Retention, ASTM C 270: 75 percent.
 - 3) Maximum Air Content, ASTM C 270: 18 percent.

C. Grout:

1. Fine Grout:

- a. Provide the following proportions by volume:
 - 1) Portland Cement: One part.
 - 2) Hydrated Lime or Lime Putty: Zero to 1/10 part.
 - 3) Aggregate Ratio (Measured in a Damp Loose Condition): Sand shall be not less than 2.25 times and not more than three times sum of volumes of cement and lime.
- b. Mix grout to have a slump of ten inches plus or minus one-inch at placement.

2. Coarse Grout:

- a. Provide the following proportions by volume:
 - 1) Portland Cement: One part.
 - 2) Hydrated Lime or Lime Putty: Zero to 1/10 part.
 - 3) Fine Aggregate Ratio (Measured in a Damp Loose Condition): Sand shall be not less than 2.25 times and not more than three times sum of volumes of cement and lime.
 - 4) Coarse Aggregate Ratio: Not less than one and not more than two times sum of volumes of cement and lime.
- b. Mix grout to have slump of ten inches plus or minus one-inch, at placement.

2.03 CONCRETE MASONRY UNITS

- A. General: Concrete masonry units shall comply with requirements below.
- B. Hollow Load-bearing Concrete Masonry Units: ASTM C90, with minimum of 15 percent coal fly ash.

- C. Size: Manufacturer's standard units with nominal face dimensions of 16 inches long by eight inches high by nominal width dimension shown on Drawings (15-5/8-inches by 7-5/8-inches actual).
- D. Waterproofing Admixture: Manufacture all types of concrete unit masonry, used in construction of exterior walls with an integral waterproofing admixture as follows:
 - 1. Material: Cross-linking acrylic polymer.
 - 2. Proportion: In strict accordance with manufacturer's instructions.
 - 3. Products and Manufacturers: Provide products of one of the following:
 - a. Dry-Block System by Forrer Industries, a Unit of W. R. Grace & Company Construction Products Division.
 - b. Eucon Blocktite by Euclid Chemical Company.
 - c. Or equal.
- E. Exposed Faces: Provide manufacturer's standard color and texture.
- F. Provide two-core concrete masonry units.

2.04 MASONRY ACCESSORIES

- A. Continuous Horizontal Wire Reinforcing and Ties for Masonry: Provide the following unless otherwise shown:
 - 1. General: Welded wire units prefabricated in straight lengths of not less than ten feet, with matching corner "L" and intersection "T" units. Fabricate from cold-drawn steel wire complying with ASTM A82, with deformed continuous 3/16-inch gage side rods and plain 9 gage cross rods, crimped for cavity wall construction, with unit width of 1.5 to two inches less than thickness of wall or partition. All reinforcing and ties shall be hot dipped galvanized after fabrication with 1.5 ounces per square foot of zinc coating complying with ASTM A153, Class B-2, unless otherwise specified.
 - 2. For single-wythe masonry, use units fabricated as follows:
 - a. Truss-type fabricated with one horizontal rod beneath each unit masonry shell wall and continuous diagonal cross-rods spaced not more than 16 inches on centers.
 - b. Products and Manufacturers: Provide one of the following:
 - 1) Lox and all Truss Reinforcement with #120 Truss-Mesh by Hohmann and Barnard, Inc.
 - 2) Or equal.
- B. Anchoring Devices for Masonry: Provide the following, unless otherwise shown:
 - 1. General: Provide the following:
 - a. Cold rolled steel sheet complying with ASTM A1008, hot-rolled steel sheet and strip complying with ASTM A1011, plates and bars complying with ASTM A36 and cold drawn steel wire complying with

- ASTM A82, all hot-dipped galvanized after fabrication with 1.5 ounces per square foot of zinc coating complying with ASTM A153.
- b. Rectangular, corrugated, one-inch wide ties, fabricated of 12-gage sheet metal, unless otherwise specified.
 - c. Flexible Anchors: When masonry abuts structural walls or framework provide flexible anchors that allow horizontal and vertical movement of masonry, but provide lateral restraint.
2. Compressible Filler: Provide watertight joint filler where unit masonry construction abuts structural framework members, or as shown. Provide the following:
- a. Polyurethane foam strip saturated with polybutylene waterproofing material which, when installed at a compression ratio of two-to-one, is impermeable to water.
 - b. Resilient to -40 degrees F with 100 percent movement recovery.
 - c. Elongation of 140 percent with a tensile strength of not less than 53 pounds per square inch.
 - d. Products and Manufacturers: Provide products of one of the following:
 - 1) Polytite Standard by Polytite Manufacturing Corporation.
 - 2) Polyseal by Sandell Manufacturing Company, Inc.
 - 3) Or equal.
3. Reinforcing Bars:
- a. Deformed carbon steel, ASTM A615, Grade 60 for bars No. 3 to No. 8 except as otherwise shown.

2.05 SOURCE QUALITY CONTROL

- A. Allowable Tolerances: For concrete masonry units provide the following:
- 1. Face Dimension: Total variation in finished and installed face dimensions of units shall not exceed 1/16-inch between largest and smallest units in each lot of units of each size.
 - 2. Distortion: Distortion of plane and edges of face of individual units, as installed, from corresponding plane surface and edges of prefaced concrete masonry unit, shall not exceed 1/16-inch.
 - 3. Top and Bottom Surfaces: Ground to provide finish height of 7-5/8 inches plus or minus 1/16-inch.

PART 3 EXECUTION

3.01 INSPECTION

- A. Contractor and installer shall examine areas and conditions under which unit masonry construction Work will be installed and notify the Owner of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner.

3.02 PREPARATION

A. Measurement of Mortar Materials:

1. Cement and Hydrated Lime: Batched by the bag.
2. Sand: Batched by volume in suitably calibrated containers, provided proper allowance is made for bulking and consolidation and for weight per cubic foot, of contained moisture.
3. Proportion of Volumetric Mixtures: One 94-pound sack of Portland cement and one 50-pound sack of hydrated lime constitute nominal one cubic foot.
4. Shovel measurement: Not allowed.

B. Mortar Mixing:

1. Type of Mixer: Machine mix in approved mixer in which quantity of water is accurately and uniformly controlled.
2. While mixer is in operation add approximately three-quarters of required water, half the sand, all the cement, then add remainder of sand.
3. Allow batch to mix briefly then add water in small quantities until satisfactory workability is obtained.
4. Mix for at least five minutes after all materials have been added.
5. Hydrated Lime for Mortar Requiring Lime Content: Use dry-mix method. Turn over materials for each batch together until even color of mixed, dry materials indicates that cementitious material has been thoroughly distributed throughout mass, then add water to obtain required plasticity.
6. Lime putty, if approved for use, shall be prepared in accordance with ASTM C5.
7. Mixer drum shall be completely emptied before recharging next batch.
8. Re-tempering of mortar is not allowed.

C. Wetting of Masonry Units:

1. Concrete Masonry Units: Except for absorbent units specified to be wetted, lay masonry units dry. Do not wet concrete masonry units.

D. Cleaning Reinforcement: Before being placed, remove loose rust, mill scale, earth, ice, and other coatings except galvanizing from reinforcement. Do not use reinforcing bars with kinks or bends not shown on Drawings or approved Shop Drawings, or bars with reduced cross-section.

3.03 INSTALLATION, GENERAL

A. Thickness: Build walls, floors and other unit masonry construction work to thickness shown. Build single-wythe walls to actual thickness of masonry units using units of nominal thickness shown or specified.

B. Leave openings for equipment, piping, ducts, and other items to be installed subsequent to start of masonry Work. After installing said items, complete unit masonry Work to match Work immediately adjacent to openings.

- C. Cut masonry units using wet cutting, motor driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining Work neatly. Use full size units without cutting wherever possible.
- D. Match Existing Masonry: Match coursing, pattern bond, color, texture and size of new unit masonry with adjacent, existing masonry.

3.04 LAYING MASONRY WALLS

A. General:

- 1. Mortar Types: Unless otherwise indicated, use mortar as specified and as follows:
 - a. For all Work, use S mortar.
 - b. Use coarse grout fill for structural requirements and for grouting reinforcing steel in unit masonry construction Work.
 - c. Do not use mortar that has begun to set or if more than 30 minutes have elapsed since initial mixing. Re-temper mortar during the 30-minute period only as required to restore workability.
- 2. Avoid using less than half-size units at corners, jambs, and where possible at other locations.
- 3. Lay up walls plumb and true to comply with specified tolerances, with courses level, accurately spaced, and coordinated with other Work.

B. Construction Tolerances:

- 1. Variation from Plumb: For lines and surfaces of columns, walls and arises, do not exceed 1/4-inch in 10 feet, or 3/8-inch in a story height (20 feet maximum), nor two-inch in 40 feet or more. Except for external corners, expansion joints and other conspicuous lines, do not exceed 1/4-inch in any story or 20 feet maximum, nor two-inch in 40 feet or more.
- 2. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4-inch in any bay or 20 feet maximum, nor 3/4-inch in 40 feet or more.
- 3. Variation of Linear Building Line: For position shown and related portion of columns, walls and partitions, do not exceed two-inch in any bay or 20 feet maximum, nor 3/4-inch in 40 feet or more.
- 4. Variation in Cross-sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4-inch nor plus two-inch.

C. Mortar Bedding and Jointing:

- 1. Lay hollow masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
 - a. Maintain joint widths shown, except for minor variations required to maintain pattern bond alignment. Lay walls with 3/8-inch joints.

2. Cut joints flush for masonry walls that are to be concealed or to be covered by other materials, except paint, unless otherwise shown.
 3. Tool exposed joints, when mortar is "thumbprint" hard, slightly concave. Rake out mortar in preparation for application of calking or sealants where required.
 4. Concave-tool exterior joints below grade.
 5. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- D. Stopping and Resuming Work: Rake back half-unit masonry length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly, if required, and remove loose masonry units and mortar prior to laying new masonry.
- E. Built-in Work:
1. As the Work progresses, build in items shown, specified or required by others. Fill cores in one block width solidly with masonry around built-in items.
 2. Where built-in items are to be embedded in cores of hollow masonry units, place layer of cavity fill mesh in joint below and rod mortar or grout into core.
- F. Horizontal Joint Reinforcing:
1. Provide continuous horizontal joint reinforcing as specified. Fully embed longitudinal side rods in mortar for their entire length with minimum cover of 5/8-inch on exterior side of walls and 1/2-inch at other locations. Lap reinforcement minimum of six inches at ends of units. Do not bridge masonry control joints with reinforcing.
 2. Reinforce all masonry walls with continuous horizontal joint reinforcing unless specifically noted or specified to be omitted.
 3. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units in accordance with manufacturer's written instructions.
 4. Space continuous horizontal reinforcing as follows:
 - a. Space reinforcing at 16 inches on centers vertically, unless otherwise shown.
 5. Reinforce masonry openings greater than 12 inches wide, with horizontal joint reinforcing placed in two horizontal joints approximately eight inches apart, immediately above lintel and immediately below sill. Extend reinforcing minimum of 2.0 feet beyond jambs of opening.
 6. In addition to wall reinforcing, provide additional reinforcing at openings as required to comply with the Contract Documents.
- G. Structural Reinforced Unit Masonry Construction:
1. Comply with the requirements of ACI 530.1 and applicable codes.
- H. Grouting Structural Reinforced Unit Masonry Construction:

1. Comply with requirements of ACI 530.1 and applicable codes.
- I. Anchoring Masonry Work:
1. Provide anchoring devices of type specified. If not shown or specified, provide standard type for facing and back up involved in compliance with requirements of Laws and Regulations.
 2. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:
 - a. Provide an open space not less than 1/2-inch or more than one-inch in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar and other rigid materials.
 - b. Provide end blocks where masonry abuts structural support to facilitate installation of compressible filler, fire-safing insulation, backer rod, and sealant.
- J. Bond Beams:
1. Provide masonry bond beams where openings of 16 inches or more are shown. Provide formed in place masonry lintels and bond beams. Temporarily support formed-in-place lintels and bond beams.
 - a. Unless otherwise shown, provide one horizontal number six deformed reinforcing bar for each 4 inches of wall thickness.
 - b. For hollow masonry unit walls, use specially formed "U"-shaped lintel and bond beam units with reinforcing bars placed as shown, filled with coarse grout as specified.
 2. Provide minimum bearing at each jamb of eight inches for all openings.
 3. On concrete unit masonry walls where pattern bond remains visually exposed, increase minimum bearing of masonry lintels to maintain joint pattern of wall and install to be indistinguishable from surrounding masonry.
- K. Protection:
1. Protect unit masonry construction Work from deterioration, discoloration, weather or damage during subsequent construction operations.

3.05 FIELD QUALITY CONTROL

- A. Contractor shall hire independent testing laboratory acceptable to Owner to take samples and conduct tests to evaluate air entrainment, water retention, and compliance of products with Contract Documents, and to determine compressive strength of mortar and grout. Conduct tests in accordance with ASTM C91. Provide tests results to Owner prior to commencement of Work.
- B. After initial test, the Owner will require maximum of five additional tests to be conducted at the Owner's discretion.
- C. Test and inspect all load-bearing concrete unit masonry during construction, meeting the requirements of Level 3 Quality Assurance as defined by ACI 530.1.

- D. Masonry walls that do not meet requirements of Special Inspections shall be repaired in manner acceptable to Owner at no expense to Owner.

END OF SECTION

SECTION 05500 METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Miscellaneous steel trim including steel angle corner guards and steel edgings.
 - 4. Metal bollards.
 - 5. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Division 03 - Concrete for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

1.03 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Galvanizing coating products.
 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
1. Steel framing and supports for mechanical and electrical equipment.
 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 3. Miscellaneous steel trim including steel angle corner guards and steel edgings.
 4. Metal bollards.
 5. Loose steel bearing plates.

1.05 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- B. Welding certificates
- C. Galvanizing coating certificates.
- D. Manufacturers literature for post-installed anchors.

1.06 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
 3. All field welding shall be inspected by a Certified Welding Inspector (CWI), Hired and paid for by the Contractor.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.02 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M. Wide Flange Sections: ASTM A572/ ASTM A572M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L.
- D. Stainless-Steel Bars and Shapes: ASTM A276, Type 316L.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A793.
- G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches or As indicated.
 - 2. Material: Galvanized steel, ASTM A653/A 653M, commercial steel, Type B structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch 0.079-inch 0.064-inch nominal thickness.

2.03 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3 (ASTM A325M, Type 3); with hex nuts, ASTM A563, Grade C3 (ASTM A563M, Class 8S3); and flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and flat washers; Alloy Group 1 (A1).

- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or epoxy adhesive type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
- H. Post-Installed Anchors: Torque-controlled epoxy adhesive anchors.
 - 1. Material for All Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn5, as needed for fastening to inserts.

2.04 MISCELLANEOUS MATERIALS

- A. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Concrete: Comply with requirements in Section 03300 Cast-in-Place Concrete for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4500 psi or greater.

2.05 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.07 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.08 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 80 steel pipe 1/4-inch wall-thickness rectangular steel tubing steel shapes, as indicated.
 - 1. Cap bollards with 1/4-inch thick steel plate.
 - 2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
 - 3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
- B. Fabricate bollards with 3/8-inch thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- D. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch wall-thickness steel tubing with an OD approximately 1/16 inch less than ID of bollards. Match drill sleeve and bollard for 3/4-inch steel machine bolt.

2.09 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.

2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Install pipe columns on concrete footings and slabs with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.03 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - 1. Do not fill removable bollards with concrete.
- B. Anchor bollards to existing construction with expansion anchors, anchor bolts or through bolts. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete.
- C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete or in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with non-shrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- D. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- E. Anchor internal sleeves for removable bollards in concrete by inserting in pipe sleeves preset into concrete or formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of sleeve. Fill annular space around internal sleeves solidly with non-shrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward internal sleeve.
- F. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.
- G. Place removable bollards over internal sleeves and secure with 3/4-inch machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.

H. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.04 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05521 PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Aluminum pipe railings.
- B. Related Sections:
 - 1. Division 05 - Metals

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: Railings to withstand structural loads indicated.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of finishing and connecting members at intersections.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. The qualified professional engineer shall be registered in the State of Florida.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication. Provide additional railing posts at middle rail interruption locations.

1.08 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1. Aluminum Pipe and Tube Railings:

- a. Blum, Julius & Co., Inc.
- b. Hollaender Manufacturing Company.
- c. Superior Aluminum Products, Inc.
- d. Tuttle Railing Systems; Div. of Tuttle Aluminum & Bronze, Inc.

2.02 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.03 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than

the strength and durability properties of alloy and temper designated below for each aluminum form required.

- B. Extruded Bars and Tubing: ASTM B221 (ASTM B221M), Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B210 (ASTM B210M), Alloy 6063-T832.
- E. Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B247 (ASTM B247M), Alloy 6061-T6.
- G. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.04 FASTENERS

- A. General: Provide the following:
 - 1. Aluminum Railings: Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- D. Post-Installed Anchors: Epoxy adhesive type anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency. Mechanical wedge type anchors are not allowed.
 - 1. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.06 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- I. Form changes in direction as follows:
 - 1. As detailed.
- J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.08 ALUMINUM FINISHES

- A. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly

marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.04 ANCHORING POSTS

- A. Anchor posts to concrete and metal surfaces with base plates as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum pipe railings, weld posts to plate and bolt to supporting surfaces. Bolt and plate assembly designed and engineered for this purpose.

3.05 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.
- C. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt or predrilled hole for exposed bolt anchorage.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.06 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.07 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 05531 METAL GRATINGS

PART 1 GENERAL

1.01 GENERAL

- A. Contractor shall provide all labor, materials, and equipment as shown, specified, and required to furnish and install trench and platform grating assemblies, miscellaneous supports and frames.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal bar gratings.
 - 2. Metal frames and supports for gratings.
- B. Related Sections:
 - 1. Division 03 - Concrete
 - 2. Division 05 - Metals

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Walkways and Elevated Access Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. - All steel and aluminum applications.
 - 2. Limit deflection to L/240 or 1/4 inch, whichever is less.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Clips and anchorage devices for gratings.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
 - 1. Shop Drawings detailing fabrication and installation of all work. Include plans, elevations and details of sections and connections. Show panel section layouts, miscellaneous supports, and fastener types and locations.
 - 2. Furnish setting drawings, templates, and installations details for installing frames and anchorages, including concrete inserts. Deliver such items to Project site in time for installation.

1.05 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
- B. NAAMM Metal Bar Grating Manual ANSI/NAAMM MBG 532, "Heavy Duty Steel Grating."
- C. Welding Qualifications:
 - 1. Quality procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel".
 - 2. Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Contractor shall field measure and verify actual locations of walls, beams and other construction contiguous with gratings by field measurements before fabrication to ensure proper installation.

1.08 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.01 HEAVY DUTY STEEL

- A. ASTM A36 for hot rolled structural steel bars, and ASTM A510 for carbon steel wire rods and coarse round wire.

2.02 STEEL

- A. ASTM A1011 for hot rolled carbon steel sheet and strip. ASTM A510 for carbon steel wire rods and coarse round wire.

2.03 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer for type of use indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Bars and Shapes: ASTM B221, alloys as follows:
 - 1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
 - 2. 6061-T1, for grating crossbars.
- C. Aluminum Sheet: ASTM B209, Alloy 5052-H32.

2.04 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1 (A1).

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.06 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.

- E. Welding: Comply with AWS recommendations and the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
1. Fabricate toe plates to fit grating units and weld to units in shop unless otherwise indicated.
 2. Fabricate toe plates for attaching in the field.
 3. Toe plate Height: 4 inches unless otherwise indicated.

2.07 METAL BAR GRATINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. IKG Industries; a division of Harsco Corporation.
 2. Ohio Gratings, Inc.
- B. Rectangular Bar Grating: As noted on the drawings and as indicated below.
1. Bearing Bar Spacing: 1-3/16 inches o.c.
 2. Bearing Bar Depth: Varies as noted on drawings and as required to comply with structural performance requirements.
 3. Bearing Bar Thickness: 3/16 inch and as required to comply with structural performance requirements.
 4. Crossbar Spacing: 4 inches o.c.
 5. Aluminum Finish: Mill finish.
 6. Steel Finish: Galvanized.
- C. Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
1. Provide no fewer than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
 2. Furnish threaded bolts with nuts and washers for securing grating to supports.
 3. Furnish self-drilling fasteners with washers for securing grating to supports.
- D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- E. Do not notch bearing bars at supports to maintain elevation.

2.08 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors a maximum 16 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.09 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.02 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach non-removable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

END OF SECTION

SECTION 06100 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. Related Documents:
1. Drawings and general provisions of the Subcontract apply to this Section.
 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes: Execution and completion of Rough Carpentry in accordance with the Specifications and Drawings including but not limited to;
1. Dimensional lumber.
 2. Roof sheathing.

1.02 REFERENCES

- A. General:
1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 3. Refer to Division 01 Section "01070 -Codes, References, and Abbreviations " for the list of applicable regulatory requirements.
- B. ASTM International.
- C. American Wood Preservers Association (AWPA).
- D. National Fire Protection Association (NFPA).

1.03 SUBMITTALS

- A. Certificate: Provide certificate from each manufacturer stating that material is first quality, meets or exceeds the properties of specified materials as specified herein, and is suitable for intended use on this Project.

1.04 QUALITY ASSURANCE

- A. Inspection: Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is completed to the point where this installation may properly commence.

- B. Discrepancies: In the event of discrepancy, immediately notify the Project Manager. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.
- C. Lumber may be rejected by the Project Manager, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be properly packed and handled while in transit so as to arrive at the job site in undamaged condition. Manufactured materials shall be delivered in suitable containers plainly marked with brand and manufacturer's name.
- B. Storage arrangements shall be subject to Project Manager's approval and shall afford every access for inspection and identification of each item. Lumber shall be piled off the ground, on skids, in a manner which prevents twisting or warping and affords proper ventilation, drainage and protection from termites and decay, rain and excessive sun. Plywood shall be protected from dampness. Material shall be protected from the elements and from damage or deterioration.
- C. Damaged or deteriorated materials or assemblies shall not be used in the work and shall be replaced at no extra cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Material shall conform to these specifications and to the applicable current editions of the Standard Specifications of ASTM and CBC.
- B. Lumber Grading:
 - 1. Plywood: U.S. Product Standard PS1 (latest edition), grade stamped, and edge branded to DFPA Standards of the APA - The Engineered Wood Association.
- C. Fir Plywood: U.S. Product Standard PS1 (latest edition), grade stamped, and edge branded to DFPA Standards of the American Plywood Association.
- D. Dimensional lumber 2 inches (50 mm) or less in thickness shall have an average moisture content of 19 percent or less but no portion of a shipment shall be over 25 percent. Air dried lumber is desired but, if necessary, lumber may be kiln dried, however, the drying process must be slow and regulated to cause only an amount of checking comparable with air-dried stock. Wood thicker than 2-1/2 inches (63 mm) shall be well seasoned stock, moisture content not to exceed 18 percent.

- E. Sills and equipment curbs which rest on concrete shall be foundation grade preservative pressure treated Douglas Fir.
- F. Framing, blocking, backing, etc., unless otherwise shown, shall be Douglas Fir. All interior wood and plywood used for blocking and built into roofing, or otherwise shown shall receive fire retardant pressure treatment in accordance with paragraph 2.05.B.

2.02 ROOF SHEATHING

- A. Plywood: See Paragraph 2.01 B & C.
- B. Oriented Strand Board: Phenolic-glued low-formaldehyde board made with Douglas fir veneers and fibers. Plywood / particleboard 5 ply composite sheathing and flooring.

2.03 PRESSURE TREATMENT

- A. Where called for on the drawings or specified herein, exposed lumber to receive preservative-type pressure treatment shall have a minimum moisture content of 19 percent after pressure treatment and shall be pressure treated using Ammoniacal copper quaternary compound (ACQ). Preservative shall penetrate a minimum of 3/8-inch (9.5 mm) deep into wood. Fasteners and connectors used with preservative pressure treated lumber shall be G185 hot dip galvanized, Type 304 stainless steel or Type 316 stainless steel.
 - 1. Dimensioned Lumber (all other): AWPA C-2, ▸ retention of 0.25 lbs/c.f. per quality standard LP-2 for above ground use.
 - 2. Pre-treated lumber shall be preserved with ACQ Preserve®, Chemical Specialties Inc.
 - 3. Field treatment shall be Boracol® or Impel® Rods, Chemical Specialties Inc. applied in accordance with the manufacturer's instructions.
- B. All interior wood and plywood used for blocking and built into roofing, or otherwise shown, shall receive fire retardant pressure treatment in accordance with American Wood Preservers Association (AWPA). Treat wood with Kopper's "Non-Com", or Baxter fire retardant treatment, or equal, and provide UL label. Plywood shall have flame spread rating after treatment of 25 or less.
- C. Subcontractor shall furnish to the Project Manager, upon delivery of the members to the job, a certificate certifying that the material has been pressure treated as specified.

PART 3 EXECUTION

3.01 WORKMANSHIP

- A. General: Rough carpentry shall produce joints true, tight, and well nailed with members assembled in accordance with the Drawings and with pertinent codes and regulations.
- B. Selection of lumber pieces: Carefully select members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.

3.02 WOOD PRESERVATIVE

- A. All exterior framing coming in contact with concrete or masonry not specified or otherwise shown to be pressure treated shall be treated with ACQ Preserve®.

3.03 SITE APPLIED WOOD TREATMENT

- A. Brush apply two coats of preservative treatment on site cut ends and site cut wood in contact with other wood surfaces.
- B. Apply preservative treatment in accordance with manufacturer's instructions.
- C. Allow preservative to cure prior to erecting members.

3.04 CLEANUP

- A. At the end of each shift and upon completion of the work, remove debris, rubbish and surplus materials from the site which resulted from work under this section. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill. Take positive measures to ensure that saw dust and wood shavings do not enter the storm drainage system.

3.05 WASTE MANAGEMENT

- A. Separate stained, painted and treated lumber from clean lumber and place in designated area for hazardous materials.
- B. Do not burn in an open fire, wood stove, fireplace or other non-industrial incinerator lumber that is less than a year old or wood treated with creosote, pentachlorophenol, CCA, ACA, or other pressure treatment.
- C. Separate the following categories for disposal and place in designated areas for hazardous materials: treated, stained, painted, or contaminated wood.
- D. Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

END OF SECTION

SECTION 06175 SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide prefabricated wood trusses for roof framing, including truss girders, bridging, bracing and anchorages as shown on the Drawings and specified herein.

1.02 REFERENCES

- A. Florida Building Code (FBC) 2023, 8th Edition
- B. National Designation Specification for Wood Construction, Latest Edition.
- C. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- D. ASTM A446 - Sheet Steel, Zinc Coated by the Hot-Dip Process, Structural Quality.
- E. AWPA - American Wood Preservers' Association.
- F. TPI - Truss Plate Institute.
- G. UL - Underwriters' Laboratories, Inc.

1.03 SYSTEM DESCRIPTION

- A. Design Roof Dead and Live Loads
 - Top Chord Dead Load: 10 psf
 - Top Chord Live Load: 20 psf
 - Bottom Chord Dead Load: 15 psf
 - Bottom Chord Live Load: 10 psf
- B. Wind velocity force design to meet ASCE 7-22, 147 mph, Risk Category III, Exposure C.
- C. Design: Conform to requirements of National Design Specification for Wood Construction.
- D. Chord and Web Members: Southern Pine No. 2 select structural or better with minimum allowable stress values per the NDS Supplement:
- E. Use only pressure treated wood for all structural wood having exterior exposure and/or in contact with concrete or masonry.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in the manufacture of prefabricated wood trusses with minimum three years experience.

- B. Design of Prefabricated Trusses and Truss Girders: Perform design under direct supervision of Professional Engineer registered in State of Florida and experienced in structural framing design of trusses.
- C. Lumber Grading Agency: Southern Pine Inspection Bureau.
- D. Truss Plates: In accordance with Truss Plate Institute.

1.05 REGULATORY REQUIREMENTS

- A. Conform to Florida Building Code, for loads and other governing load criteria.
- B. Conform to applicable code for fire retardant requirements.

1.06 SUBMITTALS

- A. Submit, in accordance with the General Conditions article no. 27, Basic Requirements Part no. 1 and the following.
- B. Submit the shop drawings, design calculations including rated load capacity of connectors, certification of connector capacities and manufacturer's license to fabricate trusses utilizing the proposed connector system, product data, including wood preservative materials, all signed and sealed by a Professional Engineer registered in the State of Florida.
- C. Indicate framing system, loads and cambers, bearing and anchor details, bridging and bracing, framed openings, erection plan and other pertinent details.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Transport and store trusses in vertical position resting on bearing ends.
- B. Protect trusses from moisture, warpage and distortion during transit and when stored.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Lumber: No. 2 Southern Pine minimum
- B. Steel Connectors: ASTM A446 steel, Grade A, galvanized, die stamped with integral teeth.
- C. Fasteners: Galvanized for exterior, high humidity, and for treated wood locations, and plain finish elsewhere. Size and type to suit condition.
- D. Bearing Plate Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to hold masonry or concrete.
- E. Wood Blocking: Solid block of same size as member or 1"x3" "X" at intervals not to

exceed depth of members x 12 or 8-feet, whichever is smaller.

2.02 WOOD TREATMENT

- A. Wood Preservative (Pressure Treatment): AWPA Treatment C2 using water borne preservative with 0.30 percent retainage.

2.03 FABRICATION

- A. Verify dimensions and site conditions prior to fabrication.
- B. Cut members accurately to length to achieve tight joint connections.
- C. Jig trusses during fabrication to assure accurate configuration. Press connectors into lumber, both sides of joint simultaneously.
- D. Build camber into truss.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that supports and openings are ready to receive trusses.
- B. Verify sufficient end bearing area.
- C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Coordinate placement of bearing and support items.

3.03 INSTALLATION

- A. Install trusses in accordance with manufacturer's instructions.
- B. Place trusses true to line and level.
- C. Provide temporary bracing to hold trusses in place until permanently secured.
- D. Place permanent bridging, bracing, and anchors to maintain trusses straight and in correct position before inducing loads. Provide solid blocking between members at all support points. Provide bridging as recommended by truss manufacturer.
- E. Do not field cut trusses.
- F. Securely fasten trusses to supporting walls or beams with hurricane clips or anchors, 16 gauge galvanized metal tie straps or equal.
- G. Frame openings between trusses with lumber.

H. In placing and fastening of sheathing, conform to the Florida Building Code.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 06600 - FIBERGLASS REINFORCED POLYMER (FRP) PRODUCTS AND FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the following FRP Products & Fabrications:

1. FRP Pultruded Gratings and Treads
2. FRP Structural Shapes and Plate
3. FRP Standard Railings
4. Molded Gratings and Treads

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals governed by this section necessary to install the fiberglass reinforced polymer (FRP) products as specified in the contract documents.

1.03 QUALITY ASSURANCE

A. The material covered by these specifications shall be furnished by an ISO-9001 certified manufacturer of proven ability who is regularly engaged in the manufacture, fabrication and installation of FRP systems.

1.04 DESIGN CRITERIA

- A. Design live loads of FRP gratings and floor panels shall not be less than 100 PSF uniformly distributed unless specifically stated otherwise in drawings. Grating and floor panel deflection at the center of a simple span not to exceed 0.25".
- B. Structural members shall be sized to support all applied loads. Deflection in any direction shall not be more than L/180 of span for structural members unless specifically stated otherwise in drawings and/or supplementary conditions. Connections shall be designed to transfer the loads.
- C. Temperature exposure is limited to 100°F unless specifically stated otherwise in drawings and/or supplementary conditions.

1.05 SUBMITTALS

- A. The FRP stair, platform and support members shall be designed by Florida registered PE utilizing the design criteria above and submit the signed and sealed calculations to the Owner for approval.
- B. Shop drawings of all fabricated pultruded gratings and treads, structural shapes and plate, standard railings, molded gratings and treads and appurtenances shall be submitted to the Owner for approval. Fabrication shall not start until receipt of Owner's approval.

- C. Manufacturer's catalog data showing:
 - 1. Materials of construction
 - 2. Dimensions, spacings, and construction of grating, handrails and building panels.
- D. Detail shop drawings showing:
 - 1. Dimensions
 - 2. Sectional assembly
 - 3. Location and identification mark
 - 4. Size and type of supporting frames required

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials used in the manufacture of the FRP products shall be raw materials in conformance with the specification and certified as meeting the manufacturer's approved list of raw materials.
- B. The visual quality of the pultruded shapes shall conform to ASTM D4385.
- C. With the exception of molded gratings and treads, all FRP products noted shall be manufactured using a pultruded process utilizing vinyl ester resin with flame retardant and ultraviolet (UV) inhibitor additives. A synthetic surface veil fabric shall encase the glass reinforcement. FRP shapes shall achieve a flame spread rating of 25 or less in accordance with ASTM test method E-84, the flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM D635. (Polyester resin is available without flame retardant and UV inhibitor additives.)
- D. All cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating.
- E. Should additional ultraviolet protection be required, a one mil minimum UV coating can be applied.
- F. All exposed surfaces shall be smooth and true to form, consistent with ASTM D4385.

2.02 PULTRUDED GRATINGS AND TREADS

- A. Grating shall be DURADEK® or DURAGRID® as manufactured by Strongwell or approved equal.
- B. The panels shall sustain a deflection of no more than 0.25" under a uniform distributed load of 100 PSF for the span lengths shown on the plans. See Strongwell's Fiberglass Grating brochure for a list of available sizes.

- C. Stair treads shall be capable of withstanding a uniform load of 100 PSF or a concentrated load of 300 lbs. on an area of 4 sq. inches located in the center of the tread, whichever produces greater stress and deflect less than 0.25".
- D. The top surface of all panels, gratings, and treads shall have a non-skid grit affixed to the surface by an epoxy resin followed by a top coat of epoxy resin.
- E. Hold down clamps shall be type 316L stainless steel clips. Use 2 at each support with a minimum of 4 per panel.
- F. Color shall be high visibility yellow or grey.
- G. All shapes and fabrications that are to be exposed to UV shall be coated with polyurethane coating of a minimum thickness of 1 mil.
- H. The FRP grating and stair treads shall be fabricated from bearing bars and cross rods manufactured by the pultrusion process. The glass fiber reinforcement for the bearing bars shall be a core of continuous glass strand rovings wrapped with continuous strand glass mat. A synthetic surface veil fabric shall encase the glass reinforcement.

2.03 FABRICATION OF STANDARD RAILING SYSTEM

- A. The fiberglass standard railing system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube using molded or pultruded components; epoxy bonded and connected as shown in the fabrication details. Railing sections shall be fabricated to the size shown on the approved fabrication drawings and shall be piece marked with a water proof tag.
- B. For Side Mount
 - 1. Post shall be constructed with a pultruded bottom plug. Length shall be sufficient to extend a minimum of 1" beyond the uppermost bolt hole to prevent crushing of post tubing. Bolt holes shall provide clearance of 1/16" for 1/2" diameter bolts/studs. On square tubes, holes shall be on longitudinal center line of post, 1" from bottom of post (minimum) and not less than 3" apart on center. Posts shall be fastened with stainless steel anchor bolts or studs, 1/2" diameter.
 - 2. Post locations shall be no greater than 18", nor less than 9" from horizontal or vertical change in handrail direction. For square tubes, post centers shall be no greater than 72" apart on any straight run or rail, or 48" apart on any inclined rail section.
- C. Other Attachment Methods
 - 1. Base mount, embedded and removable are also types of mounting procedures for railing. Design and calculations must be signed and sealed by a licensed Structural Engineer in the State of Florida and submitted to the Owner for approval.

D. Installation of Handrail Sections

1. The fabricated railing sections shall be supplied complete with fittings by the FRP manufacturer. The components used to join fabricated sections together may be shipped loose, to be epoxied and riveted, if required, together, if required in the field by the contractor.
2. The fabricated handrail sections shall be installed as shown on the approved shop drawings. The handrail sections shall be accurately located, erected plumb and level. The sections shall be fastened to the structure as shown on the approved shop drawings.

E. Approved Fabricators

1. Strongwell or approved equal.

2.04 MOLDED GRATING AND TREADS:

A. Grating shall be DURAGRATE® as supplied by Strongwell or approved equal.

B. Design

1. The grating shall be one piece construction with the tops of the bearing bars and cross bars in the same plane.
2. The mesh pattern and thickness shall be: (selected pattern and thickness shown on the drawings)
 - a. 3/4" square mesh, 1-1/2" thick
 - b. 1-1/2" square mesh, 1" thick
 - c. 1-1/2" square mesh, 1-1/2" thick
 - d. 2" square mesh, 2" thick
 - e. 1" x 4" rectangular mesh, 1" thick
 - f. 1-1/2" x 6" rectangular mesh, 1-1/2" thick
3. The standard resin systems and colors are: vinyl ester (high visibility yellow or grey).

C. Products

1. The FRP molded grating and treads shall be manufactured by the open mold process.
2. Molded stair treads shall be 1-1/2" thick in a 1-1/2" x 6" rectangular mesh pattern. The resin system will be the same as the molded grating. The stair tread shall come complete with anti-slip nosing.
3. Hold down clamps shall be:
 - a. Type M clips for attaching grating to supports
 - b. Type J clips for attaching grating to supports for moderate loads
4. Grating with cover plate
 - a. Grating shall be the same as described above in this section.

5. The cover plate for molded grating shall be an integrally molded plate as manufactured by Strongwell or approved equal.
 - a. The integrally molded plate may use the same resin as the grating.
 - b. The integrally molded plate shall be bonded to the grating, and a non-skid grit shall be affixed to the top surface of the assembly.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors.
- B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.
- C. Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.

END OF SECTION

SECTION 07411 - METAL ROOF PANELS

PART GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Roof panels.
2. Accessories.
3. Flashing and trim.

1.02 RELATED WORK

A. Section 07920, "Joint Sealants".

1.03 QUALITY ASSURANCE

A. Reference Standards:

1. Comply with the Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
2. Florida Building Code.
3. Install and fasten sheet metal work in compliance with Factory Mutual (FM) I-90 wind uplift requirements.

B. Coordination: Coordinate application of flashings with applications of roofing, protruding materials and roof accessories, including piping, conduits, lightning protection system, blocking, nailers, parapets, scuppers, etc. in such a manner that complete installation is weathertight and in accordance with the specified warranty requirements.

C. Manufacturer Qualifications: A firm experienced in manufacturing metal roofing systems similar to those indicated for this Project and with a record of successful in-service performance.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide a complete, integrated set of metal roof panel manufacturer's standard mutually dependent components and assemblies that form a system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water. Include roof panels, trims and accessories complying with requirements indicated.

B. Design Loads: As indicated on the structural drawings.

C. Thermal Movements: Provide metal roof systems that allow for thermal movements resulting from maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

D. Wind-Uplift Resistance: As indicated on the structural drawings.

1.05 SUBMITTALS

- A. Product Data: For each type of metal roofing system component indicated.
- B. Shop Drawings: Include sections, details, panel layout, and attachments to other Work.
- C. Structural analysis: Include structural analysis of roof panel and its attachment to roof deck certifying its capability to withstand the indicated loads and uplift requirements, signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Coordination drawings: Drawn to scale and coordinating metal roof panel installation with penetrations.
- E. Samples: For the following, in the profile and style indicated:
 - 1. Roof panels.
 - 2. Trim, closures, and accessories.
- F. Manufacturer certificate.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof and wall panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.07 WARRANTY

- A. Special Warranty on Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace roof and wall panels that fail in materials or workmanship within 1 year from date of Substantial Completion.
- B. Special Warranty on Roof Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- C. Special Warranty on Standing-Seam Roof Panel Weathertightness: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam roof panel assemblies that fail to remain weathertight within 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ultra Seam Incorporated

2. MBCI
3. Star Building Systems.
4. American Buildings Company.
5. Ceco Building Systems.

2.02 ROOF PANEL

- A. Basis of Design: US-200 (18" coverage, embossed) as manufactured by Ultra Seam Incorporated.
- B. Standing-Seam, Vertical-Rib Roof Panels: Fabricate flat-pan panels from galvalume sheets prepainted with coil coating, factory formed to provide 18-inch coverage. Fabricate with 2" high vertical ribs at panel edges. Design panels for mechanical attachment to roof deck using concealed clips in side laps. Apply sealant at each interlocking joint.
 1. Material: Galvalume
 2. Metal Thickness: 24 gauge
 3. Clip System: Floating to accommodate thermal movement.
 4. Finish: 70% Polyvinylidene fluoride (Kynar 500) Standard color 20 year coating
 5. Color: As selected by architect. 2 colors may be selected
- C. Roof Panel Accessories: Provide components required for a complete roof panel assembly including transitional rib caps, trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of roof panels, unless otherwise indicated.

2.03 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer. Provide sheet metal accessories of same material and in same finish as roof panels, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of roof sheets by means of plastic caps or factory-applied coating.
 1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- C. Flashing and Trim: Form from minimum 24 gauge, (unless otherwise noted) galvalume prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent roof panels..

1. Fabricate eave drip trim to profile and detail indicated, in not over 10 foot sections with minimum 6-inch lap joints.
- D. Spring Action Flashing: Basis of Design- Fry Springlok Flashing
- E. Closures: Closed-cell, laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- F. Sill pan flashing: Form from 24 gauge, galvalume sheet prepainted with coil coating in single lengths, complete with back and end returns turning up ½” and sealed tight to form a pan. Front edge turned down 1” and hemmed. Sill pan flashings shall be in color selected by architect and may be a different color than the roof panels.
- G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

PART 3 EXECUTION

3.01 ROOF PANEL INSTALLATION

- A. Standing-Seam Roof Panels: Fasten roof panels to deck with concealed clips at each standing-seam joint. Install clips at location and spacing determined by manufacturer.
1. Install clips to supports with self-drilling fasteners.
 2. Crimp standing seams with manufacturer-approved motorized seamer tool so clip, panel, and factory-applied side-lap sealant are completely engaged.
 3. At panel splices, nest panels with minimum 6-inch (150-mm) end lap, sealed with butyl sealant and fastened together by interlocking clamping plates.

3.02 ACCESSORY INSTALLATION

- A. General: Install gutters, downspouts, and other accessories with positive anchorage to building and weather tight mounting. Coordinate installation with flashings and other components.
- B. Cleats: Whenever possible, secure metal by means of continuous cleats. Lock cleat into seam of sheet metal work.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion of metal units; conceal fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection.

- E. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
- F. Provide elbow at base of downspout to direct water away from building.
- G. Pipe Flashing: Form flashing around pipe penetration and roof panels. Fasten and seal to roof panel as recommended by manufacturer.

3.03 CLEANING AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean, prepare, and prime or reprime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates.
 - 1. Apply compatible primer of same type as shop primer used on adjacent surfaces.
- B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- C. Roof Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.
 - 1. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07920 SEALANTS AND CAULKING

PART 1 GENERAL

1.01 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are reread to in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM) Publications: C 920-79 Elastomeric Joint Sealants

1.02 SUBMITTALS

- A. Division 01 - General Requirements
- B. Certificates of Conformance or Compliance: Submit certificates from the manufacturers attesting that materials meet the specified requirements.
- C. Manufacturer's Descriptive Data: Submit complete descriptive data for each type of material. Clearly mark data to indicate the type the Contractor intends to provide. Data shall state conformance to specified requirements. Data for sealant and calking shall include application instructions, shelf life, mixing instructions for multicomponent sealants, and recommend cleaning solvents.

1.03 DELIVERY AND STORAGE

- A. Deliver materials to the job site in the manufacturers' external shipping containers, unopened, with brand names, date of manufacture, and material designation clearly marked thereon. Containers of elastomeric sealant shall be labeled as to type, class, grade, and use. Carefully handle and store all materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 100 degree F or less than 40 degree F.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Subject to compliance with requirements provide products manufactured by single source.

2.02 MATERIALS

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. Products shall conform to the reference documents listed for each use. Color of sealant and calking shall match adjacent surface color unless specified otherwise. For ASTM C 920 sealants, use a sealant that has been tested on the type(s) of substrate to which it will be applied. Interior Calking or Sealant: Provide ASTM C 920, Type M, Grade NS, Class 12.5, Use NT. Color of calking or sealant shall be selected by Owner from manufacturer's full range.
- C. Exterior Sealant: For joints in vertical surfaces, provide ASTM C 920, Type M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type M, Grade P, Class 25, Use T. Color of sealant shall be selected by Owner from manufacturer's full range.
- D. Latex rubber modified, acrylic emulsion polymer sealant compound; manufacturer's standard, one part, nonsag, mildew resistant, acrylic emulsion sealant complying with ASTM C834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent
- E. Floor Joints Sealant: Provide ASTM C-920, Type S or M, Grade P, Class 25, Use T. Color of sealant shall be selected by Owner from manufacturer's standard colors.
- F. Primer for Sealant: Use a non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.
- G. Bond Breakers: Use the type of consistency recommended by the sealant manufacturer for the particular application.
- H. Silicone Joint Sealants: Use Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT
- I. Backstops: Use glass fiber roping or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by the sealant manufacturer. Backstop material shall be compatible with the sealant. Do not use oakum and other types of absorptive materials as backstops.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Surfaces shall be clean, dry to the touch, and free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Where adequate grooves have not been provided, clean out grooves to a depth of ½" and grind to a minimum width of ¼" without damage to the adjoining work. No grinding shall be required on metal surfaces.

- B. Steel Surfaces: Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a solvent that leaves no residue.
- C. Copper or Bronze Surfaces: Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. Use non-staining solvents recommended by the item manufacturer.

3.02 SEALANT PREPARATION

- A. Do not modify the sealant by addition of liquids, solvents, or powders. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

3.03 APPLICATION

- A. Backstops: Where joint cavities are constructed deeper than indicated, tightly pack the back or bottom with backstop material to provide a joint of the depth indicated. Install backstops dry and free of tears or holes.
- B. Primer: Just prior to application of the sealant or calking compound, clean out all loose particles from joints. Apply primer in accordance with compound manufacturer's directions. Do not apply primer to exposed finish surfaces.
- C. Bond Breaker: Provide bond breakers as recommended by the sealant manufacturer for each type of joint and sealant used.
- D. Sealant and Caulking Compounds: Use a compound that is compatible with the material to and against which it is applied. Do not use a compound that has exceeded its shelf life or has become too jelled to be discharged in a continuous flow from the gun. Apply the compound in accordance with the manufacturer's printed instructions. Force the compound into the joints with sufficient pressure to fill the joints solidly. Compound shall be uniformly smooth and free from wrinkles.
- E. Interior Sealant and Caulking: Provide sealant or caulking at all exposed joints in the building and at all joints indicated to receive sealant or caulking.
- F. Exterior Sealant: Provide sealant at all joints around the perimeter of openings and at all exposed joints on the building and at all joints indicated to receive sealant.
- G. Floor Joints Sealants: Provide sealant in all control joints and in other floor joints indicated or specified.
- H. Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated

3.04 PROTECTION AND CLEANING

- A. Protection: Protect areas adjacent to joints from compound smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.
- B. Cleaning: Immediately scrape off fresh compound that has been smeared on masonry and rub clean with a solvent as recommended by the compound manufacturer. Upon completion of compound application, remove all remaining smears and stains resulting therefrom and leave the work in a clean and neat condition.

END OF SECTION

SECTION 08161 FIBERGLASS DOORS & FRAMES

PART 1 GENERAL

1.01 SCOPE AND DEFINITIONS

- A. Furnish and install doors, frames of FRP composite construction in accordance with details and schedule shown on the project drawings and as specified herein. Door and frame products of aluminum, steel or wood constructions that use FRP face sheets are strictly excluded.
- B. FRP is defined as "Fiberglass Reinforced Polyester"

1.02. RELATED SECTIONS

- A. Section 04200 - Masonry
- B. Section 08710 - Door Hardware

1.03 QUALITY ASSURANCE

- A. Referenced Standards
 - 1. American Society for Testing and Materials (ASTM)
 - 2. Society of Automotive Engineers (SAE)
 - 3. International Building Code, Plastics (Chapter 26)
 - 4. UL Standards for Safety UL10B / UL10C, UBC 7-2
 - 5. ANSI A250.4 1,000,000 cycle test
- B. Experience: Manufacturer shall be engaged in the manufacture of FRP door and frame systems for a minimum of twenty five (25) years documented experience prior to the start of this work, and who has a history of successful production acceptable to the Architect.
- C. Referenced Standard: Where labeled fire doors are required, Fiberglass Doors and frames shall be UL listed and shall be tested successfully to UL10B / UL10C, UBC 7-2 standards.
- D. Process: Certify that FRP doors are manufactured via press-molding technology.
- E. Warranty: Provide written limited guarantee for FRP doors and frames as follows:
 - 1. Chem-Pruf P-Series Hurricane doors are guaranteed for the life of the product against delamination and failure due to corrosion from the specific chemical environment named at the time of purchase. Furthermore, all products are inspected prior to shipment and guaranteed against defective workmanship for a period of ten (10) calendar years after the date of purchase.

1.04 SUBMITTALS

- A. Product Data: Provide catalog cut of FRP door detailing internal construction and reinforcements, materials used and description of molding process.
- B. Shop Drawings: To include the following specific information:

1. Specifications relating to FRP door thickness, resin type, core material, method of construction, finish color, type of glass and glazing, anchor systems, joint construction and complete warranty information.
 2. Complete schedules or drawings of FRP doors and frames (and associated Builders Hardware) showing identifying mark numbers, door and frame types, typical elevations, nominal sizes, handing, actual dimensions and clearances, and required hardware preps and reinforcements.
 3. Supporting reference drawings pertaining to frame mounting details, door lite or louver installation, hardware locations, and factory hardware cutouts and reinforcements.
- C. Color Samples: Provide a complete set of available finish colors from the manufacturer for color selection upon request.
- D. Installation instructions: Include manufacturer's specific information describing procedures, sequence and required fasteners for frame and door installation.
- E. Production of FRP doors and frames shall not proceed until final approval of submittals and all necessary manufacturing information is received from customer.

1.05 DELIVERY, STORAGE AND HANDLING

- A. FRP doors and frames are to be delivered to jobsite in adequate crating with foam sheet separations between all components.
- B. Upon receipt of shipment, remove and inspect the doors and frames for damage. Note any damage on the shipping papers prior to accepting. If there is any noted (visible or concealed) damage, notify Chem-Pruf at 1-800-444-6924, immediately.
- C. Handling and storage of the doors and frames after receipt is the responsibility/liability of the customer. It is recommended that the doors be stored indoors in a vertical position, clear of the floor, with blocking between the doors to permit air circulation between the doors and prevent damage to the door faces. Rain/water or condensation must not be allowed to collect or lay between stored doors. Do not wrap in plastic sheeting as it will promote condensation formation within. Permanent discoloration can result. Failure to comply with the receiving and reporting instructions shall void the Chem-Pruf warranty.
- D. Use care in handling FRP doors and frames to prevent damage to factory finishes. Wear protective gloves and do not slide or drag doors or frames against one another.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. FRP Doors and Frames shall be as manufactured by Chem-Pruf, 5224 FM 802 Brownsville, TX 78521 ph: 800.444.6924 Website: www.chem-pruf.com

2.02

DOORS

A. Hurricane Rated FRP Doors

1. Design: FRP doors shall be of seamless press-molded construction. Laminated FRP face sheets shall be applied while wet and uncured to an internal door stile and rail subframe/core assembly and then press-molded under heat and pressure. The composite door panel must be integrally fused over its entire surface area, not just adhesive-bonded at perimeter stiles and rails. Doors shall remain under pressure during curing for flat, warp-free surfaces.
2. Stiles & Rails: A high-modulus pultruded FRP square or rectangular tube subframe is to be provided within the door. Tubes are to be mitered and joined internally at the corners with solid polymer blocks to yield a one-piece unit that does not require any secondary external sealing. Provide a tubular midrail across width of door at lock height, and additional horizontal rails where specific design conditions dictate. Doors shall incorporate molded-in FRP edge strips, chemically bonded to the subframe stiles, for machining of hardware mortises so as not to cut or otherwise compromise the integrity of the pultruded stiles, nor allow moisture to penetrate into the core of the door. All connections shall be chemically welded. No mechanical fasteners will be allowed. The use or inclusion of aluminum, steel, gypsum or wood into stile and rail construction is not permitted.
3. Core: For maximum rigidity and compressive strength a triangular shaped 3/8" cell phenolic resin impregnated kraft paper honeycomb core shall be used. Molding pressure and resin gel time shall be sufficient to allow for penetration of resin into the cellular structure of the core to maximize shear and peel strengths at the skin/core interface and eliminate the possibility of delamination. The honeycomb is to be completely enclosed within the stile and rail subframe. Use of foam or balsa wood is not permitted.
4. Internal Reinforcement: High-modulus pultruded tubular FRP, high-density polymer compression blocks, or plastic compression blocking at all hardware locations, and corner locations. No wood blocking, steel or aluminum reinforcing plates, ribs or fittings shall be used. A minimum of 900 lbs of pullout strength is required for each factory supplied hinge screw.
5. Faces: Door facings shall utilize a chemical resistant thermosetting polyester resin system with fiber reinforcing layers. Supplier shall furnish door faces as shown on the drawings and in the door elevations. Chopped strand mat layers shall be used to provide bond integrity between gelcoat, laminated facings and the internal door structure. Structural reinforcement shall be in the form of a knitted multi-layer material with layers of uni-directional glass fiber oriented in both the vertical and horizontal directions for high stiffness, impact resistance and resistance to warping. Gelcoat surface integrally molded to be 25/30 mils thick (wet) ultra-violet light stabilized marine grade NPG-isophthalic polyester gelcoat.

6. Finish: The exposed FRP door faces shall have a 3-4 mils (wet) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Coating shall have a minimum hardness of H to 2H. Finish shall be a slightly textured semi-gloss to minimize the visual effects of wear and tear.
7. Astragals: All pairs of doors shall be furnished with an astragal from door manufacturer made of same pultruded FRP material as door stile, rail and edge as required. Astragal shall be located on the meeting stile edge of each inactive leaf of double door pairs Architect shall advise active leaf of door, and astragal shall be installed to cover meeting stile gap to effect seal and security.
8. Lites: Glass required shall be factory furnished, glazed and installed. Glass supplied shall be that as required to maintain Hurricane and Impact ratings as tested. Centered glazing shall be installed between 45 degree pultruded FRP glazing stops and vinyl foam tape with concealed compression retainers. No exposed fasteners or exposed silicone will be allowed for securing glazing. Metal, pvc, or vinyl "Glass Kit" type lights are not acceptable for hurricane rated openings.
9. Raised panels and plants: All doors shown in elevation to have raised panels or plants shall be equipped with plants in configuration as shown on plans and in door schedule. Plants shall be applied by the door manufacturer as an integral part of the door face. Plants shall be bonded to the door skin; no mechanical fasters shall be permitted. All applied moldings shall be of resin material, and shall be installed by the manufacturer to resemble a raised panel door. Field applied plants or moldings shall not be acceptable.
10. Provisions for lites and louvers shall be performed during manufacture and shall not be attempted in the field. Cutouts are to be totally enclosed by pultruded FRP stiles and rails incorporated into the door structure. Lite cutouts that expose core material are not acceptable.

2.03 FRP FRAMES

A. Hurricane Rated FRP Frames:

1. Design: FRP Door frames furnished under this specification shall utilize a high-modulus pultruded structural FRP shape. The frame section shall be standard double rabbeted 5-3/4" deep x 2" face, 3/16" thick, with integral 5/8" doorstop, to match typical hollow metal configurations. Additional jamb profiles and widths are available.
2. Corner Joints: Frame jambs and header shall be joined at corners via miter connections with hidden FRP angle clips and associated fasteners. Post and beam corners will not be acceptable.
3. Hardware Reinforcements: FRP reinforcing shall be chemically welded to door frame material at required locations. Minimum screw pullout strength of 1100 lb per #12 x 1-1/4" sheet metal screw is required. Mechanically fastened reinforcements are not permitted.
4. Anchors:

- a. BOLT-IN: Provide manufacturer's required number of 3/8" diameter x 4" long flat head stainless steel sleeve anchors for masonry openings, 3/8" diameter x 4" machine screw with nut and washers for structural steel openings, #14 x 4" stainless steel flat head sheet metal screws for wood or steel stud openings. Include extra anchors for additional frame height in two foot increments above 8'-0". Provide single bolt anchor at center of all headers over four feet in nominal width. Stainless Steel fasteners shall be furnished by the factory.
 - b. GROUT-IN: Provide manufacturer's required number of wire or strap type masonry anchors for installation into block wall. Fill frame cavity with grout.
5. Finish: Frames shall have a 3-4 mils (wet) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Industrial urethane chemical coating color topcoat, to match the color and sheen of the doors, for superior weatherability. Gelcoat may not be sprayed onto the frame as a secondary coating.

2.04 MECHANICAL PROPERTIES AND TEST PERFORMANCE

- A. Pultruded structural shapes for stiles; rails, frames, and astragals shall exhibit the following minimum longitudinal coupon properties (per ASTM):
- 1. Tensile strength (D638) 30,000 psi
 - 2. Comprehensive strength (D695) 30,000 psi
 - 3. Flexural strength (D790) 30,000 psi
 - 4. Flexural modulus (D790) 1,600,000 psi
 - 5. Shear strength (D2846) 4,500 psi
 - 6. Impact, notched (D256) 25 ft-lb/in
 - 7. Barcol hardness (D2853) 50
- B. Core material shall exhibit the following minimum coupon properties (per ASTM):
- 1. Core material must comply with the International Building Code (IBC) chapter 26 requirements for use with a plastic skin.
 - 2. Shear strength, longitudinal direction (C273) 68.2 psi
 - 3. Shear strength, transverse direction (C273) 25.8 psi
 - 4. Shear modulus, longitudinal direction (C273) 6940 psi
 - 5. Shear modulus, transverse direction (C273) 1878 psi
 - 6. Shear elongation, longitudinal direction (C393 short beam) 1.79%
 - 7. Shear elongation, transverse direction (C393 short beam) 2.72%
 - 8. Maximum facing stress, longitudinal direction (C393 short beam) 735 psi
 - 9. Maximum facing stress, transverse direction (C393 short beam) 289 psi
 - 10. Maximum core shear stress, longitudinal direction (C393 short beam) 63.8 psi
 - 11. Maximum core shear stress, transverse direction (C393 short beam) 24.9 psi

12. Modulus of elasticity (EI) per 1" width, longitudinal direction (C393 short beam) 4.92E+04 psi
13. Modulus of elasticity (EI) per 1" width, transverse direction (C393 short beam) 1.97E+04 psi
14. Maximum facing stress, longitudinal direction (C393 long beam) 9011 psi
15. Maximum facing stress, transverse direction (C393 long beam) 4727 psi
16. Maximum core shear stress, longitudinal direction (C393 long beam) 48.3 psi
17. Maximum core shear stress, transverse direction (C393 long beam) 23.5psi
18. Modulus of elasticity (EI) per 1" width, longitudinal direction (C393 long beam) 1.14E+05 psi
19. Modulus of elasticity (EI) per 1" width, transverse direction (C393 long beam) 7.23E+05 psi
20. Stiffness "D", longitudinal direction (C393 long beam) 379,270 psi
21. Stiffness "D", longitudinal direction (C393 long beam) 260,608 psi
22. Compressive strength (C365) 53 psi
23. Compressive modulus (C365) 2110 psi
24. Density (C271) 2.42 lb/ft³

C. Adhesive shall exhibit the following minimum coupon properties (per SAE)

1. Tensile Strength (D882-83A modified) minimum 2000 psi
2. 8 day 25° C at 100% humidity Cross Peel (SAE J1553) minimum 330 psi
3. 7 day immersion in seawater Cross Peel (SAE J1553) minimum 330 psi
4. 30 day immersion in saltwater Cross Peel (SAE J1553) minimum 330 psi
5. 72 hour immersion in gasoline Cross Peel (SAE J1553) minimum 330 psi
6. 72 hour immersion in 20% sulfuric acid Cross Peel (SAE J1553) minimum 300 psi

D. ANSI A250.4 1,000,000 cycle test

1. 4' x 8' door (up to a full lite) and frame successfully tested in excess of 1,000,000 cycles with no failure of any of the design features of the door or frame.

E. Doors and Frames shall exhibit the following minimum properties:

1. ASTM E 283-91(99), "Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen."
2. ASTM E 331-00, "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference."
3. ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Window, Doors Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
4. AAMA 1304-02, Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.

5. ASTM E1886-02, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
6. ASTM E1996-02, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.
7. ANSI/SDI A250.13-03, Testing and Rating of Severe Windstorm Components for Swinging Door Assemblies, Section 8.2 Stiffness Classification.

2.05 FASTENERS

- A. All fasteners for all hardware shall be type 304 CRSS (18-8 series corrosion resistant stainless steel) with no exception. No carbon steel or aluminum components shall be used.

2.06 HARDWARE

- A. Doors shall be factory mortised and drilled for mortise template butt hinges, with #12x3" long stainless steel screws for hinge attachment. Provide 161 cylindrical lock bore, rim deadbolt, ANSI 86 mortise lock edge prep and pocket or flush bolt cutouts as required. Hardware used must meet the configuration tested for compliance.
- B. Frames shall be factory machined and drilled for all hardware requiring mortises, with #12x1-1/4" long stainless steel screws for hinge attachment.
- C. Hardware shall be furnished as listed in section 08 70 00 or as so designated in appropriate section, and shall be coordinated by GC and installed by experienced mechanics.
- D. Supplier shall furnish manufacturer's standard templates, installation instructions, or full size approved door and frame preparation instructions as approved by the architect and as required by door and frame manufacturer prior to door and frame factory initiated manufacture. Standard factory lead-time for production of FRP doors and frames shall commence only and when all distributors required preparation information is received and acknowledged by the door and frame manufacturer.

PART 3 EXECUTION

3.01 IDENTIFICATION

- A. Factory mark all doors and frames using a chemical resistant plastic tag or indelible marker with identifying number, keyed to shop drawings, prior to shipment.

3.02 INSTALLATION

- A. Frames: Install in strict accordance with manufacturer's printed instructions. Set plumb and square, using shims for bolt-in of existing openings, or wood bracing

prior to grouting of jambs. Use at least two 2x6 wood spreaders inside frame to maintain critical opening dimensions during grouting.

- B. Doors: Hang per manufacturer's printed instructions using special screws provided for hinge attachment. Install doors to swing freely and to stand open at any angle. After installation make final adjustments to hardware to allow for proper door operation and latching. All surface applied hardware shall be thru bolted.

3.03 CLEANING

- A. Clean exposed surfaces of FRP doors and frames with a mild, non-abrasive cleaner and water.

END OF SECTION

SECTION 08710 - DOOR HARDWARE

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Acceptable Designs: Specified products and their manufacturers establish acceptable design, material, type, grade, size, function and finish of hardware items required. Do not substitute other products, except with Engineer's acceptance.
- B. Manufacturer: Obtain each kind of hardware latch and locksets, hinges, closers from only one (1) manufacturer, although several may be indicated as offering products complying with the manufacturer's requirements.
- C. Supplier: The hardware supplier shall be a full member of the Society of Architectural Hardware Consultants and shall be available during normal working hours during the course of the project for hardware consultation to the Owner, Engineer, and Contractor.

1.02 SUBMITTALS

- A. Product Data: Submit in accordance with the requirements of Section 01300, Submittals. Include installation and maintenance instructions for operating parts and finish. Transmit copy of applicable data to Installer.
- B. Certificates: Any hardware that is furnished other than that scheduled on the drawings shall have manufacturer's certificates certifying that the hardware meets this specification submitting the hardware shop drawings.
- C. Hardware Schedule: Submit final hardware schedule in the manner and format indicated below. Hardware schedules are intended for coordination of work.
 - 1. Organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening, including:
 - a) Type, style, function, size and finish of each hardware item.
 - b) Name and manufacturer of each item.
 - c) Fastenings and other pertinent information.
 - d) Location of hard set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e) Explanation of all abbreviations, symbols, code, etc. contained in schedule.
 - f) Mounting locations for hardware.
 - g) Door and frame sizes and materials.
 - 2. Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work, e.g. hollow metal frames, which is critical in the project construction schedule.
 - 3. Include product data, samples, shop drawings of other work affected by builder's hardware, and other information essential to the coordinated review of hardware schedule.

4. Templates: Furnish for the installation of all hardware and to the manufacturer of related equipment for his preparation of that equipment for all hardware that must be attached thereto. Templates shall also be furnished to the manufacturer of wood doors for use on all wood doors that are factory fitting and factory machined for hardware.
- D. Keying Schedule: Submit separate detail schedule indicating clearly how the Owner's final instruction on keying of locks has been fulfilled. Prior to submittal blank key schedule to be completed by maintenance personnel.
- E. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of builder's hardware, submit one (1) sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.

1.03 JOB CONDITIONS

- A. Coordinate hardware with other work. Tag each item or package separately with identification related to the final hardware schedule. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper location shop or project site for installation.
- B. Packing and Marking: Package each item of hardware separately in individual containers, complete with necessary screws, keys, instructions and installation templates for spotting mortising tools. Mark each container with item's number corresponding to number shown on hardware supplier's schedule and properly tag each cylinder's key.
- C. Provide secure lock-up for hardware delivered to the project but not the installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation.
- D. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that adequate provisions are made for the proper installation of hardware.
- E. Inspection of Hardware and Installation: The hardware supplier shall visit the project when the hardware is delivered and check it before it is installed. He shall visit the project again after all the hardware has been installed and shall notify the Engineer if there is any hardware that has not been installed correctly. Contractor and supplier shall furnish Engineer with written certification to this effect. After the hardware is installed, the hardware supplier shall meet with the Owner or his representative and explain the functions, uses, and maintenance of all types of hardware installed. The Contractor shall turn over to the Owner, after completion of the work, all tools, wrenches and templates that come packaged with the hardware for the Owner's use in servicing the hardware. The hardware supplier

shall adjust the door closers for proper operation with particular attention being given to final operation of the air conditioning, heating and ventilating system.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Acceptable Manufacturers:

1. Hinges: Hager, McKinney, Stanley
2. Continuous Gear Hinges: McKinney, Zero, Select
3. Cylinders: Best, Corbin Russwin, Sargent
4. Door Closers: RYOBI, LCN, Sargent
5. Locks, Latches: Best, Corbin Russwin, Sargent
6. Silencers, Stops & Flush Bolts: Baldwin, Ives, Rockwood
7. Kick Plates, & Misc.: Baldwin, Ives, Rockwood
8. Weatherstrip: National Guard, Pemko, Zero
9. Push/Pulls: Baldwin, Ives, Rockwood
10. Exit Devices: Precision, Sargent, Von Duprin
11. Thresholds: National Guard, Pemko, Zero
12. Overhead Stops/holders: ABH, Glynn-Johnson, Rixson

2.02 MATERIALS, FABRICATION AND FINISHES

A. General:

1. Manufacturer's Name Plate: Do not use products which have manufacturer's name or trade name displayed in a visible location except in conjunction with required UL labels.
2. Unless otherwise noted, exposed hardware items shall receive satin stainless steel finish.
3. Furnish screws of type as required for substrates indicated with each hardware item. Finish exposed screws to match the hardware finish or, if exposed in surfaces of other work, to match the finishes of such other work as closely as possible.
4. Unless otherwise noted, provide concealed fasteners for hardware units that are exposed when door is closed. Where fasteners must remain exposed when door is closed, provide vandal resistant fasteners.
5. Finish shall be as scheduled. Dull Chrome [US26D], Dull Stainless Steel [US32D] Aluminum Lacquer [AL], Extruded Aluminum [Alum] and Prime Coat [USP] as listed.
6. Tools for maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance and removal and replacement of builder's hardware.
7. Hardware Operation: Force required to activate door hardware shall be not greater than 5 lbf.
8. Door Opening Force: Maximum force for pushing or pulling open a door shall comply with this paragraph. For hinged doors, the force shall be applied perpendicular to the door at the door opener or 30 inches from the hinged side whichever is farther from the hinge.

- a) Exterior hinged doors shall not exceed 8.5 lbf. Slight increases in opening force shall be allowed where 8.5 lbf. is insufficient to compensate for air pressure differentials.
- B. Hinges:
1. Provide template-produced hinges complying with ANSI A156.1.
 2. Provide stainless steel pins, non-removable type for exterior doors and non-rising types for interior doors. Pins shall have flat button ends finished to match hinge leaves.
 3. Hinges shall be full-mortised, 4½" x 4½" unless otherwise noted; five knuckle ball bearing type, heavy duty rated.
- C. Lock Cylinders and Keying:
1. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.
 2. Equip locks with manufacturer's construction master key feature that permits voiding of construction keys without cylinder removal.
 3. Comply with the Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
 4. Key Material: Provide keys of nickel silver only.
 5. Permanently inscribe each key with number or lock that identifies cylinder manufacturer's key symbol.
 6. Keying: Establish a new Masterkey System as directed by the Owner. Furnish four (4) Masterkeys, three (3) keys per lock.
- D. Locks and Latches:
1. Strikes: Except as otherwise indicated or specified, provide manufacturer's standard wrought box strike for each latch or lock bolt with curved lip extended to protect frame, finished to match hardware set.
 2. Handles and knobs: Provide manufacturer's lever handle set complete with stem, roses and trim unless otherwise noted.
 3. Lock throw: Provide 1/2" minimum throw on doors.
- E. Exit Devices: Exit devices shall be as scheduled with no substitutes accepted. Exit devices shall comply with ANSI Standard 156.3 Grade 1 modified as follows:
1. The devices shall be "touchpad" type with touchpad that shall extend a minimum of ½ of the door width.
 2. Devices should have a ¼" gap between the face of the door and the touchbar unit, eliminating the need for shims or cutting away the glass moulding.
 3. Lock stile chassis shall be cast bronze. Stamped steel units will not be accepted. All device latchbolts shall be extruded bronze and, where used in vertical rod devices, shall be deadlocking type.
 4. Device strikes shall be investment cast stainless steel.

5. Device end cap shall be all metal and secured with a bracket that completely inserts into device housing.
6. All outside device trim shall be cast or forged brass full escutcheon. Lever trim shall be "vandal resistant" with substantial resistance to rotation when locked.
7. All vertical rod devices shall be concealed and have "latch retraction" hold back.
8. Devices must be convertible from one function to another simply by exchanging back plate assembly in lock stile case and selecting proper outside trim.
9. Device shall be secured to the door with sex bolts and through bolting at both ends.
10. All devices shall be UL approved for all types and functions indicated in the Hardware Schedule.
11. Devices shall have published three (3) year warranty.
12. All exit devices shall be by the same manufacturer.
13. Mullions shall be "keyed removable" type with only a key required for take down. No key or tools shall be required to reinstall. Mullions shall be by the same manufacturer as the exit devices.

F. Closers: Shall be as scheduled.

1. Closer shall be non-handed and adjustable.
2. Closer shall have R14 high silicone aluminum alloy cylinder body with 1 ½" steel piston.
3. Closer shall have ten (10) year warranty.
4. Closer shall have all season fluid to eliminate seasonal adjustment.
5. All closers mounted parallel arm shall have EDA arm.

G. Overhead Stops/Holders: Shall be as scheduled - No Sub.

1. Units shall have metal/plated end plugs.
2. Units mounting screws shall be designed so that they go through housing and end plug.
3. Units shall have metal slide.
4. All stops shall be by same manufacturer.

H. Silencers, Stops & Flush Bolts: Shall be as scheduled.

1. Silencers: Provide plug-type silencers in all metal door frames unless continuous bumper-type weather-stripping is shown or specified. Provide three (3) silencer units in door frames.
2. All Stops, wall and floor shall be by the same manufacturer.
3. Flush bolts shall have ¾" throw with 2" vertical adjustment. Shall have override feature and stainless-steel cams and rub plates. All flush bolts shall be by the same manufacturer.

- I. Door Stripping and Seals: Unless otherwise indicated, provide full-length weather-stripping at each edge of every exterior swing door leaf. All weather-stripping to be by same manufacturer.
- J. Thresholds: Extruded aluminum, smooth commercial mill finish, grooved tread, 4" minimum tread by full door width. Thickness of threshold shall be 0.5" at primary tread surfaces, 0.1875" for secondary tread surfaces, and 0.125" for concealed flanges and legs.
- K. Kick Plates, Mop Plates and Armor Plates: .050 material sized as follows:
 - 1. Kick Plates: 8 x 2 LDW

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Properly tag, index and file all keys until turned over to the Owner. Apply hardware in accordance with templates and manufacturer's instructions; mortise and fit accurately; apply securely and adjust carefully.
 - 1. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by DHI, except where shown otherwise on drawings.
 - 2. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate.
 - 3. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
 - 4. Exercise care not to injure work when applying hardware. Review shop drawings and Contract Drawings for proper location. Cover door hardware with a heavy cloth until painting is completed. At completion of the work, examine doors and hardware, adjust as required and leave hardware in proper working order, free from defects.
 - 5. At all times, be responsible for the distribution of keys for hardware installed during construction, and cause all keys to be returned prior to final completion of the building
- B. Preparation:
 - 1. Do not install finish hardware until the wet trades have been fully completed.
 - 2. Supplier shall mark each item of hardware for location. Protect markings until each item is installed. If any item of hardware is delivered to the Project not properly marked, return it to the supplier for marking before attempting to install it.
 - 3. Install and make necessary adjustments for proper working order. Hardware damaged by improper adjustments or abuse will be rejected.
 - 4. Provide clean, properly sized, and accurately placed mortises and drilled holes for all mortise and surface mounted finish hardware. Use

appropriate jigs, templates and power mortising equipment for the installation of all mortised hardware items.

5. Metal frames to receive hardware items shall be drilled and tapped accurately.
6. Removal for Painting:
 - a) Before painter's finish is applied, remove all finish hardware except prime-coated items.
 - b) After final paint and finish coats are dry, permanently replace and adjust finish hardware for proper operation.

C. Thresholds:

1. Cut and fit threshold to profile door frames, with mitered corners and hairline joints. Screw thresholds to substrate with No. 10 or larger bronze or stainless-steel screws.
2. Set thresholds in a bed of either butyl/rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant.

D. Weatherstrip: Accurately install weatherstrip to the door or frames where scheduled using proper type flush fasteners spaced not over 18" o.c. Installed work shall make continuous contact with the abutting surfaces and shall function for use intended. Adjust seals as required.

E. Mounting Heights: Shall be as follows, measured from finished floor except for top hinge which is measured from door top:

1. Hinges: Per Florida Product Approval Installation Instructions.
2. Locks and latches: 38" operating spindle.
3. Pulls, pull and push plates: 42" center.

3.02 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubricant recommended by manufacturer and graphite-type if no other recommended]. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
- B. Upon completion of the work and before final acceptance, demonstrate that all hardware is in satisfactory working order, that all keys fit in their respective locks and upon acceptance of the work, tag and deliver all keys to the Owner.
- C. Final Adjustment: Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy to make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware

and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

- D. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finish during the final adjustment of hardware.

3.03 SCHEDULE OF HARDWARE

- A. Refer to hardware schedule on architectural schedule sheet.

END OF SECTION

SECTION 9900 - 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 their 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.

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. Owner - The term owner is used to refer to either the owner or an appointed owner's representative such as an engineer, architect, etc.
 - 2. SSPC - The Society for Protective Coatings
 - 3. Exterior - Outside, exposed to weather
 - 4. Interior Dry - Inside, concealed or protected from weather
 - 5. Interior Wet - Inside, subject to immersion services
 - 6. ASTM - American Society of Test Materials
 - 7. NACE - National Association of Corrosion Engineers
 - 8. NSF - National Sanitation Foundation
 - 9. AWWA - American Water Works Association
 - 10. ICRI - International Concrete Restoration Institute
 - 11. NAPF - National Association of Pipe Fitters
 - 12. 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 any coatings applications between the Contractor, the Coating Manufacturer, whose products are to be used, and the Owner. 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 Owner 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 Owner by the Painting Contractor.
- D. It shall be the responsibility of the Coating Manufacturer to have their representative meet in person with the Contractor and Owner before and during the job as a consultant on proper preparation and application of the coating materials unless a meeting is determined to be unnecessary by the Owner.

1.04 SUBMITTALS

- A. Contractor shall submit catalog data and cut sheets for the painting system being used if not the TNEMEC materials specified.

- B. Samples as detailed in 3.01 B shall be submitted regardless of system being used, showing each color to be used.
- C. Hazardous Material Disposal documentation shall be submitted if applicable.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practicable from the compressor.
- B. All equipment for application of the paint and the completion of the work shall be furnished by the Contractor in first-class condition and shall comply with recommendations of the paint manufacturer.
- C. Contractor will make available 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 Owner and Contractor.

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. The specified basis of design is intended to provide the longest service life possible, lowest life cycle cost and most sustainable solution. All Contractors must provide pricing based on the basis of design. If submitting alternate products, this must be shown in the Bid Schedule as an ADD or DEDUCT to the overall Base Bid, so the Owner can decide which coating system to accept.
- C. Equivalent materials of other manufacturers may be substituted on approval of the Owner. Requests for substitution must include a side-by-side comparison of equality, including: manufacturer's literature for each product giving the name, generic type, volume solids, descriptive information, evidence of satisfactory past performance, and an independent laboratory certification that their product meets the performance criteria of the specified materials.
- D. To allow time for review, all requests for substitution shall be submitted by the coating manufacturer a minimum of 10 days prior to the project bid date.
- E. 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. Substitutions which otherwise reduce performance shall not be approved.
- F. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.

- G. 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.
- H. Colors, where not specified, shall be as selected by the Owner or their Representative.
- I. All coatings in contact with potable water need to be NSF Certified, Tested, and Listed in accordance with ANSI/NSF Standard 61.
- J. All above ground potable water mains and appurtenances shall be painted Safety Blue (Tnemec 11SF).

2.03 REFERENCES

- A. This section contains references to the governing standards and documents listed below. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the more stringent of the requirements shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.
- C. Referenced publications found within this specification shall be the latest revision unless otherwise specified; and applicable parts of the referenced publications shall become a part of this specification as if fully included.
- D. ASTM International (ASTM):
 1. ASTM B117 - Salt Spray (Fog)
 2. ASTM C140 - Water Absorption (Applied to Cast Mortar Cubes)
 3. ASTM C307 - Tensile Strength, Elongation, Modulus of Elasticity
 4. ASTM C531 - Thermal Expansion
 5. ASTM C579 - Compressive Strength
 6. ASTM C580 - Flexural Strength and Modulus of Elasticity
 7. ASTM C67 - Water Absorption (Applied to Fire Clay Brick)
 8. ASTM C793 - Accelerated Weathering
 9. ASTM C97 - Water Absorption (Applied to Ohio Sandstone)
 10. ASTM D1014 - Exterior Exposure
 11. ASTM D2047 - Coefficient of Friction
 12. ASTM D2240 - Hardness
 13. ASTM D2247 - Humidity
 14. ASTM D2370 - Tensile Strength, Elongation, Modulus of Elasticity
 15. ASTM D2794 - Impact
 16. ASTM D3273 - Fungal/Mold/Mildew Resistance

17. ASTM D4060 - Abrasion
 18. ASTM D4141, Method C (EMMAQUA) - Exterior Exposure
 19. ASTM D4541 - Adhesion
 20. ASTM D4585 - Humidity
 21. ASTM D4587 - QUV Exposure
 22. ASTM D522 - Flexibility and Elongation
 23. ASTM D5590 - Fungal/Mold/Mildew/Algal Resistance
 24. ASTM D5894 - Cyclic Salt Fog/UV Exposure
 25. ASTM D624 - Tear Strength
 26. ASTM D638 - Tensile Strength, Elongation, Modulus of Elasticity
 27. ASTM D648 - Deflection Temperature
 28. ASTM D6695 - Xenon Arc Weathering
 29. ASTM D695 - Compressive Strength
 30. ASTM D7234 - Adhesion
 31. ASTM D790 - Flexural Strength and Modulus of Elasticity
 32. ASTM D870 - Immersion
 33. ASTM G85 - Prohesion
- E. NACE International (NACE):
1. NACE TM-01-74.
- F. Federal Specification (FED):
1. FED TT-C-555B - Wind Driven Rain
- G. Military and Government Specs & Standards:
1. MIL D3134 - Impact
- H. British Standard:
1. BS EN 598: 2007+A1: 2009 - Rocking Abrasion
- I. American Association of State Highway and Transportation Officials
1. AASHTO T-259 - Chloride Ion Penetration

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 Owner. 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 Owner.
- C. The Contractor shall follow the Manufacturer's latest printed recommended

minimum and maximum recoat times. If the maximum recoat time has been exceeded, the Contractor shall follow the Manufacturer's latest printed instructions.

- D. Coating thickness shall be determined by the use of a properly calibrated "Nordson-Mikrotest" or "Positest" Coating Thickness Gauge (or equal) for ferrous metal. Please note that a "Tooke" gauge may be used on cementitious surfaces, and that use of the "Tooke" gauge is classified as a destructive test.
- E. Before performing any destructive tests on a newly applied coating system, the Owner and Contractor shall determine which of them is responsible for the cost of repairing the damaged coatings.

3.02 STANDARDS FOR SURFACE PREPARATION

- A. SSPC-SP1: Solvent Cleaning: Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter and contaminates, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning.
- B. SSPC-SP2: 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. SSPC-SP3: 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. SSPC-SP5/NACE No.1: White Metal Blast Cleaning: Complete removal of all mill scale, rust, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.
- E. SSPC-SP6/NACE No.3: Commercial 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.
- F. SSPC-SP7/NACE No.4: 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 contaminates. 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.
- G. SSPC-SP10/NACE No.2: 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.
- H. SSPC-SP11: 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.

- I. SSPC-SP13/NACE No.6: Surface Preparation of Concrete: Provides requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.
 - 1. International Concrete Restoration Institute (ICRI):
 - a. ICRI 310.1R - Exposed Reinforcing bar (Rebar) Repair
 - b. ICRI-CSP 1 - Concrete Surface Profile 1
 - c. ICRI-CSP 2 - Concrete Surface Profile 2
 - d. ICRI-CSP 3 - Concrete Surface Profile 3
 - e. ICRI-CSP 4 - Concrete Surface Profile 4
 - f. ICRI-CSP 5 - Concrete Surface Profile 5
 - g. ICRI-CSP 6 - Concrete Surface Profile 6
- J. SSPC-SP14/NACE No.8: Industrial Blast Cleaning: An industrial blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, and dirt. Traces of tightly adherent mill scale, rust, and coating residues are permitted to remain on 10% of each unit area of the surface if they are evenly distributed.
- K. SSPC-SP15: Commercial Grade Power Tool Cleaning: A commercial grade power tool cleaned steel surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other foreign matter, except as noted. Random staining shall be limited to no more than 33 percent of each unit area of surface as defined.
- L. Visual standards "Pictorial Surface Preparation Standards for Painting Steel Surfaces", and the National Association of Corrosion Engineer, "Blasting Cleaning Visual Standards" TM-01-70 and TM-01-75 shall be considered as standards for proper surface preparation.
- M. NAPF 500-03-04: External Pipe Surface: When viewed without magnification, the exterior surfaces shall be free of all visible dirt, dust, loose annealing oxide, rust, mold, coatings, and other foreign matter.
- N. NAPF 500-03-05: Fitting Blast Clean #2: When viewed without magnification, no more than 5% staining may remain on the surface and the exterior surfaces shall be free of all visible dirt, dust, annealing oxide, rust, mold, coatings, and other foreign matter.

3.03 SURFACE PREPARATION

- A. The surface shall be cleaned as specified for the paint system being used. All cleaning shall be as outlined in the Society for Protective Coatings (SSPC) Surface Preparation Specification, National Association of Corrosion Engineers (NACE), and the International Concrete Repair Institute (ICRI) unless otherwise noted.

- B. If surfaces are subject to contamination, other than mill scale or normal atmospheric rusting, the surfaces shall be checked for chloride contamination, pressure washed, and acid or caustic pH residues neutralized, in addition to the specified surface preparation.
- C. All bare concrete surfaces exposed to wastewater or similar corrosive atmospheres shall be confirmed to have a minimum pH of 9 prior to the application of coatings.
- D. Oil, grease, soil, dust, etc., deposited on the surface after preparation has been completed shall be removed prior to painting in accordance with SSPC-SP1 Solvent Cleaning.
- E. Weld flux, weld spatter, and rust scale shall be removed by a minimum of SSPC-SP3 Power Tool Cleaning as per these Specifications.
- F. All weld seams, sharp protrusions and edges shall be ground smooth prior to surface preparation or application of any coatings.
- G. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the Owner.
- H. All areas which require field touch-up after erection, such as welds, burnbacks, and mechanically damaged areas, shall be prepared per the Manufacturer's latest written recommendations.
- I. In the event that an existing coating's max recoat window has been exceeded, all surfaces to be overcoated must be thoroughly and uniformly de-glossed and scarified before the application of additional coatings.
- J. All surfaces must be clean and dry prior to the application of any coatings.

3.04 PRETREATMENTS

- A. When specified, the surface shall be pretreated in accordance with the specified pretreatment prior to application of the prime coat of paint.

3.05 STORAGE

- A. Materials shall be delivered to the job site in the original packages with seals unbroken and with legible unmutilated labels attached. Packages shall be available for inspection by the Owner. All coating materials shall be stored in accordance with the Manufacturer's latest written recommendations. The Contractor is responsible for following the Manufacturer's suggested storage temperatures and conditions. The Contractor shall be solely responsible for the protection of the materials stored by themselves at the job site. Empty coating cans shall be neatly stacked in an area designated by the Owner and removed from the job site on a schedule determined by the Contractor. Owner may request a notarized statement from Contractor detailing all materials used on the Project.

3.06 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. Thinners shall be as recommended by the manufacturer and shall be added or discarded strictly in accordance with the manufacturer's instruction. Partial kits may only be used when components are accurately measured and mixed per the Manufacturer's latest written recommendations.

3.07 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 outside the limit of the manufacturer's latest written recommendations, 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°F above dew point; temperature must be maintained during curing.
- C. See coating schedule for actual coating systems to be used on this project.

3.08 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 5°F above this point. Temperature must be maintained during curing.

Example

If air temperature is 70°F and relative humidity is 65%, the dew point is 57°F. No coating should be applied unless surface temperature is 62°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 Owner.
- 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 Owner.
- 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. Unless otherwise specified, each full coat within a coating system shall be of a different or alternating color.
- K. 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 Owner).

- L. 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.
- M. 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.

3.09 WORKMANSHIP

- A. The Contractor must submit, with their bid, a list of a minimum 5 completed projects of similar size and complexity to this work with the use of Tnemec coatings. Include for each project:
 - 1. Project name & location
 - 2. Name & contact of owner
 - 3. Name & contact of engineer
 - 4. Approximate area of coatings applied
 - 5. Total project amount value
 - 6. Date of completion
- B. The Contractor must have a minimum NACE or PCI Level 1 on staff.
- C. 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.
- D. 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 Owner, shall be corrected at the expense of the Contractor.

3.10 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. Thinners shall be as recommended by the manufacturer and shall be added or discarded strictly in accordance with the manufacturer's instruction.
 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.

3.11 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 Owner 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 Owner, 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 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.

3.12 TOUCH-UP and TOUCH-UP MATERIALS

- A. All areas which require field touch-up after erection, such as welds, burnbacks, and mechanically damaged areas, shall be prepared per the Manufacturer's latest written recommendations.

- B. Strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the Owner and Manufacturer's attention. Otherwise, Contractor assumes full responsibility.
- C. 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 Owner for future touch-up. Two gallons may be required for (2) component materials.

3.13 ON-SITE INSPECTION

- A. During the course of this Project, the Owner will reserve the option of incorporating the services of a NACE Level III inspection service. The inspection service will be responsible for assuring the proper execution of this Specification by the successful Contractor.

3.14 STEEL & FERROUS METALS

- A. FERROUS METALS - NON-IMMERSION / EXTERIOR / UV-EXPOSED

The coating systems in the FERROUS METALS - NON-IMMERSION / EXTERIOR / UV-EXPOSED section are listed in order of decreasing color & gloss retention and corrosion resistance. The first system has maximum color & gloss retention and maximum corrosion resistance.

1. System No. 700-1: Zinc/Epoxy/Fluoropolymer

This system provides outstanding resistance to ultra-violet light degradation and the absolute best color and gloss retention available. This system will have excellent resistance to abrasion and chalking, and is recommended for coastal environments and on structures where extremely long-term maintenance cycles are desired (such as elevated tanks and surfaces with custom artwork). (Note: Series 700 is gloss. If the Owner desires a semi-gloss finish then Series 700 may be replaced with Series 701.) Note: For single-component application, Series 90G-1K97 may be substituted as the primer.

Surface Preparation: SSPC-SP6/NACE No.3 Commercial Blast Cleaning with a minimum 1.5 mil angular anchor profile.

Primer: Series 90-97 Tneme-Zinc	2.5 - 3.5 mils
2nd Coat: Series 66 Hi-Build Epoxoline	3.0 - 6.0 mils
3rd Coat: Series 700 Hydroflon	<u>2.0 - 3.0 mils</u>
Total Dry Film Thickness: 7.5 - 12.5 mils	
Minimum Dry Film Thickness: 9.5 mils	

2. System No. 1095-1: Zinc/Epoxy/Urethane

This system offers excellent color & gloss retention with 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. For single-

component applications, Series 90G-1K97 may be substituted for Series 90-97. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: SSPC-SP6/NACE No.3 Commercial Blast Cleaning with a minimum 1.5 mil angular anchor profile.

Shop Coat: Series 90-97 Tneme-Zinc	2.5 - 3.5 mils
2nd Coat: Series 66 Hi-Build Epoxoline	3.0 - 6.0 mils
3rd Coat: Series 1095 Endurashield	<u>2.5 - 5.0 mils</u>
Total Dry Film Thickness: 8.0 - 14.5 mils	
Minimum Dry Film Thickness: 10.0 mils	

3. System No. 1095-2: Epoxy/Epoxy/Urethane

This system is highly resistant to abrasion, wet conditions, corrosive fumes and chemical contact. It provides excellent color & gloss retention. This system should be used for exterior steel surfaces that are neither submerged, nor buried. Series 161 may be substituted for Series 66 for low temperature cure or quick recoats. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: SSPC-SP6/NACE No.3 Commercial Blast Cleaning with a minimum 1.5 mil angular anchor profile.

Shop Coat: Series 66-1211 Hi-Build Epoxoline Primer	3.0 - 6.0 mils
2nd Coat: Series 66 Hi-Build Epoxoline	3.0 - 6.0 mils
3rd Coat: Series 1095 Endura-Shield	<u>2.0 - 5.0 mils</u>
Total Dry Film Thickness: 8.0 - 17.0 mils	
Minimum Dry Film Thickness: 10.0 mils	

4. System No. 1095-3: Epoxy Mastic/Urethane (Overcoat)

This system can be used over factory finish paint or over non-sandblasted steel and offers the high performance of an epoxy/urethane system. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: High Pressure Water Clean (min. 3500 psi, 3 to 5 gallons per minute, using an oscillating tip and potable water). A cleaning detergent such as Trisodium Phosphate should be used to facilitate cleaning. A degreaser may be required for oil soaked areas or heavily contaminated areas.

Some spot areas may require Hand Tool (SSPC-SP2), Power Tool Cleaning (SSPC-SP3), or Brush Blast (SSPC-SP7/NACE No. 4) to remove loose surface rust.

Existing coatings must be clean, dry, and tightly adhering prior to application of coatings.

Spot Prime (Areas of Bare Steel): Series 135 Chembuild	4.0 - 6.0 mils
1st Coat: Series 135 Chembuild	4.0 - 6.0 mils
2nd Coat: Series 1095 Endura-Shield	<u>2.0 - 5.0 mils</u>
Total Dry Film Thickness: 6.0 - 11.0 mils*	
Minimum Dry Film Thickness: 7.0 mils	

**Does not include spot prime or previously existing coatings.*

B. EXTERIOR BELOW GRADE EXPOSURE

1. System No. N140-1: Epoxy/Epoxy/Epoxy or Urethane

This system provides exceptional corrosion protection in buried environments. It offers better corrosion protection and a healthier application process than coal-tar epoxies. The 3rd coat is dependent on the exposure - for buried areas use an extra coat of high-solids epoxy, for uv-exposed, non-immersion areas use an aliphatic acrylic urethane. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: SSPC-SP10/NACE No. 2 Near-White Blast Cleaning with a minimum angular anchor profile of 1.5 mils.

Shop Coat: Series N140 Pota-Pox Plus	2.0 - 10.0 mils
2nd Coat: Series N140 Pota-Pox Plus	4.0 - 10.0 mils
3rd Coat (Buried Areas Only): Series N140 Pota-Pox Plus	4.0 - 10.0 mils
3rd Coat (UV Exposed, Non-immersion Areas Only): Series 1095	<u>2.5 - 5.0 mils</u>
Total Dry Film Thickness: 10.0 - 30.0 mils	
Minimum Dry Film Thickness: 11.0 mils	

2. System No. 46H-413-1: Polyamide Epoxy-Coal Tar

This system provides a high-build coating for underground conditions.

Surface Preparation: SSPC-SP10/NACE No. 2 Near-White Blast Cleaning with a minimum angular anchor profile of 1.5 mils.

1st Coat: Series 46H-413 Hi-Build Tneme-Tar	8.0 - 10.0 mils
2nd Coat: Series 46H-413 Hi-Build Tneme-Tar	<u>8.0 - 10.0 mils</u>
Total Dry Film Thickness: 16.0 - 20.0 mils	
Minimum Dry Film Thickness: 18.0 mils	

C. INTERIOR (NON-IMMERSION)

1. System No.66-1: Polyamide Epoxy

This system will provide chemical and corrosion resistance against abrasion, moisture, corrosion fumes, and occasional chemical contact. Primer coat must be touched-up before second coat is applied. Substitute Series 161 for low temperature cure or quick recoats. Use this system for interior exposed, non-submerged metals.

Surface Preparation: SSPC-SP6/NACE No.3 Commercial Blast Cleaning with a minimum 1.5 mil angular anchor profile.

Shop Coat: Series 66 Hi-Build Epoxoline	3.0 - 5.0 mils
2nd Coat: Series 66 Hi-Build Epoxoline	4.0 - 6.0 mils
3rd Coat: Series 66 Hi-Build Epoxoline	<u>4.0 - 6.0 mils</u>
Total Dry Film Thickness: 7.0 - 11.0 mils	
Minimum Dry Film Thickness: 9.0 mils	

2. System No. 27WB-1: Inorganic Hybrid Water-Based Epoxy (Overcoat)

This low VOC system can be used over factory finish paint or over non-sandblasted steel and offers the high performance of an epoxy/urethane system. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: Abrasive blast cleaning in accordance with SSPC-SP7/NACE No.4 generally produces the best coating performance. If conditions will not permit this, Series 27WB may be applied to SSPC-SP2 or SP3 Hand or Power Tool Cleaned surfaces (SSPC Rust Grade Condition C).

Shop Coat: Manufacturer's Standard (or existing coating)	varies
Spot Prime (Areas of Bare Steel): Series 27WB Typoxy	3.0 - 8.0 mils
2nd Coat: Series 27WB Typoxy	3.0 - 8.0 mils
3rd Coat: Series 1095 Endura-Shield	<u>2.5 - 5.0 mils</u>
Total Dry Film Thickness: 5.5 - 13.0 mils*	
Minimum Dry Film Thickness: 7.0 mils	

**Does not include spot prime or previously existing coatings.*

D. IMMERSION

1. System No. 20-1: Polyamide Epoxy (Potable Water)

This system meets American Water Works Association AWWA D 102 Inside Paint System Number 1. Series 20 meets the requirements of approval for potable water use as established by NSF Std 61. Series FC20 may be substituted for Series 20 for low temperature cure or quick recoats.

Surface Preparation: SSPC-SP10/NACE No.2 Near-White Blast Cleaning with a minimum angular anchor profile of 2.0 mils.

Shop Coat: Series 94H ₂ O Hydro-Zinc	2.5 - 3.5 mils
Stripe Coat (Weld Seams and Edges): 20 Pota-Pox	3.0 - 5.0 mils
2nd Coat: Series 20-1255 Pota-Pox (Beige)	4.0 - 6.0 mils
3rd Coat: Series 20-15BL Pota-Pox (Tank White)	<u>4.0 - 6.0 mils</u>
Total Dry Film Thickness*: 10.5 - 15.5 mils**	
Minimum Dry Film Thickness: 11.5 mils	

**Total Dry Film Thickness excludes stripe coat*

***Note: In order to maintain NSF Std. 61 approval, maximum allowable DFT is 18 mils.*

Allow Series 20 to cure for 7 days at 75°F prior to service.

3.15 OVERHEAD METAL DECKING, JOISTS

A. EXTERIOR EXPOSURE

System No. 1029-1: HDP Acrylic Polymer

This system can be applied over a wide variety of coatings and factory finishes. It can also be applied direct to galvanized decking, joists, & conduits. Series 1029 is suitable for application in mild to moderate exposures.

Surface Preparation: Pressure clean to remove all dirt, oil, grease, chemicals and foreign contaminants. Remove loose paint and all rust by hand and power tool cleaning (SSPC-SP 2 & 3)

1st Coat: Series 115 Uni-Bond	2.5 - 4.0 mils
2nd Coat: Series 1029 Enduratone	2.0 - 3.0 mils
Total Dry Film Thickness: 4.5 - 7.0 mils	

B. INTERIOR EXPOSURE

System No. 115-1: Self-crosslinking Hydrophobic Acrylic

This system should be used on ceilings of non-chemical storage areas where a one-coat system is desired. Can be applied over steel, galvanized and aluminum decking, joist, shop primed beams, conduits and concrete. Note: Series 115 has "dry-fall" characteristics. See manufacturer's latest written Product Data Sheet for details.

Surface Preparation: Surfaces must be dry, clean and free of oil, grease and other contaminants.

One Coat: Series 115 Uni-Bond	<u>2.5 - 4.0 mils</u>
Total Dry Film Thickness: 2.5 - 4.0 mils	

3.16 GALVANIZED STEEL & NONFERROUS METALS

A. GALVANIZED STEEL, STAINLESS STEEL, ALUMINUM, OR COPPER

System No. 1095-4: Epoxy/High Build Urethane

Series 66 has excellent adhesion to galvanized steel & nonferrous metals. This system is highly resistant to abrasion, wet conditions, corrosive fumes and chemical contact. It provides excellent color & gloss retention. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: SSPC-SP1 Solvent Cleaning, followed by mechanically abrading (SSPC-SP7/NACE No.4, minimum angular anchor profile of 1.5 mils)

1st Coat: Series 66 Hi-Build Epoxoline	2.0 - 4.0 mils
2nd Coat: Series 1095 Endura-Shield	<u>2.5 - 5.0 mils</u>
Total Dry Film Thickness: 4.5 - 9.0 mils	
Minimum Dry Film Thickness: 5.0 mils	

B. ALUMINUM IN CONTACT WITH CONCRETE

System No. 46H-413-2: Polyamide Epoxy

Surface Preparation: SSPC-SP1 Solvent Cleaning, followed by thoroughly scarifying to de-gloss and provide a minimum uniform angular anchor profile of 1.0 mil.

1st Coat: Series 46H-413 Hi-Build Tneme-Tar	8.0 - 10.0 mils
2nd Coat: Series 46H-413 Hi-Build Tneme-Tar	<u>8.0 - 10.0 mils</u>
Total Dry Film Thickness: 16.0 - 20.0 mils	
Minimum Dry Film Thickness: 18.0 mils	

3.17 EXTERIOR NONFERROUS METALS

A. System No. 108.1

Surface Preparation: Remove all dirt, salts, oils, grease, mold, mildew, and other soluble contaminants and loose coatings by pressure washing (minimum 3500 psi 3-5 gallons per minute, potable water, oscillating tip). A cleaning detergent such as Trisodium Phosphate may be utilized to facilitate cleaning. A degreaser may be required for oil-soaked areas or heavily contaminated areas. In coastal areas, use a chloride remover such as Chlor-Rid. Abrasive blast or mechanically abrade surfaces in accordance with SSPC-SP16. If this is not possible, prepare surfaces in accordance with SSPC-SP2 Hand Tool or SSPC-SP3 Power Tool Cleaning. Clean as needed to ensure all surfaces are clean, dry, and contaminant-free. All prepared surfaces must be primed as soon as possible on the same day as surface preparation to prevent re-contamination of the substrate. In coastal environments, daily re-cleaning is recommended to alleviate potential for overnight chloride contamination.

Coating System:

Prime Coat: Series 108	@ 1.0 - 2.0 mils.
Intermediate Coat: Series 1095	@ 2.0 - 4.0 mils.
Finish Coat: Series 1070 (Gloss) or Series 1071 (Semigloss) or Series 1072 (Satin)	

@ 2.0 - 3.0 mils.

If applying using electrostatic spray, #51 thinner should be used (up to 6%) to optimize the electrostatic transfer efficiency.

3.18 CONCRETE

A. EXTERIOR - ABOVE GRADE (NON-IMMERSION, VERTICAL SURFACES)

1. System No. 156-1: Modified Waterborne Acrylate (Elastomeric)

This system provides exceptional elongation for spanning hairline cracks in concrete structures. It also provides mold & mildew resistance, as well as wind-driven rain resistance. For application over previously applied coatings, use TNEMEC Series 151 Elasto-Grip at 0.7 - 1.5 mils DFT prior to the application of Series 156 Enviro-Crete. Note: If a textured finish is preferred, use 157 Enviro-Crete TX (medium texture) @ 6.0 - 9.0 mils dry film thickness per coat.

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

1st Coat: Series 156 Enviro-Crete	4.0 - 8.0 mils
2nd Coat: Series 156 Enviro-Crete	4.0 - 8.0 mils
Total Dry Film Thickness: 8.0 - 16.0 mils	
Minimum Dry Film Thickness: 10.0 mils	

System No. 1026-1: Acrylic Emulsion (Non-Elastomeric)

This system provides a durable, easy-to-use, water-based coating that offers long-wearing protection. It is low odor, low VOC, and has "dry-fall" properties. See manufacturer's latest written Product Data Sheet for details. This system will provide a high vapor transmission rate.

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

Block Filler (CMU only): 1254 Epoxoblock	100 - 150 ft ² /Gallon
1st Coat: Series 1026 Enduratone	2.0 - 3.0 mils
2nd Coat: Series 1026 Enduratone	2.0 - 3.0 mils
Total Dry Film Thickness: 4.0 - 6.0 mils*	
Minimum Dry Film Thickness: 5.0 mils	
*Does not include Block Filler	

B. EXTERIOR - BELOW GRADE

1. System No. 46H-413-3: Polyamide Epoxy-Coal Tar

This system provides a high-build coating for underground conditions.

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

One or Two Coats: 46H-413 Hi-Build Tneme-Tar
Total Dry Film Thickness: 16.0 - 20.0 mils*

C. INTERIOR (NON-IMMERSION)

The coating systems in the INTERIOR (NON-IMMERSION) section are listed in

order of decreasing performance with regards to chemical & corrosion resistance. This generally has an inverse correlation with color & gloss retention. The first system has extremely good chemical resistance with the highest potential for yellowing, while the last system has extremely poor chemical resistance with the lowest potential for yellowing.

1. System No. 66-2: Polyamide Epoxy

This system provides excellent protection from abrasion, moisture, corrosive fumes and chemical contact.

Surface Preparation: Allow new concrete and masonry to cure for 28 days. Surface must be clean and dry.

For New Concrete or Porous Masonry: Apply Tnemec Series 1254 Epoxoblock WB @ 100 - 150 ft²/Gallon.

1st Coat: Series 66 Hi-Build Epoxoline	4.0 - 6.0 mils
2nd Coat: Series 66 Hi-Build Epoxoline	<u>4.0 - 6.0 mils</u>
Total Dry Film Thickness: 8.0 - 12.0 mils	
Minimum Dry Film Thickness: 10.0 mils	

2. System No. 1026-2: Acrylic Emulsion

This system provides a durable, easy-to-use, water-based coating that offers long-wearing protection. It is low odor, low VOC, and has “dry-fall” properties. See manufacturer’s latest written Product Data Sheet for details. This system will provide a high vapor transmission rate. Note: Series 1026 has a Matte finish. For a Semi-Gloss finish, specify Series 1029 Enduratone.

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

Block Filler (CMU only): 54 Masonry Filler	80 - 100 ft ² /Gallon
1st Coat: Series 1026 Enduratone	2.0 - 3.0 mils
2nd Coat: Series 1026 Enduratone	<u>2.0 - 3.0 mils</u>
Total Dry Film Thickness: 4.0 - 6.0 mils*	
Minimum Dry Film Thickness: 5.0 mils	

**Does not include Block Filler*

D. IMMERSION (POTABLE WATER)

1. System No. 22-2: Modified Polyamine Epoxy (Potable Water)

This is a low VOC system which meets the requirements of approval for potable water use as established by NSF Std 61. **This system may be applied up to 40.0 mils in a single coat, providing exceptional barrier protection and a quicker return to service.** This system is intended for use over simple shapes and areas with minimal detail work.

Surface Preparation: Allow new concrete to cure for 28 days. Mechanically abrade per SSPC-SP13/NACE No.6 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Apply Tnemec Series 218 to all surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, and to create a monolithic, paintable surface.

Single Coat: Series 22 22.0 - 27.0 mils*
Total Dry Film Thickness: 22.0 - 27.0 mils

**In order to maintain NSF Std. 61 approval, maximum allowable DFT is 50.0 mils.*

Notes:

1. Series 22 is to be spray applied only.
2. Allow Series 22 to cure for a minimum of 5 days at 75°F prior to service.

2. System No. 20-2: Polyamide Epoxy (Potable Water)

This system meets American Water Works Association AWWA D 102 Inside System No. 1. Series 20 meets the requirements of approval for potable water use as established by NSF Std 61. Series FC20 may be substituted for Series 20 for low temperature cure or quick recoats.

Surface Preparation: Allow new concrete to cure for 28 days. Mechanically abrade per SSPC-SP13/NACE No.6 to remove all laitance, fines, curing compounds, form release oils, and other contaminants, and to establish a surface profile equal to ICRI CSP 5 or greater.

Apply Tnemec Series 218 to all surfaces at a minimum of 1/16" to re-surface concrete, fill voids and bugholes, and to create a monolithic, paintable surface.

1st Coat: Series 20-15BL Pota-Pox 4.0 - 6.0 mils
2nd Coat: Series 20-1255 Pota-Pox 4.0 - 6.0 mils
3rd Coat: Series 20-15BL Pota-Pox 4.0 - 6.0 mils
Total Dry Film Thickness: 12.0 - 17.0 mils*
Minimum Dry Film Thickness: 13.0 mils

**In order to maintain NSF Std. 61 approval, maximum allowable DFT is 18 mils.*

Allow Series 20 to cure for 7 days at 75°F prior to service.

3.19 CONCRETE FLOORS (RESINOUS FLOORING SYSTEMS)

A. EPOXY FLOOR COATINGS

1. System No. 248-1: Aliphatic Moisture Cured Urethane (Thin Film with Increased Chemical Resistance, UV Stability, and Durability)

This system will provide a durable, long-wearing coating that bonds tightly to concrete and stands up under heavy foot traffic, frequent cleaning, spillage of water, oil, grease, or chemical, and UV Exposure. It is recommended that the 2nd and 3rd coat are the same color.

Moisture vapor transmission should not exceed three lbs per 1,000 ft² in a 24 hour period. (Reference ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.") Relative humidity should not exceed 80%. (Reference ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes.")

Note: For moisture content up to 15 lbs per 1,000 ft² or relative humidity up to 90%, Series 208 should be substituted for Series 201 as the primer. See manufacturer's latest written recommendations for Series 208 coverage rates.

Surface Preparation: Allow new concrete to cure for 28 days.

Mechanically abrade in accordance with NACE No.6/SSPC-SP13 to provide a minimum ICRI-CSP3 or greater surface profile.

1st Coat: Series 201 Epoxoprime	6.0-12.0 mils
2nd Coat: Series 237 Tneme-Glaze	8.0-16.0 mils
3rd Coat: Series 248 Everthane*, tinted with S821 colorant	<u>2.0-3.0 mils*</u>
Total Dry Film Thickness: 16.0- 31.0 mils	
Minimum Dry Film Thickness: 18.0 mils	

**Owner's Options for the 3^d Coat:*

- *For exterior exposures and increased resistance to ultra-violet light, add Series 44-600 UV Blocker to Series 248.*
- *If a more textured finish is desired, mix Tnemec Series S211-0213 (Fine) Glass Beads into the 3^d Coat. The glass beads are typically added at approximately 4 - 6 oz. per gallon.*

2. System No. 222-1: Decorative Quartz Flooring (Non-Slip)

This system provides a decorative, chemical, abrasion, impact resistant, non-slip, seamless flooring system with a moisture mitigating base coat that **resists up to 20 lbs of moisture vapor pressure, 99% relative humidity, and can be applied on 10-day old concrete.** This floor utilizes clear resins, allowing for visibility of the quartz or other aggregate. For a solid-color floor, tint the 2nd and 3rd coats with Series 820 field tint.

Surface Preparation: Allow new concrete to cure for 10 days. Mechanically abrade in accordance with NACE No.6/SSPC-SP13 to provide a minimum surface profile equal to ICRI-CSP4-5.

1st Coat: 241 Ultra-Tread MVT (Broadcast with Quartz or aggregate of choice)	70 ft ² per small kit
2nd Coat: 222 Deco-Tread (Broadcast with Quartz or aggregate of choice)	1/16"

3rd Coat: 284 Tneme-Glaze (clear) 8.0 - 12.0
Minimum Dry Film Thickness: 1/8"

**The degree of slip-resistance is affected by the thickness of the 3rd coat.*

3.20 CONCRETE & MASONRY

A. EXTERIOR - ABOVE GRADE (NON-IMMERSION, VERTICAL SURFACES)

1. System No. 156-1: Modified Waterborne Acrylate (Elastomeric)

This system provides exceptional elongation for spanning hairline cracks in concrete structures. It also provides mold & mildew resistance, as well as wind-driven rain resistance. For application over previously applied coatings, use TNEMEC Series 151 Elasto-Grip at 0.7 - 1.5 mils DFT prior to the application of Series 156 Enviro-Crete. Note: If a textured finish is preferred, use 157 Enviro-Crete TX (medium texture) @ 6.0 - 9.0 mils dry film thickness per coat.

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

1st Coat: Series 156 Enviro-Crete	4.0 - 8.0 mils
2nd Coat: Series 156 Enviro-Crete	<u>4.0 - 8.0 mils</u>
Total Dry Film Thickness: 8.0 - 16.0 mils	
Minimum Dry Film Thickness: 10.0 mils	

2. System No. 1026-1: Acrylic Emulsion (Non-Elastomeric)

This system provides a durable, easy-to-use, water-based coating that offers long-wearing protection. It is low odor, low VOC, and has "dry-fall" properties. See manufacturer's latest written Product Data Sheet for details. This system will provide a high vapor transmission rate.

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

Block Filler (CMU only): 1254 Epoxoblock	100 - 150 ft ² /Gallon
1st Coat: Series 1026 Enduratone	2.0 - 3.0 mils
2nd Coat: Series 1026 Enduratone	<u>2.0 - 3.0 mils</u>
Total Dry Film Thickness: 4.0 - 6.0 mils*	
Minimum Dry Film Thickness: 5.0 mils	

*Does not include Block Filler

3. System No. 662-1: Silane /Siloxane Sealer (Min. 42% Solids)

This provides a clear, filmless, penetrating water repellent for virtually all above-grade, vertical and horizontal concrete, stucco, block, and brick masonry. This will allow the substrate to resist water and chloride ion intrusion, stain damage, freeze/thaw spalling, efflorescence, and rust damage. This system will not alter the color or texture of the surface, nor

significantly affect the vapor transmission qualities of the substrate. This barrier is also resistant to ultraviolet and weather deterioration.

Surface Preparation: Allow new concrete to cure 28 days. All surfaces must be clean, dry, and free of oils, curing compounds, form release oils, and other contaminants that might interfere with the penetration of the sealer.

For Coating Brick & Concrete:
Tnemec Series 662..... Two Coats @ 75-200 ft²/gallon

For Coating Split-faced or Porous Masonry:
Tnemec Series 662..... Two Coats @ 35-100 ft²/gallon

4. System No. 626-1: Water Repellent and Graffiti Protectant

This provides superior protection against, and easy removal of, unwanted graffiti. **Series 626 is intended for use in conjunction with Series 680 Mark A Way (Cleaner) to provide a complete graffiti protection system.** This is a clear, silicone rubber-based formulation which protects vertical concrete block, brick, cast concrete, stone, and other masonry substrates with little or no change to the appearance of the untreated substrate. It has excellent stability against ultraviolet rays and salt spray.

Surface Preparation: Allow new concrete to cure 28 days. All surfaces must be clean, dry, and free of oils, curing compounds, form release oils, and other contaminants that might interfere with the penetration of the sealer.

For Coating Brick & Concrete:
Tnemec Series 626..... Two Coats @ 125-200 ft²/gallon

For Coating Split-faced or Porous Masonry:
Tnemec Series 626..... Two Coats @ 65-150 ft²/gallon

B. EXTERIOR - BELOW GRADE

2. System No. 46H-413-3: Polyamide Epoxy-Coal Tar

This system provides a high-build coating for underground conditions.

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

One or Two Coats: 46H-413 Hi-Build Tneme-Tar
Total Dry Film Thickness: 16.0 - 20.0 mils*

C. INTERIOR (NON-IMMERSION)

The coating systems in the INTERIOR (NON-IMMERSION) section are listed in order of decreasing performance with regards to chemical & corrosion resistance.

This generally has an inverse correlation with color & gloss retention. The first system has extremely good chemical resistance with the highest potential for yellowing, while the last system has extremely poor chemical resistance with the lowest potential for yellowing.

1. System No. 104-2: Cycloaliphatic Amine Epoxy

This system will produce a tile-like finish for easy cleaning and superior stain resistance. It will also provide protection against chemical attack, corrosive fumes, high humidity and wash down. Backroll first coat to fill porosity.

Surface Preparation: Allow new concrete and masonry to cure for 28 days. Surface must be clean and dry.

For New Concrete or Porous Masonry: Apply Tnemec Series 1254 Epoxoblock WB @ 100 - 150 ft²/Gallon.

1st Coat: Series 104 H.S. Epoxy (backrolled)	8.0 - 10.0 mils
2nd Coat: Series 104 H.S. Epoxy	<u>8.0 - 10.0 mils</u>
Total Dry Film Thickness: 16.0 - 20.0 mils	
Minimum Dry Film Thickness: 18.0 mils	

2. System No. 66-2: Polyamide Epoxy

This system provides excellent protection from abrasion, moisture, corrosive fumes and chemical contact.

Surface Preparation: Allow new concrete and masonry to cure for 28 days. Surface must be clean and dry.

For New Concrete or Porous Masonry: Apply Tnemec Series 1254 Epoxoblock WB @ 100 - 150 ft²/Gallon.

1st Coat: Series 66 Hi-Build Epoxoline	4.0 - 6.0 mils
2nd Coat: Series 66 Hi-Build Epoxoline	<u>4.0 - 6.0 mils</u>
Total Dry Film Thickness: 8.0 - 12.0 mils	
Minimum Dry Film Thickness: 10.0 mils	

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

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. Note: Series 113 has a Satin finish. For a gloss finish, specify Series 114 Tnemec-Tufcoat.

Surface Preparation: Allow new concrete and masonry to cure for 28 days. Surface must be clean and dry.

For New Concrete or Porous Masonry: Apply Tnemec Series 1254 Epoxoblock WB @ 100 - 150 ft²/Gallon.

1st Coat: 113 Tneme-Tufcoat	4.0 - 6.0 mils
2nd Coat: 113 Tneme-Tufcoat	<u>4.0 - 6.0 mils</u>
Total Dry Film Thickness: 8.0 - 12.0 mils	
Minimum Dry Film Thickness: 9.0 mils	

4. System No. 1026-2: Acrylic Emulsion

This system provides a durable, easy-to-use, water-based coating that offers long-wearing protection. It is low odor, low VOC, and has “dry-fall” properties. See manufacturer’s latest written Product Data Sheet for details. This system will provide a high vapor transmission rate. Note: Series 1026 has a Matte finish. For a Semi-Gloss finish, specify Series 1029 Enduratone.

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

Block Filler (CMU only): 54 Masonry Filler	80 - 100 ft ² /Gallon
1st Coat: Series 1026 Enduratone	2.0 - 3.0 mils
2nd Coat: Series 1026 Enduratone	<u>2.0 - 3.0 mils</u>
Total Dry Film Thickness: 4.0 - 6.0 mils*	
Minimum Dry Film Thickness: 5.0 mils	

**Does not include Block Filler*

3.21 GYPSUM WALLBOARD & WOOD

A. GYPSUM WALLBOARD

The coating systems in the GYPSUM WALLBOARD Section are listed in order of decreasing performance with regards to chemical resistance. This generally has an inverse correlation with color & gloss retention. The first system has very good chemical resistance with the highest potential for yellowing, while the last system has extremely poor chemical resistance with the lowest potential for yellowing.

1. System No. 113-2: Acrylic-Epoxy (Interior Only)

This system is designed for mild environments where frequent cleaning is expected. It provides a higher build, low odor, and fade resistant colors. It offers easy cleanup and stain-, abrasion-, chemical-, and moisture-resistance. Note: Series 113 has a satin finish. If a gloss finish is desired, specify Series 114 Tneme-Tufcoat instead.

Surface Preparation: Surface must be clean and dry.

1st Coat: 51PVA Sealer	1.0 - 2.0 mils
2nd Coat: 113 H.B. Tneme-Tufcoat*	<u>4.0 - 6.0 mils</u>
Total Dry Film Thickness: 5.0 - 8.0 mils	
Minimum Dry Film Thickness: 6.0 mils	

**If brushing or rolling, two coats may be required to achieve the specified film thickness.*

2. System No. 1026--3: Acrylic Emulsion (Interior/Exterior Exposure)

This system is designed for mild use areas like office walls, laboratory ceilings, stairwells, etc. Note: Series 1026 has a Matte finish. For a Semi-Gloss finish, specify Series 1029 Enduratone.

Surface Preparation: Surface must be clean and dry.

1st Coat: Series 51PVA Sealer	1.0 - 2.0 mils
1st Coat: Series 1026 Enduratone	2.0 - 3.0 mils
2nd Coat: Series 1026 Enduratone	<u>2.0 - 3.0 mils</u>
Total Dry Film Thickness: 4.0 - 6.0 mils	
Minimum Dry Film Thickness: 5.0 mils	

B. WOOD - EXTERIOR or INTERIOR EXPOSURE

1. System No. 1029-2: HDP Acrylic Polymer

Series 1029 has a low semi-gloss finish. If a gloss finish is desired, specify Series 1028 Enduratone.

Surface Preparation: Surface shall be clean and dry.

1st Coat: 10-99W Undercoater*	2.0 - 3.0 mils
2nd Coat: 1029 Enduratone	2.0 - 3.0 mils
3rd Coat: 1029 Enduratone	<u>2.0 - 3.0 mils</u>
Total Dry Film Thickness: 6.0 - 9.0 mils	
Minimum Dry Film Thickness: 7.0 mils	

**Allow Series 10 to cure for 3 days before topcoating with Series 1029.*

3.22 EXTERIOR OF PRESTRESSED CONCRETE TANKS

A. System No. 156-3: Existing Tanks (Previously Painted)

This system provides exceptional elongation for spanning hairline cracks in concrete structures. It also provides mold & mildew resistance, as well as wind-driven rain resistance. Note: If a textured finish is preferred, replace Series 156 with Series 157 Enviro-Crete TX (medium texture) @ 6.0 - 9.0 mils dry film thickness per coat.

Surface Preparation: Remove all dirt, oil, grease, chalk, and loose paint per high pressure water blast (min. 3500 psi).

1st Coat: 151 Elasto-Grip	0.7 - 1.5 mils
Stripe Coat: Use a brush to fill all hairline cracks with Series 156 Envirocrete*	
Topcoat: 156 Envirocrete	<u>6.0 - 8.0 mils**</u>
Total Dry Film Thickness: 6.7 - 9.5 mils***	
Minimum Dry Film Thickness: 7.0 mils	

1st Coat: Series 46H-413 Hi-Build Tneme-Tar 8.0 - 10.0 mils
2nd Coat: Series 46H-413 Hi-Build Tneme-Tar 8.0 - 10.0 mils
Total Dry Film Thickness: 16.0 - 20.0 mils
Minimum Dry Film Thickness: 18.0 mils

C. System No. 1095-5: Acrylic Polyurethane (PVC or HDPE Pipe)

This system provides a user friendly, low VOC, aliphatic acrylic polyurethane coating which offers excellent color and gloss retention. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: SSPC-SP1 followed by hand or power sanding to thoroughly and uniformly scarify and de-gloss the surface.

1st Coat: Series 66 Hi-Build Epoxoline 2.0 - 3.0 mils
2nd Coat: Series 1095 EnduraShield 2.5 - 5.0 mils
Total Dry Film Thickness: 4.5 - 8.0 mils
Minimum Dry Film Thickness: 5.0 mils

D. System No. 1026-4: Acrylic Emulsion (Interior Exposed, Insulated Pipe)

Surface Preparation: Surface shall be clean and dry.

1st Coat: Series 1026 Enduratone 2.0 - 3.0 mils
2nd Coat: Series 1026 Enduratone 2.0 - 3.0 mils
Total Dry Film Thickness: 4.0 - 6.0 mils
Minimum Dry Film Thickness: 5.0 mils

E. System No. 1095-6: Epoxy Mastic/Urethane (Overcoat) (Existing Pipes Previously Coated with High Performance Coatings)

This system can be used over factory finish paint or over non-sandblasted steel and offer the high performance of a urethane coating. Series 1095 has a semi-gloss finish. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

Surface Preparation: High Pressure Water Clean (min. 3500 psi, 3 to 5 gallons per minute, using an oscillating tip and potable water). A cleaning detergent such as Trisodium Phosphate should be used to facilitate cleaning. A degreaser may be required for oil soaked areas or heavily contaminated areas.

Some spot areas may require Hand Tool (SSPC-SP2), Power Tool Cleaning (SSPC-SP3), or Brush Blast (SSPC-SP7/NACE No. 4) to remove loose surface rust.

Existing coatings must be clean, dry, and tightly adhering prior to application of coatings.

Spot Prime (Areas of Bare Steel): Series 135 Chembuild	4.0 - 6.0 mils
1st Coat: Series 135 Chembuild	4.0 - 6.0 mils
2nd Coat: Series 1095 Endura-Shield	<u>2.5 - 5.0 mils</u>
Total Dry Film Thickness: 6.5 - 11.0 mils*	
Minimum Dry Film Thickness: 7.0 mils	

**Does not include spot prime or previously existing coatings.*

3.24 SYSTEMS REFERENCE GUIDE

A. STEEL & FERROUS METALS

FERROUS METALS - NON-IMMERSION / EXTERIOR / UV-EXPOSED

- 3.14.A.1 System No. 700-1: Zinc/Epoxy/Fluoropolymer
- 3.14.A.2 System No. 1095-1: Zinc/Epoxy/Urethane
- 3.14.A.3 System No. 1095-2: Epoxy/Epoxy/Urethane
- 3.14.A.4 System No. 1095-3: Epoxy Mastic/Urethane (Overcoat)

EXTERIOR - BELOW GRADE

- 3.14.B.1 System No. N140-1: Epoxy/Epoxy/Epoxy or Urethane
- 3.14.B.2 System No. 46H-413-1: Polyamide Epoxy-Coal Tar

INTERIOR (NON-IMMERSION)

- 3.14.C.1 System No. 66-1: Polyamide Epoxy
- 3.14.C.2 System No. 27WB-1: Inorganic Hybrid WB Epoxy (Overcoat)

IMMERSION

- 3.14.D.1 System No. 20-1: Polyamide Epoxy (Potable)

B. OVERHEAD METAL DECKING, JOIST

- 3.15.A System No. 115-1: Self-crosslinking Hydrophobic Acrylic (Interior)
- 3.15.B System No. 1029-1 HDP Acrylic Polymer (Exterior)

C. GALVANIZED STEEL & NONFERROUS METALS

GALVANIZED STEEL, STAINLESS STEEL, ALUMINUM, OR COPPER

- 3.16.A System No. 1095-4: Epoxy/High Build Urethane

ALUMINUM IN CONTACT WITH CONCRETE

- 3.16.B System No. 46H-413-2: Polyamide Epoxy-Coal Tar

D. CONCRETE

EXTERIOR-ABOVE GRADE (VERTICAL SURFACES)

- 3.17.A.1 System No. 156-1: Modified Waterborne Acrylate (Elastomeric)
- 3.17.A.2 System No. 1026-1: Acrylic Emulsion (Non-Elastomeric)

EXTERIOR-BELOW GRADE

- 3.17.B.1 System No. 46H-413-3: Polyamide Epoxy-Coal Tar

INTERIOR (NON-IMMERSION)

- 3.17.C.1 System No. 66-2: Polyamide Epoxy
- 3.17.C.2 System No. 1026-2: Acrylic Emulsion

IMMERSION (POTABLE WATER)

- 3.17.D.1 System No. 22-2: Modified Polyamine Epoxy (Potable Water)
- 3.17.D.2 System No. 20-2: Polyamide Epoxy (Potable)

E. CONCRETE FLOORS (RESINOUS FLOORING SYSTEMS)

- 3.18.A.1 System No. 248-1: Moisture Cured Urethane (Thin film with increased chemical resistance, UV stability, and durability)
- 3.18.A.2 System No. 222-1: Decorative / Functional Flooring (Non-Slip)

F. GYPSUM WALLBOARD & WOOD

GYPSUM WALLBOARD

- 3.19.A.1 System No. 113-2: Acrylic Epoxy
- 3.19.A.2 System No. 1026-3: Acrylic Emulsion

WOOD - EXTERIOR or INTERIOR EXPOSURE

- 3.19.B.1 System No. 1029-2: HDP Acrylic Polymer

G. EXTERIOR OF PRESTRESSED CONCRETE TANKS

- 3.22.B System 156-3: Existing Tanks (Previously Painted)

H. PIPE EXTERIOR COATING SYSTEMS

- 3.24.A System No. N140-2: Epoxy/Epoxy/Topcoat (Buried or Exposed)
- 3.24.B System No. 46H-413-4: Polyamide Epoxy-Coal Tar (Buried Only)
- 3.24.C System No. 1095-5: Acrylic Polyurethane (PVC or HDPE Pipe)
- 3.24.D System No. 1026-4: Acrylic Emulsion (Interior Insulated Pipe)
- 3.24.E System No. 1095-6: Epoxy Mastic/Urethane (Overcoat)

3.25 COATING SCHEDULE

A. GENERAL

1. Interior of concrete surfaces (non-immersion) – System 66-2.
2. Exterior above grade masonry – System 156-1.
3. Exterior below grade masonry – System 46H-413-3.
4. Interior masonry – System 104-2.
5. Ductile iron pipe submerged exposed to corrosive environment – System N140-2.
6. Ductile iron pipe non-submerged exposed to exterior corrosive environment – System N140-2.
7. Carbon steel and mechanical equipment non-immersion exposed to corrosive environment – System 1095-1.
8. Galvanized and non-ferrous metals non-immersion exposed to corrosive environment- System 1095-4.
9. PVC piping non-submerged interior-System 1095-5.
10. Contractor shall submit color chart to owner for color selection.
11. Contractor shall schedule the painting work to occur near the end of the project.

END OF SECTION

SECTION 10200 - LOUVERS AND VENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Fixed and adjustable extruded-aluminum louvers.
- B. Related Sections include the following:
 - 1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.03 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section, unless otherwise defined in this Section or in referenced standards.
- B. Drainable-Blade Louver: Louver designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions.

1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.
 - 1. Wind Load: Uniform pressure (velocity pressure) of 30 lbf/sq. ft., acting inward or outward.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the louver manufacturer required for this project.
- B. Source Limitations: Obtain all louvers, Architectural and Mechanical, through one source from a single manufacturer.

1.06 SUBMITTALS

- A. Product Data: For each type of product specified.

- B. Product Certificates: Signed by manufacturers of louvers certifying that the products furnished comply with requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with AMCA's Certified Ratings Program.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Arrow United Industries.
 - 2. Greenheck
 - 3. Or Approved Equal.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Louver Schedule on the Drawings.

2.02 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.
- B. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
 - 1. Use types and sizes to suit unit installation conditions.
 - 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- C. Anchors and Inserts: Of type, size, and material required for loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as needed for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

2.03 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining materials' tolerances, and perimeter sealant joints.

1. Frame Type: Channel type, extended sill.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide sill extensions and loose sills made of same material as louvers to prevent water penetrating to interior.
- F. Join frame members to one another and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.04 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Louver Construction: Provide fixed-blade louvers with extruded-aluminum frames and drainable blades with hidden downspouts at jambs and mullions. Full head and sills with blades and jamb contained within.
- B. Horizontal, Drainable-Head Louvers: As follows:
 1. Louver Depth: 4 inches.
 2. Frame Thickness: 0.081 inch.
 3. Blade Thickness: 0.081 inch.
 4. Blade Angle and Spacing: 37 degrees and 6 inches o.c.

2.05 ADJUSTABLE EXTRUDED-ALUMINUM LOUVERS

- A. Louver Construction: Provide fixed-blade louvers with extruded-aluminum frames and drainable blades with hidden downspouts at jambs and mullions. Full head and sills with blades and jamb contained within.
- B. ½" diameter extruded aluminum axles of Pinlock design with double-sealed bearings.
- C. Operating linkage concealed in channel and out of air stream.

2.06 LOUVER SCREENS

- A. General: Provide exterior louver with louver screen complying with the following requirements:
 1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type For Intake Louvers: Insect.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:
 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.
 - a. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Mill finish, unless otherwise indicated.

3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.
- D. Louver Screening for Aluminum Louvers: As follows:
1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.
 2. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Factory finish louvers after assembly.

2.08 ALUMINUM FINISHES

- A. Kynar

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate Setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION

- A. Locate and place louver units level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. All fasteners shall be stainless steel or aluminum. Provide a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.03 ADJUSTING, CLEANING, AND PROTECTING

- A. Periodically clean exposed surfaces of louvers that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Protect louvers from damage during construction. Use temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at the time of Substantial Completion.
- D. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS & ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Cabinets.
- C. Accessories.

1.02 RELATED SECTIONS

- A. Section 09900 - Painting: Field paint finish.

1.03 REFERENCES

- A. NFPA 10 - Portable Fire Extinguishers.
- B. UL 299 - Dry Chemical Fire Extinguishers.
- C. UL 711 - Rating and Fire Testing of Fire Extinguishers.

1.04 SUBMITTALS FOR REVIEW

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

1.05 SUBMITTALS FOR INFORMATION

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- C. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.06 SUBMITTALS AT PROJECT CLOSEOUT

- A. Two copies Operation and Maintenance Data.
- B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.07 QUALITY ASSURANCE

- A. Provide units conforming with UL 711.

1.08 REGULATORY REQUIREMENTS

- A. Conform to NFPA 10 for requirements for extinguishers.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
 - 1. Potter-Roemer Model 7044-A Alta Series, full glazing with 3010 extinguisher.
 - 2. Larsen AL-2712-SM, full glazing with MPIO extinguisher, surface mounted.
 - 3. J. L. Industries, Academy Series 1023-F, with Cosmic 10E extinguisher.

2.02 EXTINGUISHERS

- A. Dry Chemical Type: UL 299, Cast steel tank, with pressure gage; Class A, B, C; 10 pound.
- B. Extinguisher Finish: Stainless steel enamel to red color as selected.
- C. Where called for on drawings provide brackets for 20 #APOC extinguisher mounting without cabinet.

2.03 CABINETS

- A. Metal: Formed aluminum.
- B. Configuration: Semi-recessed type, sized to accommodate accessories.
- C. Door Glazing: Plastic, clear, 1/4 inch clear acrylic.
- D. Cabinet Mounting Hardware: Appropriate to cabinet.
- E. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- F. Pre-drill for anchors.
- G. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.
- H. Weld, fill, and grind components smooth.
- I. Glaze doors with resilient channel gasket glazing.

- J. Finishing Cabinet Exterior Trim and Door: Anodized to clear color.
- K. Finishing Cabinet Interior: White polyester coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall backup for cabinet are correctly installed and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 5'-0" from finished floor to handle of extinguishers.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets on wall brackets.

3.03 LOCATIONS

- A. Provide one (1) fire extinguisher in the locations noted on the Architectural drawings.

END OF SECTION

SECTION 11235 CHEMICAL STORAGE AND FEED SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Contractor shall furnish all labor, materials, equipment, and appurtenances required to furnish, install, test and place into satisfactory operation complete chemical storage and feed systems as shown on the Drawings and as specified herein. This section includes, but is not limited to:
1. Sodium hypochlorite chemical feed pumps
 2. Sodium hypochlorite storage tanks
 3. Ammonium sulfate chemical feed pumps
 4. Ammonium sulfate storage tanks
 5. Control panel and associated equipment
 6. Chemical metering pump skids, complete with all piping, valves, and accessories needed for a fully operational and tested system.
- B. All electrical, mechanical, metal, painting and instrumentation work required and included herein shall conform to the applicable requirements of this project.
- C. It is the intent of these Specifications that the Contractor is to provide a complete and workable system whether or not any specific component is shown or specified.

1.02 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
1. The chemical feed system manufacturer(s) shall have at least five (5) years' experience in furnishing equipment of similar capacity and service capability to the equipment described herein. As part of their submittal package, the system manufacturer shall submit the following:
 - a. Evidence that the manufacturer's equipment of similar capacity and service capability has been in successful operation for at least five (5) years in at least ten (10) separate skid-mounted installations.
 2. Tank manufacturer(s) shall have experience producing substantially similar equipment and shall show evidence of at least five (5) installations where storage tanks of the types specified herein have been in satisfactory operation for at least five (5) years.
 - a. The tank manufacturer(s) shall perform the tests described below prior to shipping. Test samples shall be taken from the cut areas where fittings are inserted in each tank.
 - 1) Impact Test: ASTM 1998-Section 11.3 shall be used for this test. Sample shall not shatter at 120 ft. lbs. with sample at minus 20 degrees F for a ½-in wall thickness. For a wall

thickness less than ½-in, the sample shall not shatter at 100 ft. lbs. and minus 20 degrees F.

- 2) Degree of Crosslinking Test: ASTM 1998-Section 11.4 shall be used in this test. A minimum of 70 percent (70%) Gel must be obtained.
- 3) Hydrostatic Test: Each tank shall be filled with water and checked for leaks no less than one hour after filling.
- 4) Wall Thickness: Each tank shall have an actual wall thickness measurement taken at every 90 degrees, at each one-foot elevation, up to 3-feet from the bottom of the tank.

1.03 SUBMITTALS

- A. Manufacturer/Supplier's literature, illustrations, and bill of materials for each component of the system. Data shall include a complete description in sufficient detail to permit comparison with these Specifications.
- B. Dimensions, materials, size, and weight.
- C. Performance data.
- D. Drawings showing fabrication, assembly, installation, and wiring diagrams. Wiring diagrams shall consist of, at a minimum, control schematics, including coordination with other electrical control devices operating in conjunction with the chemical feed systems.
- E. Affidavits of compliance with referenced standards and codes.
- F. Tank Data:
 1. Dimensions of tank, cover, fittings, and attachments.
 2. Locations of fittings and attachments.
 3. Weight of tanks.
 4. Instructions for handling, storage, and installation of tanks.
 5. Statement that materials and resin used are suitable for intended service.
- G. Operation and Maintenance Data - Submit complete Operation and Maintenance manuals in accordance with Division 1.

1.04 WARRANTY

- A. Prior to acceptance of the chemical feed systems, provide written warranty from the system manufacturer that includes the following statements:
 1. System manufacturer has inspected the installation during and after completion and the chemical feed systems is free from faults and defects and is in conformance with the Contract Documents.
 2. Chemical feed systems shall remain free of defects for a period of one (1) year from the date of final acceptance.
 3. The Contractor shall warrant the tanks to be free from defects in materials and workmanship for three (3) years from the date of substantial completion and

to be suitable for the storage of Sodium Hypochlorite and Ammonium Sulfate, as specified in these Specifications.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All equipment and materials shall be inspected against approved Shop Drawings at time of delivery. Equipment and materials damaged or not meeting requirements of the approved Shop Drawings shall be immediately returned to the system manufacturer for replacement.
- B. Equipment and materials shall be stored in a dry location and protected from the elements according to the system manufacturer's instructions.
- C. Equipment and materials shall be handled in an approved manner according to the system manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL

- A. The chemical systems shall feed commercially available sodium hypochlorite and ammonium sulfate. Instrumentation, controls, logic, programming, interlocks, and valving shall be provided as required for the system to operate as described below. General arrangement, piping sizes, and accessories will be designed by the manufacturer and approved by the County. Two (2) sodium hypochlorite chemical feed pumps and two (2) ammonium sulfate chemical feed pumps shall be provided at the Chemical storage area.
- B. Chemical Feed Pump Operation
 - 1. The feed system metering pumps shall operate automatically in response to the control signals as described in Section 2.03. The 4-20 mA signals shall control the pump speed.
 - 2. A 4-20 mA chlorination residual signal and/or flow signal shall be used to control the feed pumps. If a pump fails, the pump shall automatically switch over to the standby pump and send an alarm.
 - 3. The feed system metering pumps shall be able to operate manually.

2.02 CHEMICAL STORAGE TANKS AND APPURTENANCES

- A. The tank(s) shall be rotationally-molded, high density cross-linked polyethylene, double wall, flat bottom tanks. The assembly consists of one cylindrical, closed top inner primary tank and one cylindrical, open top containment outer tank. Each tank is a rotationally molded one-piece seamless constructed tank. The tanks are designed for above-ground, vertical installation and are designed to store approved chemicals at atmospheric pressures. The assembly shall be designed to prevent rainwater and debris from entering the containment tank. Tanks shall be adequately vented as properly described by the manufacturer. Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer, date of manufacture, and serial numbers must be permanently embossed into the tank.

- B. High Density Cross-linked Polyethylene resin used in the tank manufacture shall contain ultraviolet stabilizer as recommended by resin manufacturer. Where black tanks are indicated, the resin shall have a carbon black compounded into it. The tank material shall be rotationally molded and be a resin that is commercially available at the time of tank manufacturer.
- C. For sodium hypochlorite, tank resin shall include an antioxidant polyethylene system with four times the antioxidant properties of a standard polyethylene bonded to the interior surface during the manufacturing process.
- D. Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.
- E. The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation:

$$T = P \times OD/2SD \text{ or } 0.433 \times SG \times H \times OD/2SD$$

Where: T = wall thickness, in
P = pressure, psi
SG = specific gravity, gm/cc
H = fluid head, ft
OD = outside diameter, ft
SD = hydrostatic design stress

- 1. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187” thick.
- 2. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.
- 3. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

Tank Diameter, ft	Min Knuckle Radius, in
less than or equal to 6	1
greater than 6	1-1/2

- D. The Storage tank type shall be double walled as manufactured by Poly Processing Co. Inc., Snyder Industries Inc., or approved equal.
- E. Unless otherwise indicated, tanks less than 2000 gallons in non-pneumatic applications shall have a manway cover 17-in or smaller of Polyethylene material with a coarse thread. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton for Sodium Hypochlorite and EPDM for Ammonium Sulfate.

NOTE: Tanks must be vented to allow for performance at atmospheric pressure, in accordance with the following matrix:

Venting Requirements For Polyethylene Tanks									
Mechanical Pump Fill	Pneumatic Fill								
IF ≤ 1000 gallons	IF - Vent length ≤ 3 feet			IF - Vent length > 3' and ≤ 30'			IF - Scrubber Application		
Vent size should equal size of largest fill or discharge fitting	AND - Vent screen mesh size ≥ 1/4" or no screen used			AND - 3 or less 90° elbows with no other restrictions or reduction in pipe size			Vent pipe size throughout scrubber system CANNOT be reduced!		
							Centerline of dispersion pipe not to be submersed > 6 inches		
IF > 1000 gallons	Emergency Pressure Relief Cover Required			Emergency Pressure Relief Cover Required			Perforated dispersion pipe must be same diameter or larger, as vent. Sum of perforations ≥ cross sectional area of pipe		
Vent size should exceed the largest fill or discharge fitting by 1 inch	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size
	2"	2"	4"	2"	2"	6"	2"	2"	6"
	3"	2"	6"	3"	2"	6"	3"	2"	8"
	3"	3"	6"	3"	3"	8"	3"	3"	10"

(2) 2 inch vents **DO NOT EQUAL** 4 inch venting capacity

For detailed venting guidelines, please visit our Technical Resources at www.polyprocessing.com

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- F. Sodium Hypochlorite tanks shall not exceed 5'-4" in diameter and 8'-3" in overall height.
- G. Ammonium Sulfate Tanks shall not exceed 2'-8" in diameter and 7'-0" in overall height.
- H. Each XLPE tank shall be equipped with the following accessories as shown on the Drawings:
 - 1. Accessories in top dome of sodium hypochlorite storage tanks:
 - a. 17-inch manway with pressure relief to prevent over pressurization of the tank.
 - b. 2-inch PVC flange style universal dome fitting for fill assembly with quick connect and cap.
 - c. 3-inch PVC flange style threaded bulkhead fitting for reverse float sight gauge.
 - d. 3-inch PVC flange style universal dome fitting for vent.
 - e. PVC NPT fitting with PVC pipe extension, sized as required for level sensor, 6-inch length, with flanged end for level sensor.
 - f. 3-inch PVC flange style universal dome fitting for overflow.
 - g. Others as required, specified elsewhere, or shown on the Drawings.

2. Accessories in top dome of ammonium sulfate storage tanks:
 - a. 14-inch manway with pressure relief to prevent over pressurization of the tank.
 - b. 2-inch PVC flange style universal dome fitting for fill assembly with quick connect and cap.
 - c. 3-inch PVC flange style threaded bulkhead fitting for reverse float sight gauge.
 - d. 3-inch PVC flange style universal dome fitting for vent.
 - e. PVC NPT fitting with PVC pipe extension, sized as require for level sensor, 6-inch length, with flanged end for level sensor.
 - f. 3-inch PVC flange style Universal dome fitting for overflow.
 - g. Others as required, specified elsewhere, or shown on the Drawings.

3. Level Indication:
 - a. Float Indication: The level indicator shall be assembled to the tank and shall consist of PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear UV resistant PVC sight tube, and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time. Indicator shall be neon orange color for visual ease for onsite operators.
 - b. Ultrasonic Level Indicator: The ultrasonic level indicator shall be a ultrasonic level transmitter, level controller with one 4-20 mA level input and NEMA 4X box to be supplied by tank manufacturer.
 - c. Reference Specification Section 13120 for additional requirements.

- N. The manway cover shall be a bolt on type or screw on type lid manufactured out of XLPE. Bolts used on the bolt on type lid shall be nylon or a compatible plastic material.

- O. All precautionary labeling shall be furnished and installed as recommended by the Manufacturing Chemists Association for each of the chemical bulk storage tanks.

2.03 SKID-MOUNTED CHEMICAL FEED PUMP FEED SYSTEMS

- A. The chemical metering pump feed systems shall include a skid assembly containing chemical metering pumps, all necessary piping, valves, fittings, supports, electrical controls and accessories as shown on the Drawings and specified herein.

- B. Manufacturers:
 1. ProMinent Fluid Controls, Inc.
 2. Approved equal.

- C. Solenoid-Actuated Metering Pump
 1. The chemical metering pump(s) shall be microprocessor-controlled, simplex, solenoid-driven, reciprocating, mechanically-actuated diaphragm type. All pumping functions shall be set by membrane-switch keypad and

status shall be displayed on an illuminated LCD. The housing shall be rated NEMA 4X.

2. The power supply shall be 120 VAC, 60 Hz, single phase.
3. The liquid end shall be physically separated from the drive unit by a backplate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the solenoid if the primary diaphragm fails. The diaphragm shall be constructed of a steel core, vulcanized into nylon-reinforced EPDM, with PTFE-faced fluid contact surface.
 - a. The liquid end shall be PVC with EPDM seals, with built-in coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure. The suction and discharge valves shall be of the double ball check design.
4. Stroke length control shall be manually adjusted between 0% and 100% with a stroke adjustment knob on the pump face control. The LCD shall digitally display stroke length setting in 1% increments in the full range between 0% and 100%.
5. Programming shall allow pump to display pump output in gallons/hour or liters/hour.
6. The pump shall be equipped with the programmable function of pressure levels to allow pump to operate at reduced pressures from the maximum rated pressure of the pump.
7. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or L/hr, dosing quantity, mA current input being received by pump, and indication of external mode.
8. Stroke frequency control shall be manually adjusted by touch keypads or turn knob, with the set stroke rate displayed on the LCD. The metering pump shall be capable of receiving a pulse input via optional external control cable such that one pulse gives one pump stroke rate. The pump shall be capable of remote ON-OFF operation using the pause function via a voltage free contact relay through a control cable.
9. The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmable at the pump. The pump shall allow the setting of a maximum stroke rate which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ratio in proportion to the electrical signal can be configured.
10. An SPDT relay shall be installed for pump fault indication. The metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e., low chemical supply in tank/lack of chemical supply shut down, flow monitor, system faults, and fuse/power supply failure).

D. Coordination

1. The chemical metering pump supplier shall coordinate the control requirements with the System Integrator so that the chemical metering pump power and control configuration is appropriate and complete.

- E. Each chemical feed system shall be completely assembled, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid are as indicated on the drawings and shall include the metering pumps, calibration column, piping, valves, piping accessories, (pulsation dampeners, strainers, back pressure valves, pressure relief valves, etc.), and wiring integral to the skid. The chemical metering pump manufacturer shall be responsible for providing all equipment, valves and piping within the skid boundary.
1. The skids shall be constructed of fusion welded polypropylene sheets with adequate supports for all equipment and piping of a ½" drip lip. Forklift truck cut outs shall also be provided.
- F. Accessories
1. Calibration Chamber
 - a. Provide one (1), clear plastic calibration chamber with vent for use in calibrating the metering pumps.
 - b. The chamber shall be sized to give adequate capacity for a minimum 30-second draw down test.
 - c. The scale shall give direct readings in mL and GPH without the need for calculations.
 - d. The calibration chamber shall be piped and valved so each pump shall be able to utilize the calibration chamber without interfering with the operation of the other pumps.
 - e. The top of the chamber shall have a threaded fitting to allow for piping to a common vent.
 2. Pulsation Dampeners
 - a. Shall be of the single diaphragm design, capable of arresting water hammer in the pump discharge lines created by the metering pumps.
 - b. Materials of construction of diaphragm and body shall be corrosion resistant to the chemical fluid pumped.
 - c. Provide one (1) dampener on the discharge side of each metering pump.
 - d. Each pulsation dampener shall include an integral pressure gauge.
 - e. Pulsation dampeners shall be sized appropriately for each pump to remove a minimum of 95% of the pulsations.
 3. Backpressure and Pressure Relief Valves
 - a. Adjustable diaphragm backpressure sustaining type valve installed on pump discharge header and set at location recommended by manufacturer. Materials to be suitable for rated chemical service.
 - b. Adjustable diaphragm pressure relief valve installed externally on pump discharge header and set at location recommended by manufacturer. PRV required for each pump mounted on feed system. Materials to be suitable for respective chemical service.

4. Piping, Valves and Appurtenances
 - a. Skid piping shall be Schedule 80 PVC. Cement shall be as recommended by the pipe manufacturer for the service outlined in the Section.
 - b. True-union ball valves shall be provided for isolation of major equipment. Seals shall be compatible with the chemical being pumped.

5. Flow Meters
 - a. Skids shall include chemical magmeters with ½” PVDF flanges and Teflon liners. Internal tube bore to be determined by skid manufacturer. Contractor to provide chemical flow ranges to manufacturer - see Section 2.05.
 - b. Chemical magmeter electrodes shall be Alloy C for Sodium Hypochlorite and 316 stainless steel for Ammonium Sulfate.
 - c. Chemical magmeters shall be factory or field installed by the skid manufacturer.

2.04 MAINTENANCE

- A. Provide all special tools required for normal maintenance. Tools shall be packaged in a lockable steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.

- B. Provide a list of all spare and replacement parts with individual prices and location where they are available. Prices shall remain in effect for a period of not less than one year after start-up and final acceptance.

2.05 CHEMICAL METERING PUMP SCHEDULE

QTY	GPH	Pressure	Size	Diaphragm	SPM	Drive	DBL/Ball/Chk	Chemical
2	3.7	80 PSIG	10	PTFE/E	72	AC	PVC/Viton	Ammonium Sulfate
2	5.1	80 PSIG	30	PTFE/E	72	AC	PTFE/Viton	12.5% Sodium Hypochlorite

1) Chemical metering pumps shall be capable of meeting +/- 50% of the above flow rates.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The chemical feed systems shall be installed in accordance with manufacturers’ instructions and recommendations in locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the Shop Drawings.

- B. Install the MHDXLPE tanks in accordance with the Drawings and the manufacturer’s

instructions.

- C. All fitting connections shall be installed with flexible type connections as per the Manufacturers recommendations.
- D. Make all pipe connections to tanks as shown on the Drawings.
- E. Following the field test, tanks and support members shall be anchored in their final position according to the manufacturer's recommendations.

3.02 FIELD PAINTING

- A. Field painting is included in Section 09900.
- B. Meter pumps shall not be field painted.

3.03 FIELD TESTING

- A. Working under the direction of the manufacturer's representatives, conduct in the presence of the County such tests as are necessary to indicate that each item of equipment conforms to this Section. Supply all electrical power, water, slurry, or chemical mix to complete the field tests.
- B. If the performance of any item of equipment does not meet the specified requirements, take corrective measures, or remove the unit and replace with one which satisfies the conditions specified. A 2-hour operating period for each item of equipment will be required before acceptance. During this 2-hour operating period, supply all power and water necessary.
- C. All chemical metering pumps shall be field calibrated in the presence of the County at 20, 50, 75 and 100 percent (20%, 50%, 75%, and 100%) of stroke and speed, and six (6) sets of calibration curves shall be provided.
- D. Tests on all chemical metering pumps are to be conducted at point of discharge at selected strokes and speeds to confirm repeatability of settings.
- E. After installation, each tank connecting pipes and valving shall be field tested by filling with water. The tank and fittings shall hold water without loss, evidence of weeping or capillary action for a period of 24-hours prior to acceptance. The County's Representative may also inspect the tank for defects, damage, and conformance with the Specifications.
- F. After testing, the tank shall be thoroughly cleaned and dried.
- G. Should any defects become evident during inspection, testing, or within the guarantee period, the Contractor shall repair or replace the defective tank or fitting(s) as approved by the County's Representative.

END OF SECTION

SECTION 11310 AXIAL SPLIT CASE CENTRIFUGAL PUMPS

PART 1 GENERAL REQUIREMENTS

1.01 DESCRIPTION OF WORK

- A. Work Included in this Section: The Contractor shall provide all the required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, and test equipment for furnishing, installation, adjustment, and full test loading of all the mechanical work shown on the Drawings and included in these Specifications.

1.02 QUALITY ASSURANCE

A. Reference Standards

1. American Iron and Steel Institute (AISI):
 - a. Steel Products Manual
2. American National Standard Institute (ANSI)
3. American Society of Mechanical Engineers (ASME)
4. American Water Works Association (AWWA)
5. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
6. FM Global (FM)
7. Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps (HI)
8. National Electrical Manufacturer's Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum)
 - b. ICS 6, Enclosures for Industrial Controls
9. National Fire Protection Agency (NFPA):
 - a. 70, National Electrical Code (NEC)
10. Underwriters Laboratories, Inc. (UL)
11. Electronic Industries Association (EIA)
12. Insulated Cable Engineers Association, Inc. (ICEA)
13. Institute of Electrical and Electronic Engineers, Inc. (IEEE)
14. National Electrical Contractors Association
15. National Electrical Safety Code (NESC)
16. Occupational Safety and Health Agency (OSHA)

- B. Available Manufacturers: Subject to compliance with requirements, provide from the following:
 - 1. Goulds
 - 2. Flowserve
 - 3. Approved equal

1.03 SUBMITTALS

- A. Submit manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards.
- B. Submit certified copies of reports of factory test specified in this section and required by referenced standards.
- C. Submit shop drawings showing all dimensions; also include performance data and physical characteristics.
- D. Submit manufacturer's parts list, operation and maintenance literature and instructions.
- E. Submit copies of the operating and maintenance manuals prepared specifically for this installation. Manuals shall include all required cuts, drawings, equipment lists, descriptions and similar items that are required to instruct operating and maintenance personnel unfamiliar with such equipment.
- F. Certified Factory Tests: Each pump shall be given a complete non-witnessed performance test to include head/capacity, Hp and efficiency to prove that the pumps supplied conform to the requirements of this specification. The curves shall be plotted from no flow at shut off head to maximum flow at minimum head specified. No shipment of the pumps shall be made until after the Engineer's approval of the testing is obtained.

1.04 GUARANTEE AND WARRANTY

- A. In addition to the requirements in the General Conditions and the Special Conditions, the Contractor shall require the manufacturer to furnish a warranty valid through the warranty period to assure that any equipment specified herein which does not meet the performance requirements for the specifications, is repaired to the County's satisfaction or replaced with equipment that does meet the performance requirements of the specification. The warranty shall be for minimum period of two years from the date of Final Acceptance for the portion of work associated with the equipment specified herein.

PART 2 PRODUCTS

2.01 AXIAL SPLIT CASE CENTRIFUGAL PUMPS

- A. Furnish and install two (2) axial split case centrifugal pumps. The pumps shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations. The power cables shall be sized according to NEC and ICEA standards.
- B. Power and pilot cable supports shall be provided and consist of a wire braid sleeve with attachment loops or tails to connect to the underside of the access frame.

2.02 MATERIALS

- 1. Construction: All iron / 316 SS (NSF Certified)
- 2. Pump case: Cast iron, ASTM A48, Class 30B.
- 3. Casing wear ring: Nitronic 60
- 4. Impeller: Austenitic 316SS
- 5. Casing gaskets: Non asbestos
- 6. Shaft material: 316SS
- 7. Shaft type: Straight bore
- 8. Shaft Sleeve: 316SS
- 9. Lubrication: Regreaseable bearings
- 10. Bearings: SKF 6211 (inboard) / SKF 5309 A/C3 (Outboard)
- 11. Mechanical Seal: Chesterton 155 1RCO-NSF (Carbon vs Silicon Carbide), Single Cartridge
- 12. Set screw: 316 SS

2.03 EQUIPMENT

- 1. Number of pumps: Two (2)
 - 2. Design conditions: See performance criteria.
 - 3. Pump configuration: Axial Split Case.
 - 4. Maximum pump speed: 1800 rpm
 - 5. Nameplate driver horsepower: See performance criteria.
 - 6. Drive type: Variable speed.
 - 7. Discharge: See performance criteria.
 - 8. Motor requirements:
 - a. 480V, 3 phase, 60 hertz
 - b. NEMA TEFC - Type B
 - c. Premium Efficiency
 - d. Inverter Duty Class H insulation
 - e. Thermal Winding Switches (Two per phase)
 - f. Space Heater
 - g. Service factor: 1.15
 - h. Sealed bearings
- 1) L-10 rating bearing life of 100,000 hours minimum

- i. All motor parts including frame, brackets, fan cover and terminal box shall receive a minimum of two coats of high grade USDA accepted epoxy paint. Motor assembly shall successfully withstand salt spray tests for corrosion in accordance with ASTM B 117 for 96 hours.

9. Ambient conditions:

- a. Water maximum temperature: 104°F
- b. Air maximum temperature: 176°F

2.04 COMPONENTS

A. General

Pump shall be single stage, double suction design. Materials shall be bronze-fitted, 316 stainless steel trim or all 316SS. High efficiency, heavy duty design and maintenance features shall be of primary importance as described in following specifications.

B. Casing

Shall be split with halves bolted together. Flanged suction and discharge connections shall be located in lower half. Removal of upper half shall permit inspection, maintenance or removal of entire rotating element without disturbing suction or discharge piping or driver. Seats for stuffing box bushing shall be cast and bored integrally with lower half casing. Casing shall be supported by integrally cast feet. Upper half shall have taps for seal piping, priming and vents. Lower half shall have taps for gauges and draining. Casing shall have permanently fixed stainless steel nameplate.

C. Impeller

Shall be enclosed, double suction to provide axial hydraulic balance, and cast in one piece. Shall be dynamically balanced and keyed to shaft.

D. Wearing Rings

Case wear rings shall be supplied to maintain proper running clearance with impeller hubs and to minimize leakage between suction and discharge chambers of casing. Shall be held in position by anti-rotation pins. Impeller shall be designed to accept impeller wear rings. Impeller rings shall be held in position by axial set screws.

E. Shaft

Shall have as short a span as possible to minimize deflection and vibration. Shall be completely sealed by gaskets between the shaft sleeves and impeller hubs to assure shaft is completely dry during operation.

F. Shaft Sleeves

Shall be held in position by sleeve nuts located outside the stuffing box area. Shall be key driven at the impeller end. An O-ring seal shall be provided to prevent leakage between sleeves and sleeve nuts.

- G. **Mechanical Seals**
Pump shall be furnished with single cartridge NSF certified mechanical seals with carbon vs silicon carbide seal faces.
- H. **Bearing Housings**
Seats shall be cast and bored integrally with lower half casing to assure accurate alignment of rotating assembly without need for external adjustment.
- I. **Bearings**
Double row ball bearing shall be provided on thrust end; single row deep groove ball bearing on coupling end. Thrust bearing shall be held in position on shaft with tapered snap ring and locked in bearing housing. Radial bearing shall be free to float axially in housing to take radial load only. Housings shall be completely sealed by Inpro VBX labyrinth seals to exclude moisture and dirt making units suitable for outdoor installation. Bearings shall be grease lubricated with reliefs to prevent over lubrication.
- J. **Bedplate and Coupling**
Bedplate shall be fabricated steel with drip lip, tapped drain connection and opening for grouting. Flexible coupling shall be supplied.

2.05 SPARE PARTS

- A. Spare parts shall be furnished as specified herein.
- B. Spare parts shall be marked with parts numbers and shall indicate the equipment for which they are intended. Spare parts shall be packed in suitable containers also marked with the parts numbers and the equipment for which they are intended.
- C. Prior to final acceptance of the work, the CONTRACTOR shall turn over to the COUNTY all specified spare parts. The CONTRACTOR shall prepare a listing of all such spare parts and include a copy of the list in the operation and maintenance manuals.
- D. The following spare parts and tools shall be furnished for each pump:
 - 1. One set of mechanical seals.
 - 2. One set of spare gaskets and o-rings.
 - 3. One set of casing rings.

2.06 SOURCE QUALITY CONTROL

- A. Secure from the pump manufacturer the following inspections and tests on each pump before shipment from factory:
 - 1. Check impeller, motor rating and electrical connections for compliance with Specification.
 - 2. Test motor and cable insulation for moisture content or insulation defects.

- B. Factory test of each pump with lab motor for head, flow, and efficiency per HI Standards acceptance grade 1U.

2.07 PERFORMANCE CRITERIA

PUMP #1 and #2 - BASIS OF DESIGN - FLOWSERVE 8LR-14A

Operating Conditions	
SERVICE	Booster Type - Split Case Pump
LIQUID	Water, Rated Temp. 72.0 deg F
CAPACITY	Rated 2,600.0 gpm
HEAD	80.0 (ft)
Performance at 1791 RPM per HI 14.6 1U basis power	
RATED EFFY	79.6% with contract seal
RATED POWER	66.0 hp (incl. Mech. seal drag 0.69). (Run out 96.3 hp NOL 108.1 hp)
NPSHR	26.6 ft
SHUT OFF HEAD	131.5 ft
MIN. FLOW	Continuous Stable: 851.8 gpm Hydraulic: 851.8 gpm
Materials	
CONSTRUCTION	All iron / 316SS (NSF Certified)
CASING	Cast iron (max.casing pressure @ rated temperature 175.0 psi g)
CASING WEAR RING	Nitronic 60
IMPELLER	316SS - Enclosed (11.13 in rated, max=14.00 in, min=10.50 in)
CASING GASKETS	Non asbestos
SHAFT MATERIAL	316SS SHAFT TYPE Straight bore
SHAFT SLEEVE	316SS
LUBRICATION	Regreasable bearings
Piping Bypass tubing	316SS

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine the pumps to be sure all passages are clean and clear of obstruction and that impellers rotate freely. Examine pump mounting surface and also make certain that bolts are properly located. Correct any irregularities prior to installation.

3.02 INSTALLATION

- A. Install pumps in accordance with specifications, drawings and manufacturer's written instructions. Install units level and plumb. Securely anchor units. Insure that stress is not applied to suction and discharge connections by piping. Make sure all connections are tight.
- B. Seal pump cable end with a high quality protective covering, to make it impervious to moisture or water seepage prior to electrical installation.

3.03 TESTING

- A. After installation, test pumps in accordance with Hydraulic Institute Standards. The pump shall be field tested to establish field head and overall efficiency. Report and test shall include voltage and amperage measurements

3.04 STARTUP AND TRAINING

- A. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training. The representative shall make a minimum of 2 visits, minimum 4 hours on site for each visit to the site. The first visit shall be for the assistance in the installation of equipment. Subsequent visits shall be for checking the complete installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of the Engineer and verify that the equipment conforms to the requirements. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.

END OF SECTION

SECTION 13100 INSTRUMENTATION & CONTROL, GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall provide, through the services of a single Control Systems Integrator (CSI), all components, system installation services, as well as all required and specified ancillary services, in connection with the Instrumentation and Control System (ICS).
- B. The system shall include all materials, labor, tools, fees, and documentation required to furnish, install, test, and place into operation, a complete and operable ICS as shown and/or specified within this section, related ICS specification sections, and subsections within equipment specifications.
- C. The system shall include all measuring elements, signal converters, transmitters, specialty cables, control panels, digital hardware and software, remote telemetry units (RTU), signal and data transmission systems, interconnecting wiring and such accessories as shown, specified, and/or required to provide the functions indicated, whether specifically mentioned or not.
- D. The specifications provided within this section shall be applied to all of the Instrumentation and Control specifications, Division 13, as well as additional specifications sections as referenced. The ICS shall be provided as a single and complete system as specified herein and as specified within the following ICS specifications:
 - 1. Section 13120 - Instrumentation and Control, Field Equipment
 - 2. Section 13130 - Instrumentation and Control, Control Enclosures
- E. For the purposes of these specifications the Control Systems Integrator shall be referred to as the CSI. Where references are made to the SCADA System Programmer or the SSP, it shall be understood that all application software services will be provided by others outside the scope of this Contract. Although the SSP will provide programming services outside of this Contract, that in no way relieves the CSI from providing all materials, labor, documentation, etc., including coordination, programming, startup, and testing services, as necessary to ensure the complete system is fully capable of providing all specified functions, whether provided by the CSI or programmed by the SSP. Additional clarifications of responsibilities are provided herein and within related ICS specifications, as it pertains to the relationship between the CSI and the SSP.
- F. The Contractor shall be ultimately responsible for installation of the ICS. However, the CSI will include installation within the scope of their subcontract to provide for installation of the complete system as specified. The CSI shall also coordinate this work with the Contractor to ensure that the proper type, size, and number of wires with their conduits are provided and installed. This coordination will also ensure that proper electrical power circuits are provided for all components and systems.
- G. The Contractor's responsibilities shall be to provide all additional materials and

work necessary to supplement the materials and work provided by the CSI; thereby satisfying all requirements that are within ICS specification sections.

- H. The Contractor shall coordinate structural work, penetrations, painting, etc., as required for installation of a complete ICS. In-line or integrally mounted items (such as flow elements, level sensors, etc.) shall be installed under the supervision of the CSI.
- I. The Contractor shall be responsible for coordinating interfaces between ICS equipment provided under the ICS specification sections and the equipment provided under other sections of the specifications. The Contractor shall verify and coordinate space requirements, process equipment power supply and voltage, process equipment control power supply and voltage, compatibility of control signals, details of equipment installation and interconnection. In addition to the above requirements, special consideration shall be given to equipment provided under the following specification sections:
 - 1. Section 02640 - Valves and Appurtenances
 - 2. Section 11310 - Axial Split Case Centrifugal Pumps
 - 3. Section 16370 - Variable Frequency Drives
- J. Coordination shall include distribution of approved shop drawings to all vendors, subcontractors, etc., involved in the control interface. Likewise, the Contractor shall ensure that instrumentation and control devices such as PLC equipment, network equipment, and field instruments, provided under other sections of the specifications, are compatible and of the same quality and characteristics as similar devices specified under the ICS specification sections.
- K. Where specific equipment manufacturers and model numbers are provided without additional named manufacturer, the equipment is to be provided as named to match the County's existing inventory.

1.02 SCOPE

- A. The scope listed within this subsection pertains to major items of supply. Refer to the complete Contract Documents for all requirements.
- B. Manatee County is in the process of upgrading equipment and modifying the operation of the North West Booster Pump Station. In order to effectively monitor and control this facility and support the upgraded equipment, modifications to the existing Instrumentation & Controls and SCADA system are required.
- C. Monitoring and control of the facility is accomplished through an existing PLC/RTU control panel which will be modified as part of the project to support the new equipment and operating protocols. The PLC/RTU control panel communicates over an Ethernet network to the local Operator Interface Terminal (OIT) and over a licensed radio communication link to the Lake Manatee Water Treatment Plant (LMWTP) SCADA System, both of which will be modified to support the facility changes.
- D. This project will provide for the following components, systems, or subsystems:

1. Provide modifications to the existing site PLC/RTU control panel (RTU 46) to support the signals included in the provided PLC I/O schedule. Modifications will maintain the consistency of the original panel and UL 508A requirements.
 2. Furnish various local process monitoring instrumentation complete with surge protection and signal transmission as specified and included in the provided Instrumentation Schedule.
 3. Furnish Surge Protective Devices (SPDs) for instrumentation and control panels as specified.
 4. Furnish spare parts as described herein.
 5. Provide implementation and testing of the complete system including all field signals regardless of provision and complete to the source generation.
 6. Furnish training of the County personnel.
 7. Provide Operations and Maintenance Manuals.
 8. Support the on and off-site programming and testing efforts of the SSP.
- E. The CSI shall provide control panel modifications complete with wiring, relay logic, pilot devices, backup power systems, power and signal line surge protection, radio communications equipment and appropriate interfaces to all station equipment.
- F. The Contractor, working in conjunction with the CSI, shall be responsible to provide a complete and operational system in full compliance with the specifications and contract drawings. The CSI shall be responsible for the detailed design, field verification, installation, technical oversight, testing, quality assurance and documentation of all technical details involving instrumentation and control for this project. The CSI shall furnish trained personnel on site during any activities requiring installation, calibration, testing or startup of any controls or communications.
- G. The following items will be provided outside of the CSI contract. This in no way relieves the Contractor or CSI from incorporating these items and providing a complete and functional ICS. The Contractor shall retain the services of McKim & Creed to perform the following for the contract Allowance.
1. PLC programming of control logic functions. This includes control applications for the monitoring and control of the existing high service pumping and chemical process. This does not include initial PLC configuration or any test programs to be provided by the CSI as part of the system installation and startup to satisfy testing requirements.
 2. SCADA and Historian Server application programming.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Divisions 2 & 11 - Equipment
1. Refer to individual product specifications within specification sections for additional requirements specific to those devices. Instrumentation and control equipment supplied as part of packaged systems and electric or pneumatic valve actuators shall be integrated into the ICS as specified and be in compliance with these specification sections.

- B. Division 12 - Furnishings
 - 1. Coordinate all ICS equipment installations within furnishings, to ensure proper fit, clearance, accessibility, environmental conditions, etc., are provided satisfactory to the equipment manufacturer and the County.
- C. Division 13 - Special Construction
 - 1. Refer to individual product specifications within specification sections for additional requirements specific to those devices. Instrumentation and control equipment supplied as part of packaged systems shall be integrated into the ICS as specified.
- D. Division 15 - Mechanical
 - 1. Refer to individual product specifications within specification sections for additional requirements specific to those devices. Instrumentation and control equipment supplied as part of packaged systems shall be integrated into the ICS as specified and be in compliance with these sections.
- E. Division 16 - Electrical
 - 1. Where electrical subcomponents are to be provided as part of ICS equipment, but for which there is no specification, provide in accordance with Division 16 - Electrical. These subcomponents shall be compatible and of the same quality and characteristics as similar devices specified under Division 16 - Electrical. If possible, the same make and/or model supplied under Division 16 shall be provided.
 - 2. The following work shall be provided under Division 16 - Electrical:
 - a. Conduit, raceways, and installation of wire and cable for all instrumentation and control system signal wiring, grounding systems, special cables and network cables except as noted.
 - b. Instrumentation and control system signal field wire.
 - c. Grounding systems for all ICS equipment.
 - d. Mounting of ICS electrical enclosures (i.e. control panels, SPD boxes, electronic instrumentation, etc.) with exclusion of final measuring elements of instrumentation (i.e. flow tubes, sensors in process piping, etc.) which shall be as coordinated by the Contractor.
 - e. Pump motor Variable Frequency Drives (VFDs)

1.04 DEFINITIONS AND ABBREVIATIONS

- A. The following definitions and abbreviations are used throughout the specifications and drawings when referring to instrumentation and control equipment, functions, and service. Definitions and abbreviations are not listed for those used in common industry practice except where to provide explicit meaning. Refer to ISA, IEEE, and other industry standard references for those not listed herein.

CSI.....Control System Integrator
 ICS.....Instrumentation and Control System

OIT.....Operator Interface Terminal
 OWS.....Operator WorkStation
 PID.....Proportional-Integral-Derivative Control
 SCADA.....Supervisory Control and Data Acquisition
 SSP.....SCADA System Programmer
 SPD.....Surge Protective Device
 RTU.....Remote Telemetry Unit
 PLC.....Programmable Logic Controller

1.05 CODES AND STANDARDS

- A. The ICS shall comply with the National Electric Code, National Electric Safety Code, OSHA, and with all applicable federal, state, county, municipal, and electrical utility codes and regulations, as well as the Contract Documents. In the event of any conflict between these codes, regulations, and Contract Documents, the most restrictive shall apply.

- B. The Instrumentation and Control System shall comply with the following codes and standards as well as any others within the specifications and drawings. In the event of any conflict between these codes, regulations, standards, and Contract Documents, the most restrictive shall apply.
 - 1. Applicable federal, state, and local code requirements.
 - 2. Applicable standards of the National Fire Protection Association (NFPA).
 - a. National Electrical Code (NEC).
 - b. Standard for Electrical Safety in the Workplace (NFPA 70E).
 - 3. Applicable standards of the Underwriter's Laboratories, Inc. (U.L.)
 - a. UL 508 Industrial Control Equipment.
 - b. UL 508A Industrial Control Panels.
 - 4. Applicable standards of the Institute of Electrical and Electronics Engineers (IEEE)
 - 5. Applicable standards of the National Electrical Manufacturers Association (NEMA)
 - a. NEMA 250 Enclosures for Electrical Equipment (1000 V Maximum).
 - b. NEMA ICS 1 Industrial Control and Systems: General Requirements.
 - c. NEMA ICS 6 Enclosures for Industrial Control and Systems.
 - 6. Applicable standards of the International Society of Automation (ISA)
 - a. S5.1 Instrumentation Symbols and Identification.
 - b. S5.4 Instrument Loop Diagrams.
 - c. S20 Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.
 - d. TR20.00.01 Specification Forms for Process Measurement and Control Instruments.

1.06

SUBMITTALS

- A. Submittals shall be provided in accordance with the requirements set forth in the General Conditions, Section 01340 - Shop Drawings, Project Data and Samples, and as specified herein.
- B. Every submittal shall have a separate section entitled "Requested Deviations from ICS Specifications" which shall clearly define and clearly explain all requested deviations and exceptions of the Instrumentation and Control System to this Specification. Only those deviations requests listed in this section will be reviewed.
- C. Submit complete, orderly, and indexed submittals as listed below. Partial submittals that do not contain sufficient information for a complete review or are unclear will not be reviewed and will be returned as not approved, resubmit.
- D. After all changes or corrections resulting from the review of the system supplier's drawings have been made, panels may be built and instrumentation devices may be supplied in accordance with the approved drawings. One set of "as shipped" prints shall be included in the panels when shipped from the system supplier's wiring and assembly shop.
- E. The following major list of submittals shall be provided as a minimum. Major submittals are generally listed in the order they are to be provided. Refer to related ICS specification sections and equipment subsections for additional submittals and submittal requirements.
 - 1. Preliminary Design Review/Project Plan Submittal
 - 2. Process Instrumentation Submittal
 - 3. SCADA System Hardware and Control Panel Submittal
 - 4. Training Submittal
 - 5. Testing Submittal
 - 6. Tools, Supplies, and Spare Parts List Submittal
 - 7. Preliminary and Final Operation and Maintenance Manuals
- F. Preliminary Design Review/Project Plan Submittal
 - 1. The Project shall provide an overview of the proposed system including system architecture diagrams, the approach to work, the proposed work schedule indicating milestones and potential meetings, project personnel and organization, details of factory and field testing, details of training programs, and a paragraph-by-paragraph review of the specifications indicating any proposed deviations. The schedule shall illustrate all major project milestones including the following:
 - a. Schedule for all subsequent project submittals, coordinated with the Contractor's overall project schedule. Schedule shall include review dates for each submittal listed under the schedule.
 - b. Tentative dates for all project design review meetings.
 - c. Schedule of manufacture and staging of all instrumentation and control system equipment.
 - d. Schedule for all testing.

- e. Schedule for shipment of all instrumentation and control system equipment and peripheral devices.
- f. Schedule for equipment start up.
- g. Schedule for all training.
- h. Project organization chart including responsibilities and contact information.

2. No other submittals will be allowed prior to acceptance of the Project Plan.

G. Process Instrumentation Submittal

1. This submittal shall provide complete documentation of all field devices and other instrument and control equipment not specified to be submitted elsewhere. The submittal shall include an index/table of contents with cross references to individual devices and equipment.

- a. Provide data sheets for each component listing all model numbers, options and ancillary devices that are being provided.

The data sheets shall be provided with an index and proper identification and cross referencing. They shall include but not be limited to the following information:

- 1) Plant Equipment Number and ISA tag number per the project P&IDs and/or Loop Diagrams.
- 2) Product (item) name used herein and on the Contract Drawings.
- 3) Manufacturers complete model number.
- 4) Location or service of the device.
- 5) Input - output characteristics.
- 6) Power requirements
- 7) Range, size, and graduations.
- 8) Set Points.
- 9) Physical size with dimensions, enclosure NEMA classification and mounting details.
- 10) Bills of material for all equipment assemblies including quantities, manufacturer, model number, description, and tagging cross reference.
- 11) Materials of construction of all components.
- 12) Options included for the device.
- 13) Instrument or control device sizing calculations where applicable.
- 14) Certified calibration data on all flow metering devices.

- b. Provide manufacturer equipment specification sheets and literature which shall fully describe the device, the intended function, how it operates and its physical environmental and performance characteristics. Information provided shall include data supporting the information provided in the data sheet and shall highlight all options and equipment details to clarify the specific device to be

provided. As a minimum, the specification sheets shall include the following:

- 1) Dimension, rigid-clearances.
 - 2) Mounting or installation details which includes mounting racks, sun shields, SPDs, cabling between sensor and transmitter (where applicable), etc.
 - 3) Connection.
 - 4) Electrical power or air requirements.
 - 5) Materials of construction.
 - 6) Environmental characteristics.
 - 7) Performance characteristics.
- c. The submittal shall also contain all planning information, site preparation instructions, grounding and bonding procedures, cabling diagrams, plug identifications, safety precautions or guards, equipment layouts and installation details in order to enable the Contractor to proceed with the detailed site preparation for all equipment.

H. SCADA System Hardware and Control Enclosures Submittal

1. Provide detailed drawings covering control panels, consoles and/or enclosures which shall include:
 - a. Cabinet assembly and layout drawings to scale. These shall include both front and interior layouts and include reference to the assembly bill of material. Dead-front panel details shall show enclosure with and without outer door. Enclosures requiring sun shields, air-conditioning units, and other equipment and accessories shall be included on layout scaled drawings.
 - b. Material, fabrication, and painting specifications.
 - c. Panel construction details such as NEMA rating, panel thickness, structural stiffeners and mounting brackets, door hinges, latches, etc.
 - d. Color selection samples for selection by the County's representative.
 - e. Bills of material for each control panel assembly to include item number, device cross reference designation, manufacturer, model number, description and quantity.
 - f. Panel nameplate schedule for exterior and interior of control panel which lists the nameplate inscriptions and service legends of all panel equipment and components.
 - g. Control panel design calculations including power supply loading/sizing, UPS loading/sizing, heat dissipation/heating and cooling requirements and I/O module layout with spare point availability.
 - h. Panel wiring diagrams showing all power connections to equipment within and on the panel, combined panel power draw requirements (volts, amps), breaker sizes, fuse sizes and grounding. This wiring diagram shall be in ladder logic format and shall reference the

- appropriate loop drawing for continuations or details where required. Show all wire numbers and terminal block designations.
- i. For modifications to existing equipment or control panels, provide scaled drawings and details which indicate all modifications and new equipment to be provided including updated bills of material, panel layouts, and wiring diagrams, power supply/UPS loading, etc.
2. Provide detailed loop diagrams on a single 11-in x 17-in or 8.5-in x 11-in sheet for each monitoring or control loop. The loop diagram shall show all components of the loop both analog, digital, and discrete including all relays, switches, dropping resistors, etc. which are being provided for proper operation. Loop numbers used shall correspond to the loop numbers indicated in the Contract Documents. The format shall be the International Society of Automation, Standard for Instrument Loop Diagrams, ISA-S5.4 plus the following requirements:
- a. On each diagram, present a tabular summary of (1) the output capability of the transmitting instrument, (2) the input impedance of each receiving instrument, (3) an estimate of the loop wiring impedance based on wire sizes and approximate length used, (4) the total loop impedance, (5) reserve output capacity.
 - b. Show all interconnecting wiring between equipment, panels, terminal junction boxes and field mounted components. The diagrams shall show all components and panel terminal board identification numbers and all wire numbers. This diagram shall include all intermediate terminations between field elements and panels (e.g. terminal junction boxes). The diagrams shall be coordinated with the electrical contractor and shall bear their mark showing this has been done.
 - c. Show location of all devices.
 - d. Provide instrument description showing type, manufacturer, model number, range, set points and operation (e.g. fail open, open on energize, normally closed, etc.) as applicable.
 - e. Show all instrument loop power or instrument air requirements back to termination on terminal block or bulkhead, fuse block (including fuse size), etc., as applicable.
3. This submittal shall provide complete documentation of the proposed hardware (PLCs, communications equipment, peripherals, etc.) including:
- a. A system block diagram(s) showing in schematic form, the interconnections between major hardware components such as control centers, panels, consoles, computers and peripheral devices, telemetry equipment, local digital processors and like equipment. The block diagram shall reflect the total integration of all digital devices in the system and shall reflect any human/machine interface locations. All components shall be clearly identified with appropriate cross references to the location of each.

The diagram shall reference all interconnecting cabling requirements for digital components of the system including any

data communication links.

Coordinate project IP addressing scheme and include all device addresses as part of the block diagram.

- b. Data sheet for each hardware component, listing all model numbers, optional, auxiliary and ancillary devices that are being provided.

The data sheets shall be provided with an index and proper identification and cross referencing. They shall include but not be limited to the following information.

- 1) Equipment Number and ISA tag number per the Loop Diagrams (where applicable).
- 2) Product (item) name used herein and on the Contract Drawings.
- 3) Manufacturers complete model number.
- 4) Location of the device.
- 5) Input - output characteristics.
- 6) Range, size, and graduations.
- 7) Physical size with dimensions, enclosure NEMA classification and mounting details.
- 8) Materials of construction of all components.
- 9) Power supply device sizing calculations where applicable.

- c. Equipment specification sheets which shall fully describe the device, the intended function, how it operates and its physical environmental and performance characteristics. Each data sheet shall have appropriate cross references to loop or equipment identification tags. As a minimum the specification sheets shall include the following:

- 1) Dimensions and working clearances.
- 2) Mounting or installation details.
- 3) Connection diagrams.
- 4) Electrical power requirements (volts, amps).
- 5) Materials of construction.
- 6) Environmental characteristics.
- 7) Performance characteristics.

- d. The submittal shall contain all planning information, site preparation instructions, grounding and bonding procedures, cabling diagrams, plug identifications, safety precautions or guards, and equipment layouts in order to enable the Contractor to proceed with the detailed site preparation for all equipment.

- 4. The submittal shall contain a complete system Input/Output (I/O) and termination list for the local control PLC panel. The list shall be sorted first by ISA tag name and second by I/O type (i.e. AI, AO, DI, DO, PI, PO. etc.). The list shall contain as a minimum the following for each active point and spare point:

- a. Full ISA instrument tag (or notation as spare).
- b. Type of I/O (i.e., DI, DO, AI or AO).
- c. I/O terminal point physical location (panel name, PLC or RIO unit number, rack, slot, point, etc.).
- d. I/O point address.
- e. Point name.
- f. Terminal Strip and Number

I. Training Submittals

- 1. Definition of each course.
- 2. Specific course attendance.
- 3. Schedule of training courses including dates, duration, and location of each class.
- 4. Resumes of the instructors who will conduct the training class.

J. Testing Submittals

- 1. The test plan shall be submitted after all equipment submittals have been approved by the County and/or Engineer.
- 2. The test plan shall demonstrate that the CSI has designed and configured a system that meets the design specifications. The documents for the test plan shall be structured so that it is easily understood what the inputs are, what the predicted outputs should be, and what the actual outputs are. The test plan should have sign-off and date block for the CSI, the Contractor, and the County.
- 3. The complete test plan should include but not be limited to the following:
 - a. Test assumptions and methods
 - b. Test Equipment List
 - c. Test Personnel Staffing and Qualifications
 - d. Test Schedule with time allotted for each task
 - e. System hardware and software summary.
 - f. Communications test to the various PLCs for Discrete and Analog I/O data transfer.
 - g. RSSI and signal to noise ratio values and result for each location.
 - h. Fiber optic cable and termination tests.
 - i. 100 percent I/O point test including all spare points based upon the previously submitted System I/O list.
 - j. Functional and Control strategy tests.
- 4. Test Procedures: Submit the procedures proposed to be followed during the test. Procedures shall include test descriptions, forms, and checklists to be used to control and document the required tests. Testing may not be started until all Testing Submittals have been approved.
- 5. Test Documentation: Submit a copy of the signed off test procedures upon completion of each required test.

6. Parameters/Calibration Information: Specific parameter and/or calibration information entered and used to set up the field instruments furnished under this contract.

K. Tools, Supplies, and Spare Parts Lists Submittal

1. This submittal shall include a list of all required and recommended spares. The following information shall be provided in table format:
 - a. Specification Section
 - b. Tag name
 - c. Description
 - d. Quantity
 - e. Manufacturer
 - f. Model, part, order number
 - g. Local distributor and manufacturer contact information. Contact information shall include address, phone number, and website.

L. Operational and Maintenance Manuals

1. Prior to installation of any equipment onsite, preliminary O&M manuals shall have been submitted and approved. No installation of equipment shall be permitted without the Contractor maintaining an updated version of these preliminary O&M manuals onsite for the County's and Engineer's use.
2. After all field changes or corrections made during installation and field check out have been completed, then all system supplier documentation, including drawings, shall be revised to reflect the "as installed, corrected and accepted" condition of the system and final record copies of O&M manuals for the system shall be provided to the County and Engineer for approval.
3. Final system documentation shall be provided in 3-hole type binders of archival quality (e.g. slant D or elliptical binding, vinyl with metal hinge or extra heavy weight vinyl, etc.) with a binding no larger than three (3) inches. Materials shall be printed on 8.5" x 11" or 11" x 17" tear resistant paper or ring reinforced paper where tear resistant is not available. Drawings shall be either folded to fit within an 8.5" x 11" binder or in an 11" x 17" 3-hole binder. Each binder shall include fifteen percent (15%) spare space for the addition of future material. Tear resistant paper shall be Xerox Never Tear or equal.
4. Final documentation shall also be provided in an electronic format. Electronic documentation shall be organized and provided on CD which shall include all CAD drawings, manuals and word processing documents. Electronic documentation format shall be primarily Adobe .pdf with additional documents provided in AutoCAD, Microsoft Office, HTML or as approved by the Engineer or County. Organization of the electronic documentation shall be such as to allow point and click navigation from a table of contents to the particular documents with the ability to return to the table of contents from any location with one mouse click.
5. AutoCAD drawings files shall include all supporting files, symbol libraries and print configurations needed to support future modifications and properly print additional drawing copies.
6. All electronic media (i.e. software, electronic documentation, configuration files/reports, device backups, etc.) shall be provided with two (2) backup

copies, each organized into a separate binder. Media storage binders shall include but not be limited to the following:

- a. Table of contents
 - b. Archival media holders (e.g. CD, DVD, floppy, tape disk, etc.)
 - c. Support contacts (i.e. company, phone, internet link, etc.)
 - d. Software system requirements and installation instructions
7. Laminated or water/tear resistant copies of all applicable instrumentation and control system drawings shall be supplied in drawing pocket of each control enclosure after "as installed, corrected, and accepted" revisions have been made to the enclosure.
8. Operation and Maintenance manuals shall include but not be limited to the following:
- a. Manufacturer standard O&M manuals for all equipment and software furnished.
 - b. Custom O&M information describing the specific configuration of equipment and software, and the operation and maintenance requirements for this particular project.
 - c. The manuals shall contain all illustrations, detailed drawings, wiring diagrams and instructions necessary for installing, operating and maintaining the equipment.
 - d. All modifications to manufacturer standard equipment and/or components shall be clearly identified and shown on the drawings and schematics. All information contained therein shall apply specifically to the equipment furnished and shall only include instructions that are applicable.
 - e. A functional description of the entire system, with references to drawings and instructions.
 - f. A complete "as built" set of all approved shop drawings, which shall reflect all work required to achieve final system acceptance.
 - g. Copies of well annotated "As Built" program listings of all application software provided and developed for this project contract. Listings shall reflect any modifications made during testing of the installed control system.
 - h. ISA calibration data sheets which includes specific instrument parameter information entered and used to set up the device.
 - i. A complete list of the equipment supplied, including serial numbers, ranges, configuration parameters and other pertinent data.
 - j. Full specifications on each item.
 - k. Detailed service, maintenance and operation instructions for each item supplied.
 - l. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
 - m. Complete parts lists with stock numbers and name, address and telephone number of the local supplier.
 - n. References to manufacturers' standard literature where applicable.

- o. Warning notes shall be located throughout the manual where such notes are required to prevent accidents or inadvertent misuse of equipment.
- p. The operating instructions shall clearly describe the step by step procedures that must be followed to implement all phases of all operating modes. The instructions shall be in terms understandable and usable by operating personnel and maintenance crews and shall be useful in the training of such personnel.
- q. The maintenance instructions shall describe the detailed preventive and corrective procedures required, including environmental requirements during equipment storage and system operation, to keep the System in good operating condition. All hardware maintenance documentation shall make reference to appropriate diagnostics, where applicable, and all necessary wiring diagrams, component drawings and PCB schematic drawings shall be included.

1.07 MEETINGS

- A. The Contractor shall be required to give the County and their representatives, at least two weeks' notice prior to any scheduled meetings. The notice may be shortened by consent.
- B. Preliminary Site Testing Meeting: A preliminary site testing meeting shall be conducted by the Contractor for the County and Engineer, to ensure site readiness, testing strategies and proper coordination between parties related or involved in testing the ICS. The Contractor shall be responsible for arranging the on-site meeting after the Site Testing Plan has been approved and no earlier than 3 weeks prior to testing. The Engineer must be satisfied that the site is ready and that the testing will be performed to their satisfaction prior to any documented ICS testing being performed. The Contractor shall arrange for detailed meeting minutes to be recorded, approved, and distributed to meeting attendees. Additional meetings may be required at the discretion of the County and Engineer to resolve specific action items not addressed in the preliminary site testing meeting. Two weeks prior to the meeting the Contractor shall submit the following for approval.
 - 1. A proposed list of meeting attendees including organization and phone number.
 - 2. A proposed meeting agenda.
 - 3. A list of personnel to be involved in the testing including their responsibilities, qualifications, and phone numbers.
 - 4. A list of tasks requiring County, Engineer or outside party involvement in testing.
 - 5. A testing schedule that coordinates the ICS testing with the operability of the specific equipment being tested.
- C. Additional meetings may be required at the discretion of the County and Engineer, to resolve specific action items not addressed in the preliminary design review or preliminary site testing meeting.

1.08 CONTROL SYSTEM INTEGRATOR

- A. The Control System Integrator shall be regularly engaged in the detailed design, fabrication, installation and startup of instrumentation and control systems for water and wastewater treatment facilities in the state of the project location. Any CSI that has been subject to litigation or the assessment of liquidated damages for nonperformance on any project within the last five calendar years shall not be acceptable.
- B. Where specific manufacturers and/or models of major hardware or software products (PLC, software, Network Equipment, Wireless Equipment, etc.) are specified to be used on this project, the CSI shall have completed at least one project using that specified hardware or software. As used herein, the term “completed” shall mean that a project has been brought to final completion and final payment has been made.
- C. Control System Integrators shall meeting the following minimum qualifications:
1. A minimum of 7 years’ experience with at least 5 years in water / wastewater projects
 2. References for 3 completed projects of like size and application to the project specified herein
 3. Project bonding capacity of \$2 million
 4. UL 508A certified panel shop
 5. Electrical contractors license in the project site’s state.
 6. On staff licensed professional engineer capable of being registered in the state of the project and registered in that state, if required to perform engineering services as specified to implement this project.
- D. The listing of acceptable Control System Integrators in this specification in no way relieves the Control System Integrator from meeting the qualifications specified herein. Acceptable Control System Integrators shall be as follows:
1. Rocha Controls: 5025 W. Rio Vista Ave., Tampa, FL 33634; (813)-628-5584; www.rochacontrols.com
 2. Revere Control Systems: 2240 Rocky Ridge Road, Birmingham, AL, 35216; (205) 824-0004; www.reverecontrol.com
 3. Wood Automation and Controls: 5306 4th Ave. Cir. E., Bradenton, FL, 34208; (941) 444-4165; www.woodPLC.com
 4. Or Pre-Approved Equal.
- E. The County shall have the right of access to the CSI’s facilities and the facilities of their equipment suppliers to inspect materials and parts, witness inspections, tests and work in progress, and examine applicable design documents, records and certifications during any stage of design, fabrication and tests. The CSI and their equipment suppliers shall furnish office space, supplies and services required for these surveillance activities.

1.09 QUALITY ASSURANCE

- A. The listing of specific products in this specification in no way relieves the Contractor of furnishing equipment which shall meet the performance and quality criteria

specified herein.

- B. All equipment and materials shall be new and the products of reputable recognized suppliers having adequate experience in the manufacture of these particular items.
- C. For uniformity, only one manufacturer will be accepted for each type of product.
- D. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses that may occur during fabrication, transportation, and erection as well as during continuous or intermittent operation. They shall be adequately stayed, braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.
- E. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, which shall be of sturdy and durable construction and be suitable for long, trouble free service.
- F. Electronic equipment shall be suitable for the specified environmental conditions.
- G. Optional or substituted equipment or both requiring changes in details or dimensions required to maintain all structural, mechanical, electrical, control, operating, maintenance or design features incorporated in these specifications and drawings, shall be made at no additional cost to the County. In the event that the changes are necessary, calculations and drawings showing the proposed revisions shall be submitted for approval. The Contractor shall coordinate all changes with other affected trades and contracts and pay all additional charges incurred.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All materials, equipment, and devices shall, as a minimum, meet the requirements of UL, where UL Standards are established for those items, and the requirements of NFPA-70. All control panels shall comply with the requirements of UL 508A for Industrial Control Panels. All items shall be new and unused unless specified or indicated otherwise.
- B. Prior to shipment of field panels, equipment, and instruments provide corrosive inhibitive vapor capsules in shipping containers as recommended by the manufacturer or distributor.
- C. Properly store, adequately protect, and carefully handle equipment and materials to prevent damage before and during installation. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations. Replace damaged or defective items.
- D. All equipment shall be the latest and proven design. Specifications and drawings call attention to certain features, but do not purport to cover all details entering into design of the instrumentation system. The completed system shall be compatible with functions required and the equipment furnished by the Contractor.

- E. All electrical components of the system shall operate on 120 volt, single phase, 60 Hz power source, except as otherwise noted in the Specifications. Drawings and specifications indicate the energy sources that will be provided. Any other devices necessary to obtain proper operation of the instrumentation and control system from these energy sources shall be furnished with the system.
- F. All necessary fuses or switches required by the instrumentation manufacturer for equipment shall be provided with the equipment. All instruments requiring internal power supply shall have internal on-off switches.
- G. The mechanical, process, and electrical drawings indicate the approximate locations of field instruments, control panels, systems, and equipment as well as field mounted equipment provided by others. The instrumentation subcontractor shall examine the mechanical, process and electrical drawings to determine actual size and locations of process connections and wiring requirements for instrumentation and controls furnished under this Contract. The CSI shall inspect all equipment, panels, instrumentation, controls and appurtenances either existing or furnished under other Divisions of the Specifications to determine all requirements to interface same with the ICS. The Contractor shall coordinate the completion of any required modifications with the associated supplier of the item furnished.
- H. Instrumentation equipment and enclosures shall be suitable for ambient conditions specified. All system elements shall operate properly in the presence of telephone lines, power lines, and electrical equipment.
- I. Inside control rooms and climate-controlled electrical rooms, the temperature will normally be 20 to 25 degrees C; relative humidity 40 to 80 percent without condensation and the air will be essentially free of corrosive contaminants and moisture. Appropriate air filtering shall be provided to meet environmental conditions (i.e., for dust).
- J. Other indoor areas may not be air conditioned/heated; temperatures may range between 0 and 40 degrees C with relative humidity between 40 and 95 percent.
- K. Field equipment, including instrumentation and panels, may be subjected to wind, rain, lightning, and corrosives in the environment, with ambient temperatures from - 20 to 40 degrees C and relative humidity from 10 to 100 percent. All supports, brackets and interconnecting hardware shall be aluminum, 316 stainless steel, or as shown on the installation detail drawings.

2.02 TOOLS, SUPPLIES, AND SPARE PARTS

- A. Provide special tools, other than those normally found in an electronic technician's tool box, required to test, diagnose, calibrate, install, wire, connect, disconnect, assemble and disassemble any digital equipment, instrument, panel, rack, cabinet or console mounted equipment for service and maintenance (i.e., connector pin insertion and removal tools, wire crimping tool, special wrenches, special instrument calibrators, indicator lamp insertion and removal tools, etc.).
- B. Provide tools and test equipment together with items such as instruction manuals, carrying/storage cases, unit battery charger where applicable, special tools, calibration fixtures, cord extenders, patch cords and test leads, which are not

specified but are necessary for checking field operation of equipment supplied under this Section.

- C. The CSI shall provide supplies as needed or as required by the County during the specified warranty period. All fuses consumed during installation, testing, start-up, the system availability demonstration, and the warranty period shall be replaced by the Contractor.
- D. Provide spare parts for items of ICS equipment as recommended by the manufacturer and in accordance with the Contract Documents.
- E. Furnish all spares in moisture-proof boxes designed to provide ample protection for their contents. Label all boxes to clearly identify contents and purpose.
- F. Refer to individual product specifications for additional requirements specific to those devices.

2.03 SIGNAL TRANSMISSION

- A. The Contractor shall be responsible for providing a signal transmission system free from electrical interference that would be detrimental to the proper functioning of the ICS equipment.
- B. The Contractor shall be responsible for coordinating signal types and transmission requirements between the various parties providing equipment under this Contract. This shall include, but not be limited to, distribution of appropriate shop drawings among the equipment suppliers and subcontractors.
- C. The CSI shall provide 24 VDC power supplies for signals and instruments where applicable and as required inside panels, controls, etc. Where two-wire instruments transmit directly to the instrumentation and control system, the CSI shall use power supplies at the PLC-equipped control panels for those instruments. Where four-wire instruments with on-board loop power supplies transmit directly to the instrumentation and control system, the CSI shall provide necessary signal isolators or shall otherwise isolate the input from the ICS loop power supply. Similar provisions shall be made when a third element such as a recorder, indicator or single loop controller with integral loop power supply is included in the loop.
- D. Analog signal transmission between electric or electronic instruments, controllers, and all equipment and control devices shall be individually isolated, linear 4-20 mA and shall operate at 24 VDC. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating. All cable shields shall be grounded at one end only, at the control panel, with terminals bonded to the panel ground bus. Analog signal isolation and/or conversion shall be provided where necessary to interface with instrumentation, equipment controls, panels, and appurtenances.
- E. Non-standard analog transmission systems such as pulse duration, pulse rate, and voltage regulated shall not be permitted except where specifically noted in the Contract Documents. Where transmitters with nonstandard outputs do occur, their outputs shall be converted to an isolated, linear, 4-20 mA signal.

- F. All discrete inputs to equipment and PLC's, from field devices, starters, panels, etc., shall be dry contacts in the field device or equipment, powered from the PLCs, unless specified otherwise. Sensing power (wetting voltage) supplied by the PLC shall be 24 VDC.
- G. All discrete outputs from local control panels and Control and Information System PLCs to field devices, starters, panels, etc., shall be 120 VAC / 28 VDC 5A dry contacts. Output contacts may be powered from the field equipment or powered from 24 VDC / 120 VAC sourced from PLCs cabinet power system, as required to interface with field equipment. Outputs to solenoid valves, horns, and strobe lights shall be 120 VAC, powered from the PLC or control panel unless specified or shown otherwise.
- H. Discrete signals between starters, panels, etc. where 120 VAC is utilized shall be clearly identified in the starter, panel, etc. as being powered from a different power supply, than other starter/panel components. Where applicable, warning signs shall be affixed inside the starter, panel, etc., stating that the panel is energized from multiple sources. Output contacts in the starter, panel, etc. which are powered from other locations shall be provided with special tags and/or color coding. Disconnecting terminal strips shall be provided for such contacts. The above requirements shall apply to all starters and panels, regardless of supplier.

2.04 NAMEPLATES

- A. All items of equipment listed in the instrument schedule, control panels, and all items of digital hardware shall be identified with nameplates. Each nameplate shall be located so that it is readable from the normal observation position and is clearly associated with the device or devices it identifies. Nameplates shall be positioned so that removal of the device for maintenance and repair shall not disturb the nameplate. Nameplates shall include the equipment identification number and description. Abbreviations of the description shall be subject to the Engineer's approval.
- B. Nameplates shall be made of 1/16 inch thick machine engraved laminated phenolic plastic having white numbers and letters not less than 3/16 inch high on a black background.
- C. Nameplates shall be attached to metal equipment by stainless steel screws and to other surfaces by an epoxy based adhesive that is resistant to oil and moisture. In cases where the label cannot be attached by the above methods, it shall be drilled and attached to the associated device by means of stainless steel wire.
- D. Nameplates for field instruments shall be 316 stainless steel, minimum of 1"H x 4"W and attached with stainless steel wire.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The CSI shall provide the Contractor a periodic written report detailing progress of start-up. This report shall include specific tabulations of devices on which start-up has been completed.

- B. Equipment shall be located so that it is accessible for operation and maintenance. The CSI shall examine the Contract Drawings and Shop Drawings for various items of equipment in order to determine the best arrangement for the work as a whole and shall supervise the installation of ICS equipment.
- C. Instrumentation and Control System equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field, all information relevant to the placing of process control work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- D. The CSI shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the CSI shall be required to ship his material in sections sized to permit passing through restricted areas in the building. The CSI shall also investigate and make any field modifications to the allocated space for each cabinet, enclosure, and panel, to assure proper space and access (front, rear, side).
- E. Two complete sets of approved shop drawings shall be kept at the job site during all on-site construction. Both sets shall be identically marked up to reflect any modifications made during field installation or start-up. All markings shall be verified and initialed by the Engineer or his designated representative. Following completion of installation and the operational readiness test, one set of the marked-up drawings shall be provided to the Engineer, the other retained by the CSI for incorporation of the mark-ups into final as-built documentation.
- F. All work shall be in strict accordance with codes and local rulings, should any work be performed contrary to said rulings, ordinances and regulations, the Contractor shall bear full responsibility for such violations and assume all costs arising there from.
- G. Brackets and hangers required for mounting of equipment shall be provided. They shall be installed in a workmanlike manner and not interfere with any other equipment.
- H. The Contractor shall take steps to keep electrical and control enclosures clean and free of contaminants throughout installation. Cleaning after installation is not acceptable. Under no circumstances are electrical and control enclosures to be cleaned using compressed air to blow out dust, causing contaminants to be forced into sensitive electronics.
- I. Provisions shall be made to completely capture filings (metal, etc.) when drilling into enclosures, to prevent contamination of electrical equipment.
- J. Upon completion of the instrumentation and control work, the Contractor shall thoroughly clean all soiled surfaces of installed equipment and materials and remove all surplus materials, rubbish, and debris that has accumulated during the construction work. The entire area shall be left neat, clean, and acceptable to the County.

3.02 WIRING AND GROUNDING

- A. The following wiring practice guidelines shall be used in order to minimize ground loops, to minimize electromagnetic interference/radio frequency interference (EMI/RFI) to this equipment, and to provide maximum practical immunity from damage resulting from lightning-induced transients.
- B. Common wires or conductors shall not be utilized (either within panels or external to panels or for grounding of field devices) for both signal shield or signal grounding and for safety grounds.
- C. Exposed wire lengths extending from within shielded signal cables shall be minimized to reduce pick-up of EMI/RFI by signal circuits. Exposed lengths of less than one inch are preferred, and a maximum exposed length of two inches may be permitted where necessary. No splicing of signal wires is permitted.
- D. All signal wiring shall be shielded, both within panels and external to panels. Unless otherwise specified, all signal wiring shall be No. 16 AWG stranded tinned two-conductor twisted pair, with 100 percent coverage aluminized Mylar or aluminized polyester shield and tinned copper drain wire.
- E. Signal wiring within outdoor or indoor field device enclosures shall conform to the same requirements as panel wiring.
- F. The shield on each process instrumentation cable shall be continuous from source to destination and grounded at one end only. In general, grounding of signal cable shields shall be done at the control panel end. The signal cable for no signal shall share a common cable shield grounding wire with the signal cable shield for any other signal and shall not share a common grounding wire with any other circuit. The length of no signal cable shield grounding wire shall not exceed two inches, with less than one-inch maximum length preferred.
- G. All indoor and outdoor instruments and panel enclosures shall be properly grounded by a good earth grounding rod or grid using the practice defined in Section 800.40 of the National Electric Code. Ground jumper wire to a signal ground wire, within a control panel or instrument 4-wire surge protection enclosure, is unacceptable.

3.03 TESTING, GENERAL REQUIREMENTS

- A. As a minimum, testing shall include the following:
 - 1. Operational Readiness Testing (ORT).
 - 2. System Acceptance Testing (SAT).
- B. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system's or subsystem's producing the correct result (effect), the specific test requirement will have been satisfied.
- C. All tests shall be conducted in accordance with prior Engineer approved procedures, forms, and check lists. Each specific test to be performed shall be described and a space provided after it for sign off by the appropriate party after its satisfactory completion.

- D. Copies of these sign off test procedures, forms, and check lists 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 Contractor shall require the CSI to coordinate all testing with the Contractor, all affected Subcontractors, and the County.
- G. The Engineer reserves the right to test or retest all specified functions whether or not explicitly stated in the prior approved test procedures.
- H. The Engineer's decision shall be final regarding the acceptability and completeness of all testing.
- I. The CSI shall furnish the services of servicemen, all special calibration and test equipment, and labor to perform the field tests.

3.04 OPERATIONAL READINESS TESTING (ORT)

- A. The entire system shall be certified (inspected, calibrated, tested, and documented) that it is ready for operation. Each specified function shall be verified on a paragraph-by-paragraph, loop-by-loop and site-by-site basis.
- B. The County and/or Engineer reserves the right to witness any test, inspection, calibration, or start-up activity. Acceptance by the Engineer of any plan, report, or documentation relating to any testing or commissioning activity specified herein, shall not relieve the Contractor of their responsibility for meeting all specified requirements.
- C. The CSI shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the County. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities for equipment specified herein.
- D. Each instrument shall be calibrated at 0, 25, 50, 75 and 100 percent of span using test instruments to simulate inputs and read outputs. Test instruments shall be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracies as set forth by the National Institute for Standards and Technology (NIST).
- E. The CSI shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposed calibration sheets for various types of

instruments for Engineer approval prior to the start of calibration. This sheet shall include but not be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made.

- F. If doubt exists as to the correct method for calibrating or checking the calibration of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.
- G. Upon completion of calibration, devices calibrated hereunder shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to over-voltage, incorrect voltages, overpressure or incorrect air. Damaged equipment shall be replaced and recalibrated at no cost to the County.
- H. After completion of instrumentation installation and calibration, the CSI shall perform a loop check. The Contractor shall submit final loop test results with all instruments listed in the loop. Loop test results shall be signed by all representatives involved for each loop test.
- I. Loop/Component Inspections and Tests: The entire system shall be checked for proper installation, calibrated, and adjusted on a loop-by-loop and component-by-component basis to ensure that it is in conformance with related submittals and the Contract Documents.
 - 1. The Loop/Component Inspections and Tests shall be implemented using Engineer approved forms and check lists.
 - 2. The Contractor shall require the CSI to maintain the Loop Status Reports and Components Calibration sheets at the job-site and make them available to the Engineer/ County at any time.
 - 3. These inspections and tests do not require witnessing. However, the Engineer will review and initial all Loop Status Sheets and Component Calibration Sheets and spot-check their entries periodically and upon completion of the Operational Readiness Tests. Any deficiencies found shall be corrected.

3.05 SYSTEM ACCEPTANCE TEST (SAT)

- A. Successful completion of the operational readiness test, as determined by the County and/or Engineer, shall be the basis for starting the witnessed system acceptance test. The Engineer shall approve the ORT test results and the Engineer and County shall be given two weeks' notice prior to the start of the System Acceptance Test.
- B. The system acceptance test shall repeat loop and functional testing done during the operational readiness test in order to demonstrate to the County and Engineer that the system has been started up, is operating, and is in compliance with these Specifications. Each specified function shall be demonstrated on a paragraph-by-paragraph, loop-by-loop and site-by-site basis.

- C. The SCADA system and PLC programming will be tested by the SSP for the new control system during the system acceptance testing. The CSI shall be available for testing services, as necessary, to ensure the complete system is fully capable of providing all specified functions, whether provided or programmed by the CSI or by the SSP. The CSI shall include (3) days minimum for testing and startup service with the SSP.
- D. The following documentation shall be made available to the Engineer during the test:
 - 1. All Contract Drawings and Specifications, addenda, and change orders.
 - 2. Master copy of the test procedure.
 - 3. One copy of all O&M Manuals at the job-site both before and during testing.
- E. Any malfunction during the tests shall be analyzed, and corrections made by the CSI. The Engineer and/or County will determine whether any such malfunctions are sufficiently serious to warrant a repeat of this test.
- F. After all functions have been tested and all corrections made, the system shall operate continuously for 15 days without failure before this test will be considered successful.
- G. The total availability of the system shall be greater than 99.5 percent during this test period. Availability shall be defined as "Avail. = (Total Time-Down Time,) / Total Time x 100%". Down times due to power outages or other factors outside the normal protection devices or back-up power supplies provided, shall not contribute to the availability test times above.

3.06 TRAINING

- A. The CSI shall provide project specific classroom training at the County's site or designated location. Training shall be provided for the operation and maintenance of all equipment provided, as well as site specific installation configuration training for the system as a whole.
- B. Each student shall be provided with training materials. All training materials shall be provided in hardcopy as well as electronically, with all materials in Microsoft Office or Adobe pdf file format. All training files shall be updated with final configuration information and resubmitted for approval.
- C. The County reserves the right to record any and all training sessions for the purposes of future or refresher training.
- D. To facilitate the County's operations staff scheduling, training shall be conducted in two (2) four-hour sessions, a morning session and an afternoon session. Morning and afternoon sessions will cover the same material on a given day. The training shall consist of one (1) day minimum with (2) sessions per day.
- E. Maintenance training shall be provided to designated maintenance personnel, so that each component may be maintained without the assistance of outside organizations. The training shall be extensive so that after training, personnel shall be able to identify

component malfunctions and repair components to the board/module replacement level. Training shall cover the entire system including controls and field equipment.

- F. Maintenance training shall be conducted in one (1) session, with a minimum of 8 hours of instruction.
- G. Under the scope of this project, the CSI will not be responsible for providing PLC and HMI control programming and logic. Specific training should therefore include, but not be limited to the following: System architecture and interconnection, wiring, field instrumentation, and PLC hardware including maintenance and troubleshooting.
- H. Refer to related specification sections for additional training requirements.
- I. Training sessions shall be carried out to the satisfaction of the County before final acceptance will be provided.

3.07 WARRANTY

- A. The warranty for the ICS shall be provided as specified in Section 1740 - Warranties and Bonds, and as specified herein. The warranty period for this system shall be for one year and shall begin upon acceptance of the complete system by the County. During this warranty period, the CSI shall provide, at no additional cost to the County, the services of a trained, competent, field service engineer who shall arrive on site within 36 hours of notification by the County or Engineer, to repair and/or replace any faulty device or equipment supplied by the system supplier as part of this Instrumentation and Control System. All preventive and corrective activities shall be documented with service reports, which shall identify the equipment being serviced, state the condition of the equipment, describe all work performed, and list materials used. A copy of all service reports shall be delivered to the County on or before the next business day.
- B. The CSI shall be capable of providing, after the warranty period for this system expires, a 1-year renewable service contract whereby a trained, competent field service engineer shall arrive on site within 36 hours of notification by the County. Information relative to charges for such service and availability of such service shall be submitted to the County and the Engineer.
- C. Components shall be furnished to the manufacturer's standard for service intended, unless otherwise indicated in the Specifications or on the Contract Drawings.

END OF SECTION

SECTION 13120 INSTRUMENTATION & CONTROLS - FIELD EQUIPMENT

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish, test, install and place in satisfactory operation all equipment required to provide a complete and operable Instrumentation and Control System (ICS) as specified herein and as shown on the Contract Drawings, even if each needed item is not specifically specified or shown.
- B. The Control System Integrator (CSI) shall provide full onsite supervision of all equipment provided under this section, where installation is provided by others.
- C. Field equipment (i.e. primary elements, measuring devices, transmitters, field controllers, chart recorders, indicators, and other instrumentation and accessories) shall be provided with all components necessary for a fully functional device whether specifically mentioned in these specifications or not. This shall include, as applicable or recommended by the manufacturer: sample conditioning, sensors, sensor holder and mounting brackets, transmitter, all required cables, calibration equipment, chemicals, reagents, and spare parts.
- D. Specialty cables between sensors/probes and their electronics/transmitters shall be furnished with each instrument. Cables shall be coordinated with the conduit installation and be of sufficient length to not require any splicing. Special cables include any type of cable not specified in Division 16 - Electrical.

1.02 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples and as specified in Section 13100 - Instrumentation and Controls, General Requirements. In addition, the following specific submittals items shall be provided:
 - 1. An ISA specification sheet for each instrument furnished and/or calibrated shall be submitted with the field equipment submittals. The ISA data sheet shall be in accordance with ISA Standards ISA S20 "Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves" and ISA TR20.00.01 "Specification Forms for Process Measurement and Control Instruments".
 - 2. The CSI and the field equipment manufacturer shall review the proposed installation and configuration of all field equipment, prior to submittal for approval, and shall identify any condition which shall require corrective measures. The following as a minimum shall be reviewed for the installation configuration of each instrument:
 - a. Listed features
 - b. Material of construction

- c. Consideration of process fluid
 - d. Environmental conditions
 - e. Installation location
 - f. Process connections
 - g. Ability to perform maintenance
3. Submit in writing in the field equipment submittal, that each piece of equipment is suitable for the proposed installation. Any proposed deviations shall be reviewed by the Engineer prior to execution.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Unless otherwise specified, instruments shall be provided with enclosures to suit the specified environmental conditions. Field-mounted devices shall be rugged and mounted on walls, equipment racks, or pipe stanchions. Where the field equipment's integral enclosure for a specified instrument is not available with the specified environmental rating, the field equipment shall be provided in a control enclosure as specified in Specification Section 13130 - Instrumentation and Controls, Control Enclosures.
- B. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted or shown on the Contract Drawings, installed adjacent or near to the sensor, in a readily accessible location. Special cables that are required for interconnection between sensors or probes and transmitters shall be furnished with the instrumentation devices by the associated equipment manufacturer. Special cables shall be of the required length for the equipment locations and conduit routing paths shown on the Contract Drawings. No splicing of cables will be accepted.
- C. Electronic equipment shall utilize printed circuitry and shall be coated (tropicalized) to prevent contamination by dust, moisture and fungus. Ambient conditions shall be - 15 to 50° C and twenty to ninety-five percent (20% - 95%) relative humidity, unless otherwise specified. Field mounted equipment and system components shall be designed for installation in dusty, humid and corrosive service conditions.
- D. All non-loop-powered instruments and equipment shall be designed to operate on a 60 Hz alternating current power source at a nominal 120 VAC, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
- E. All analog transmitter and controller outputs shall be isolated, 4-20 mA into a load of 0-750 ohms minimum, unless specifically noted otherwise.
- F. Each field instrument receiving a power source of 120VAC shall be provided with a field mounted disconnect switch, as specified under Division 16, allowing the

incoming power to the instrument to be removed or turned off at any time. Instruments mounted adjacent or nearby other instruments shall each have their own individual disconnect switch, where multiple instruments on one disconnect switch is unacceptable.

- G. Process taps for primary sensors shall be sized to suit each individual installation and the requirements of the instrument served. It is the Contractor's responsibility to ensure that the location, supports, orientation and dimensions of the connections and taps for instrumentation furnished under this Division are such as to provide the proper bracing, the required accuracy of measurement, protection of the sensor from accidental damage, and accessibility for maintenance while the facility is in operation. Isolation valves shall be provided at all process taps.
- H. All instrumentation exposed to sunlight shall be provided with sunshields constructed from 316 stainless steel. Sunshields shall be designed to withstand regional wind and ice loads. Sunshield design shall be submitted for approval.
- I. All outdoor external sample/process piping, including valves and appurtenances, shall be insulated with weather-proof insulation, and heat-taped to prevent freezing. Heat taping shall be thermostatically controlled and self-regulating, and shall adjust its heat output to the temperature of the lines.
- J. Each instrument shall include a stainless steel tag, with tag number and calibration data from the contract drawings, attached to the instrument. Where not physically connected to the instrument, the tag shall be attached with stainless steel wire.

2.02 TOOLS, SUPPLIES, AND SPARE PARTS

- A. Tools, supplies, and spare parts shall be provided as specified in Section 13100 - Instrumentation and Controls, General Requirements, and as specified for each equipment item. In addition, the following items shall be provided:
 - 1. All instruments shall be supplied with one (1) years' worth of supplies, including chemicals and reagents, for the calibration, operation, and maintenance of the device.

2.03 ACCESSORIES

- A. Instrument tubing shall be 1/4 x 0.065-inch seamless, annealed, ASTM A-269 Type 316L stainless steel with Type 316 - 37° stainless steel flared fittings, or equal to Swagelock or Parker-CPI flareless fittings.
- B. Diaphragm seals shall be provided to systems as shown on the Contract Drawings, as specified herein and/or for isolation of pressure gauges, switches and transmitters attached to systems containing chemical solutions or corrosive fluids. As a minimum, seals shall be of all 316 stainless steel construction. Diaphragms shall be 316L stainless steel for operating pressures at or above 15 psi, and elastomers for operating pressures below 15 psi. Diaphragm material shall be non-

reactive with the process fluid. Refer to the Instrument Schedules for specific materials requirements. Seal shall have fill connection, 1/4-inch NPT valve flush port and capable of disassembly without loss of filler fluid. Where specified, diaphragm seals shall comply with the above requirements, and shall be provided with 316 stainless steel factory filled capillaries. Seals shall be equal to Helicoid Type 100 HA, Mansfield & Green, Ashcroft or approved equal.

- C. Isolation valves shall be 1/2-inch diameter ball valves with 316 stainless steel body, 316 stainless steel ball.

2.04 SURGE PROTECTIVE DEVICES (SPDs)

- A. SPDs shall be supplied for all field equipment power, signal, and communications wires that have any portion extending outside of a building. Refer to Specification Section 13130 - Instrumentation and Controls, Control Enclosures for requirements.

2.05 LEVEL SWITCH, SUSPENDED FLOAT TYPE

- A. Float switches shall be of the non-mercury displacement type, encapsulated in polyurethane or vinyl floats.
- B. Units shall be waterproof, shockproof, explosion-proof and equipped with sufficient submersible cable to extend to the control panel or junction box without splicing.
- C. Any required weights shall be provided. Switches shall be suspended on a suitable rack or rail of stainless-steel construction.
- D. Suspended type float switches shall be equal to Flygt ENM-10, Anchor Scientific Eco- Float or approved equal. Where required due to shallow container depth, leak detection float switch shall be capable of normal operation in less than 4" liquid.

2.06 LEVEL TRANSMITTER, ULTRASONIC TYPE:

- A. Ultrasonic Level transmitters shall be provided for measurement of chemical storage tanks and/or as indicated on the Contract Drawings. Equipment shall be provided with features and accessories as described herein and suitable for the application.
- B. Ultrasonic level transmitters shall meet the following specifications as a minimum:
 - 1. NEMA 4X enclosure
 - 2. 120VAC, 60Hz input power
 - 3. Process display with keypad for menu driven configuration
 - 4. One (1) isolated 4-20 mA output
 - 5. One (1) alarm relay output
 - 6. Non-volatile memory
 - 7. Accuracy: 0.25 %

- C. The Transmitters shall be of corrosion resistant construction, utilizing only those exposed materials which are compatible with process specific fluid and/or gas exposure.
- D. The CSI shall provide all mounting hardware needed for all applications for this project; and shall coordinate the details of the installation so that the instruments are installed in keeping with the best standard and recommended practices of the manufacturer and conforming to the requirements set forth by the Engineer
- E. Level transmitters shall be fully programmable and configurable using a computer and keypad. The final 'As-Built' documentation shall be provided with a tabulation of the Programming Parameters used in each level transmitter so that the initial calibration can be reproduced if a spare transmitter is installed.
- F. Transmitters shall be installed using the appropriate transducer, suitable for the range and process connection of the installation. The cable provided with the transducer shall be of sufficient length to provide installation without splicing the cable at any point.
- G. The CSI shall provide flange mounting hardware components and appropriate mounting assistance to install and secure the transducers in a manner in keeping with the recommendations of the manufacturer of the equipment and/or in keeping with the general details provided in the drawings. All hardware shall be fabricated from corrosion resistant materials and shall utilize stainless steel hardware. The mounting system shall be secure and permanent and shall allow easy access to the sensor for servicing. All cables shall be installed in suitable rigid conduit with only short lengths of flexible conduit allowed to complete the installation.
- H. Spare parts: Provide one (1) spare Ultrasonic Level Transmitter of each type used, and one (1) spare transducer of each type used (supplied with the longest cable utilized in the project).
- O. Ultrasonic Level transmitters shall be VEGA Model VEGASON 61 or approved equal.

2.07 FLOW SWITCHES, VANE

- A. Vane operated flow switches shall consist of a paddle or vane, a magnet that moves with the paddle or piston and a reed switch. Motion from the vane shall be passed through a sealed, magnetically coupled mechanism to actuate the switch.
- B. Vane operated flow switches shall have the following specifications:
 1. Temperature Limit: 275° F
 2. Max. Operating Pressure: 1,000 psig
 3. Switch Type: SPDT snap action micro switch
 4. Switch Rating: 10 A, 125 VAC; 106 cycle contact life

5. Body Type/Material: Single piece milled, bored brass
 6. Enclosure Classification: Class I, Groups C, D
 7. Enclosure Classification: Class II, Groups E, F, G
 8. Vane Type/Material: Layered, 316 stainless steel
- C. Manufacturer/Model: Model V4-2-U Flotect by W.E. Anderson, or equal.

2.08 SUNSHIELDS

- A. All outdoor mounted transmitters shall be provided with a 316 stainless steel sunshield. Sunshields are to be sized so that the sunshield will extend a minimum of three (3) inches beyond the transmitter enclosure on all sides.
- B. The sunshield shall be sized to include protection for the transmitter and the surge arresting device.
- C. All sunshield and instrument mounting hardware shall be 316 stainless steel.
- D. Orient Sunshield and transmitter so as to minimize exposure of display to direct sunlight.
- E. Sunshield design shall be submitted for approval.

PART 3 EXECUTION

3.01 REQUIREMENTS

- A. In addition to the requirements specified in this section, refer to Section 13100 - Instrumentation and Controls, General Requirements.

END OF SECTION

INSTRUMENTATION AND CONTROL SYSTEM INSTRUMENT SCHEDULE
MANATEE COUNTY, FLORIDA

NORTHWEST BOOSTER PUMP STATION

TAG	SPECIFICATION	DESCRIPTION	SERVICE	RANGE/SET POINT	SUPPLIER	NOTES
DGS-NWB-400-FS-101		Vane Flow Switch	Chemical Building Emergency Eyewash/ Shower High Flow		Vendor	
DGS-NWB-400-LIT-135	13120-2.06	Ultrasonic Level Transmitter	Sodium Hypochlorite Storage Tank 1 Level	0-20 FT	ICS/Vendor	
DGS-NWB-400-LIT-136	13120-2.06	Ultrasonic Level Transmitter	Sodium Hypochlorite Storage Tank 2 Level	0-20 FT	ICS/Vendor	
DGS-NWB-400-LIT-145	13120-2.06	Ultrasonic Level Transmitter	Ammonium Sulfate Storage Tank 1 Level	0-20 FT	ICS/Vendor	
DGS-NWB-400-LIT-146	13120-2.06	Ultrasonic Level Transmitter	Ammonium Sulfate Storage Tank 2 Level	0-20 FT	ICS/Vendor	
DGS-NWB-400-LS-137	13120-2.05	Non-Mercury Float Level Switch	Sodium Hypochlorite Storage Tank Containment High Level		ICS/Vendor	
DGS-NWB-400-LS-138	13120-2.05	Non-Mercury Float Level Switch	Sodium Hypochlorite Metering Skid Containment High Level		ICS/Vendor	
DGS-NWB-400-FIT-139	11235-2.03,F,5	Chemical Magnetic Flow Meter	Ammonium Sulfate Flow	0-XX GPH	Vendor	
DGS-NWB-400-FIT-149	11235-2.03,F,5	Chemical Magnetic Flow Meter	Sodium Hypochlorite Flow	0-XX GPH	Vendor	

SECTION 13130 INSTRUMENTATION & CONTROL, ENCLOSURES

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish, modify, test, install and place into satisfactory operation all control enclosures (i.e. Field panels, control panels, RTU panels, cabinets, consoles, boxes, etc.) required to provide a complete and operable Instrumentation and Control System (ICS) as specified herein and as shown on the Contract Drawings, even if each needed item is not specifically specified or shown.
- B. The Contractor shall also be responsible to provide modifications to existing control panels as described herein or as indicated in the PLC Input/Output Schedule Attachment. Modifications to existing control panels shall also conform to the requirements of these specifications.
- C. New control enclosures and/or subpanels shall be assembled, wired, and tested in the CSI's own facilities, unless specified otherwise.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. In addition to the requirements specified in this section, the requirements of specification Section 13100 - Instrumentation and Control, General Requirements and the sections referenced therein shall be applied.

1.03 SUBMITTALS

- A. All submittals shall be in accordance with Section 13100 - Instrumentation and Control, General Requirements. In addition, the following specific submittal items shall be provided.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All enclosures shall fit within the allocated space shown on the Drawings. The Contractor shall examine plans and/or field inspect new and existing structures as required to determine installation requirements and shall coordinate the installation of all enclosures with the County and all affected contractors. The Contractor shall be responsible for all costs associated with installation of enclosures, including repair of damage to structures (Incidental, accidental, or unavoidable).
- B. A minimum estimated size is shown on the Drawings. The Contractor shall furnish enclosures of the size and quantity required to house the manufacturers' equipment supplied and all other electrical components installed in the enclosure. In addition, provide useful space and power supply capacity as spare for future expandability to a minimum of one (1) item per item type installed or twenty percent (20%) of quantity of each type item installed, whichever yields the greater spare space.
- C. Enclosures (cabinets, panels, boxes, etc.) shall be formed or welded construction, reinforced with Unistrut, Powerstrut or equal to facilitate mounting of internal components or equipment. Sufficient access plates and doors shall be provided

to facilitate maintenance and testing of the supplier's equipment. Doors shall be removable. Enclosures with any dimension thirty-six (36) inches or greater shall be provided with removable lifting lugs designed to facilitate safe moving and lifting of the panel during installation. No screws or bolts shall protrude through from the interior enclosure.

- D. All steel enclosures shall be free from dirt, grease and burrs, and shall be treated with a phosphatizing metal conditioner (phosphate conversion coating) before painting. All surfaces shall be filled, sanded, and finish coated by spraying a 1-2 mil epoxy prime coat and smooth, level, high grade textured finish between flat and semi-gloss shine. The colors shall be selected by the County from a minimum of six (6) color samples provided. All stainless steel enclosures shall be polished to a No. 4 finish.
- E. Enclosures shall be prefabricated cabinets and panels equal to Hoffman, Saginaw, Rittal or Schaefer. The Contractor may optionally provide enclosures custom fabricated by a reputable panel fabrication shop acceptable to the Engineer.
- F. Each panel shall incorporate a removable back panel on which control components shall be mounted. Back panels shall be secured to the enclosures with collar studs. All components shall be of the highest industrial quality and securely mounted to the removable back panels with screw and lock washers. Back panels shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.
- G. All enclosures with any dimensions of (24) inches or larger shall be provided with drawing pockets for as-built panel drawings. One (1) laminated copy of the appropriate panel as-built drawings shall be furnished and left in the pocket of each panel.
- H. All enclosures shall be protected from internal corrosion-inhibiting vapor capsules as manufactured by Northern Instruments Model Zerust VC, Hoffman Engineering, Model A-HCL, or equal.
- I. All metallic enclosures with door mounted equipment shall have the door grounded by means of flexible ground strap.
- J. The enclosure and all interior and exterior equipment shall be identified with nameplates. The equipment shall be mounted such that service can occur without removal of other equipment. Panel mounted equipment shall be flush or semi-flush mounted with flat black escutcheons. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating. All enclosures shall fit within the allocated space as shown on the Contract drawings.
- K. Enclosures shall provide mounting for control equipment, input /output subsystems, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling.
- L. Locate equipment, devices, hardware, instrumentation and controls, electrical equipment and wiring to be installed inside the enclosures and/or as facial features on the enclosures, so that connections can be easily made and so that there is ample room for servicing each item. Every component in and on the enclosures

shall be able to be removed individually without affecting the other components and without the need to move other components. Support and restrain all internally, as well as panel mounted components to prevent any movement.

- M. All cabinets and/or enclosures shall be NEMA rated for the environment in which it is to be installed and as noted in the Drawings.
- N. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.
- O. Control panels shall be built in accordance with UL508A Industrial Control Panels and NEC Article 409 Industrial Control Panels. Control panels shall be UL508A labeled and marked as defined in NEC 409.110 with the following:
 - 1. Manufacturer's name and contact information (i.e. address, phone, website, email, etc.).
 - 2. Supply voltage, phase, frequency, and full-load current.
 - 3. Short-circuit current rating or the industrial panel based on one of the following:
 - a. Short-circuit current rating of a listed and labeled assembly.
 - b. Short-circuit current rating established utilizing an approved method.
 - c. Electrical wiring diagram numbers or the index sheet to the electrical wiring diagrams.
 - d. The enclosure type number (i.e., NEMA 1A, 3R, 12, 4X, 9, 9, etc.).
- P. All work shall be performed in a professional manner and in consideration of allowing ease of future troubleshooting and maintenance. All equipment should be mounted so as to minimize crowding within the panel. All devices shall be mounted and wired in a neat and workmanlike manner. Each component shall be prominently identified with the use of permanent engraved legend plates.
- Q. Grounding: All suppressors shall be grounded per the suppressor manufacturer's recommendations. Furnish control panels with an integral copper grounding bus for connection of suppressors and other required instrumentation. Provide single-point connection of all grounds to grounding bus using the shortest possible path. Each grounded object shall have a separate connection to the ground bus. Do not connect cable shields to suppressor ground terminal or daisy-chain ground connections. Provide 1-inch wide by 1/8-inch thick copper ground bus as a minimum.

2.02 PANEL ENCLOSURE MATERIAL AND CONSTRUCTION

- A. Outdoor Enclosures
 - 1. All outdoor enclosures shall be rated NEMA 4X, constructed of 316 stainless steel with a white powder epoxy coating finish unless specified otherwise. Outdoor enclosures shall have a hinged and gasketed door. Door latches shall be all stainless steel, fast operating clamp assemblies (quick release), which do not require bolts or screws to secure. Gaskets shall be polyurethane.

2. Outdoor panels shall be fitted with pad-lockable latch kits.
3. Outdoor enclosures with internal digital electronics, exterior indicators, or exterior indicator lights shall have external sun shields or sun shades, constructed of the same materials as the associated enclosure, unless otherwise specified.
4. Outdoor enclosures shall be designed for ambient conditions of -15 to 50°C and twenty to ninety-five percent (20% - 95%) relative humidity, unless otherwise specified. Outdoor enclosures shall be provided with thermostatically controlled space heaters to provide condensation protection.

B. Indoor Enclosures

1. Indoor enclosures located in the same area (i.e. room, etc.) as open process tanks, open process channels, closed process piping, chemical tanks, or process equipment containing wet liquids or possible airborne powders, shall be rated NEMA 4X, constructed of 316 stainless steel, fiberglass, fiberglass reinforced polyester, or polycarbonate, unless specified otherwise. Enclosures shall have a hinged and gasketed door. Door latches shall be all stainless steel, fast operating clamp assemblies (quick release) which do not require bolts or screws to secure. Gaskets shall be polyurethane.
2. Indoor enclosures located in a dry or environmentally controlled area (i.e. electrical room, etc.) shall be NEMA 12 steel, unless specified otherwise. Enclosures shall have a hinged and gasketed door. Door latches shall be 3 point door latch with handle for all enclosures with a dimension of 24 inches or larger, or otherwise shall be fast operating clamp assemblies which do not require bolts or screws to secure. Gaskets shall be polyurethane.
3. Indoor enclosures in a non-air conditioned space shall be designed for ambient conditions of 0 to 40°C and twenty to ninety-five percent (20% - 95%) relative humidity, unless otherwise specified. Indoor enclosures in an air conditioned space shall be designed for ambient conditions of 20 to 30°C and twenty to eight-five percent (20%-85%) relative humidity, unless otherwise specified.

C. Terminals

1. Terminal blocks shall be assembled on non-current carrying galvanized steel DIN mounting rails, securely bolted to the cabinet sub-panel. Terminals shall be of the screw down pressure plate type equal to that manufactured by Allen Bradley, Phoenix Contact, Wieland, Square D, or equal. Power terminal blocks shall be single tier with a minimum rating of 600 volts, 30 amps. Signal terminal blocks shall be single tier with a minimum rating of 600 volts, 20 amps.
2. Terminals shall be marked with a black waterproof, permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

D. Wiring

1. All wiring shall be bundled and run open or enclosed in vented plastic wireway, as required. All conductors run open shall be bundled and bound with nylon cable ties, at regular intervals, with intervals not to exceed 12 inches. Adequately support and restrain all wiring runs to prevent sagging or other movement. Care shall be taken to separate communication, network, electronic signal, AC discrete signal, DC discrete signal and power wiring. Wiring to equipment mounted on doors or where movement of the equipment will take place, shall be installed in nylon spiral wrapping sheaths.
2. Wires shall be color coded as follows:
 - a. Equipment Ground - GREEN
 - b. 120 VAC Power Distribution - BLACK
 - c. 120 VAC Power Neutral - WHITE
 - d. 120 VAC Control (Internally Powered) - RED
 - e. 120 VAC Control (Externally Powered) - YELLOW
 - f. 24 VAC Control - ORANGE
 - g. DC Power (+) - BLUE
 - h. DC Power (-) - BLUE/WHITE
 - i. DC Control - BLUE
 - j. Analog Signal (+) - BLACK
 - k. Analog Signal (-) - WHITE\
3. All wiring shall comply with accepted standard instrumentation and electrical practices. Field wiring for power, control and signal wires shall comply with Division 16 of the specifications. For each pair of parallel terminal blocks, the field wiring shall be between the blocks.
4. Internal panel wiring shall be as follows:
 - a. AC power wiring: 14 AWG minimum, stranded copper conductors, THHN/THHW wire rated for 600 volts and 90 °C. For wiring carrying more than 15 amps, use sizes required by NEC.
 - b. AC control and dc power and control wiring: 16 AWG minimum, stranded copper conductors, THHN/THHW wire rated for 600 volts and 90 °C.
 - c. Instrument signal wiring: 18 AWG stranded conductors, tinned copper, twisted pair or triad, overall one hundred percent (100%) aluminum foil shield with 20 AWG stranded drain wire, plenum rated 300V 60°C polyethylene insulated wire with PVC jacket, equal to Belden 8760.
 - d. All stranded wire shall have a minimum of sixteen (16) strands, except for drain wires.

E. Identification

1. Provide a laminated black nameplate with beveled edges and ½ inch white letters to identify each console, panel or cabinet on the front of the enclosure.
2. Provide laminated, beveled edge, plastic legend plates and nameplates, with 1/4 inch letters, for each front panel mounted device as shown on the

Drawings. Legend plates and nameplates shall be the size as shown on the Drawings. Color shall be black lettering on white background except caution/warning nameplates which shall be white lettering on a red background. Attach front panel nameplates with both a permanent adhesive and stainless steel machine screws into tapped holes.

3. Tag all interior instruments and other components with engraved, laminated plastic nameplates with 1/8 inch, minimum, lettering. Legends shall be consistent with wiring and layout drawings. Nameplates shall be attached with permanent adhesive to the panel, near the device or on the device itself or as otherwise approved by the Engineer.
4. Number and label each wire in the systems. Every unique wiring node shall have its own individual unique number. Numbers shall be shown on all submitted drawings. All wires shall be labeled at each termination and junction of the wire and at 30 inch intervals along the wire. All multi-conductor cables shall be labeled at each end and at 30-inch intervals with CBL-XXX and also label each conductor at both ends. Labeling shall be self-laminating white/transparent self-extinguishing vinyl strips (equal to Brady DAT 7 292) with clear heat shrink tubing over the markers. Length shall be sufficient to provide at least two and one-half (2 ½) wraps. All labels shall be machine-printed with wire and /or cable numbers.

F. Accessories

1. Control operators such as pushbuttons (PB), selector switches (SS), and pilot lights (PL) shall be equal to Allen Bradley 800H, Square D Company Type SK or equal. Control operators shall be 30.5 mm, round, heavy-duty, oil tight NEMA 4X corrosion resistant.
2. Pushbuttons and selector switches shall be non-illuminated, spring release type. Pushbuttons shall include a full guard. Panic stop/alarm pushbuttons shall be red mushroom type with manual-pull release. Pilot lights shall be of the proper control voltage, LED type (indoor) and lamp type (outdoor).
3. Control operators shall have legend plates as specified herein, indicated on the Contract Drawings, or otherwise directed by the Engineer. Legend plates shall be plastic, white field (background) with black lettering. Engraved nameplates shall be securely fastened above each control operator. If adequate space is not available, the nameplate shall be mounted below the operator.
4. Control operators for all equipment shall be as specified herein and of the same type and manufacturer unless otherwise specified or indicated on the Contract Drawings. Modifications to existing panels using control operators and indicators of the same type and manufacturer shall be allowed with Engineer's approval.
5. Where required to interface between motor control centers, equipment controls, and control panels, control relays, interposing relays and associated control wiring circuitry shall be furnished and installed to provide the monitoring and/or control functions specified herein. Control relays shall be miniature type with DPDT contacts rated a minimum 10 amp @ 120 VAC, push-to-test button, and status indicator. Relay coils shall be 120/240 VAC or 24 VDC as required. Relays shall be equal to Idec, Square D, Omron, Allen-Bradley or approved equal.

G. Surge Protective Devices (SPDs)

1. Surge Protective Devices shall be provided at the following minimum locations:
2.
 - a. At any connections between AC power and electrical and electronic equipment, including panels, assemblies and field mounted instruments.
 - b. At both ends of all analog signal circuits that have any portion of the circuit extending outside of a protecting building and/or control panel.
 - c. At the control panel of all discrete signal circuits that have any portion of the circuit extending outside of a protecting building and/or control panel.
 - d. At both ends of all copper-based communications cables that extend outside of a building.
 - e. At all specified spare analog inputs and outputs and spare discrete signal inputs in PLCs and RTUs.
3. SPDs shall be listed/recognized by Underwriters Laboratory (UL) Standard for Safety Surge Protective Devices for the appropriate service.
4. These protective devices shall be external to and installed in addition to any protective devices built into the equipment. Power and signal protection shall be installed in either in a NEMA 4X enclosure or in the enclosure that houses the equipment to be protected.
5. All surge protective devices shall be mounted and wired per the manufacturer's recommendations including local grounding for surge energy dissipation. For surge suppressors use No. 8 cable for ground connection or install suppressor directly on ground bus using grounding screw. Provide 1-inch wide by 1/8-inch thick copper ground bus as a minimum.
6. Panel-mounted signal circuit protectors shall be made for mounting on a terminal block rail. Each SPD shall include a moveable grounding link to allow each signal cable shield to be individually grounded to the panel via the mounting rail through the SPD for that cable without the use of any additional grounding wire or to be isolated from ground at the SPD. Each mounting rail shall be grounded to the panel by the use of rail mounting screws at approximately one-foot intervals. Protection shall be from line to line and from each line to ground. Protection shall also be from shield to ground where the shield is not grounded at the protector. Each SPD shall have the ability to protect against surge currents greater than 10,000 amperes. Each SPD shall add no more than 22 ohms per signal wire to the total signal loop resistance of the analog signal loop in which it is installed. SPDs shall not introduce error-producing ground loop currents into the instrumentation signal circuits. SPD shall be equal to Phoenix Contract PlugTrab-PT series, EDCO DRS-036, DEHN or approved equal.
7. Signal circuit SPD for 2-wire field instruments shall be a conduit connected/pipe nipple type and shall have characteristics equal to the panel mounted devices. Units shall be mounted to a transmitter conduit entry point where available. When not available or practical, then these devices shall be mounted in NEMA 4X enclosures located at the field

- devices. SPD devices shall be equal to Phoenix Contact SURGETRAB, S-PT-EX-24VDC (2800035), EDCO SS64-36, DEHN, or approved equal.
8. Signal circuit SPD for 4-wire field instruments shall be a separate enclosure unit capable of providing protection on both the power and signal side. The unit shall contain the characteristics of the line power protector and signal circuit protectors discussed above. Units shall be enclosed in a manufacturer assembled NEMA 4X polycarbonate enclosure with a clear polycarbonate cover. SPD devices shall be equal to Phoenix Contact BoxTrab, BXT-N4X 4-Wire (5603514), EDCO SLAC-12036, or approved equal.
 9. SPD devices for CAT 5 or 6 Ethernet cable data signal protection shall be DIN-rail mount type with RJ45 plug connection to the device it is protecting. Surge suppressor type shall be gas-filled surge arrester and diodes with a total surge current of 10kA. SPD shall be Phoenix Contact, DT-LAN-CAT.6+ (281007), or approved equal.
 10. SPD devices for RS-485 cable connection data signal protection shall be DIN-rail mount type with 9-position D-SUB connector to the device it is protecting. Surge suppressor type shall be gas-filled surge arrester and diodes with a total surge current of 10kA. SPD shall be Phoenix Contact, DT-UFB-485/BS (2920612), or approved equal.
 11. SPD specifications and ratings for signal or communications types not defined herein shall be as specified elsewhere or of a type recommended by the manufacturer of the device being protected. SPD devices shall be equal to Phoenix Contact, Dehn, Edco, or approved equal.

2.03 TOOLS, SUPPLIES, AND SPARE PARTS

- A. Tools, supplies, and spare parts shall be provided as specified in Section 13100 - Instrumentation and Control, General Requirements and as specified for each equipment item. In addition, the following items shall be provided.
 1. One (1) of each type of panel mounted equipment (i.e., indicators, signal converters, etc.) provided under this Contract.
 2. One (1) of each type of control relay provided under this Contract.
 3. Two (2) of each type of signal surge protective device used.
 4. One (1) of each type of communication surge protective device used.

PART 3 EXECUTION - NOT USED

3.01 REQUIREMENTS

- A. In addition to the requirements specified in this section, refer to Section 13100 - Instrumentation and Control, General Requirements.
- B. Keep enclosures clean at all times. Keep enclosures doors closed except when actually working in the enclosure. Protect all equipment during installation, including hole punching for conduit connection. Remove all filings and thread cuttings from enclosures. Careful attention must be paid to provide installations which are both functional and esthetically acceptable.
- C. All conduits used in conjunction with control panels or instrumentation of any kind shall be sealed using a suitable duct-sealing compound to minimize the possible

damage caused by vapors or wetness. It shall be the responsibility of the CSI to verify that this is accomplished early in the project, so that corrosion damage does not occur during the time of construction.

- D. Equipment shall be located so that it is accessible for operation and maintenance. The CSI shall examine the Contract Drawings and Shop Drawings for various items of equipment in order to determine the best arrangement for the work as a whole and shall supervise the installation of all equipment.

3.02 WIRING AND GROUNDING

- A. The following wiring practice guidelines shall be used in order to minimize ground loops, minimize the effects of electromagnetic interference/radio frequency interference (EMI/RFI) and to provide maximum practical immunity from damage resulting from lightning-induced transients.
- B. Common wires or conductors shall not be utilized (either within panels or external to panels, or for grounding of field devices) for signal shielding, signal grounding, or safety grounds.
- C. Exposed wire lengths extending from within shielded signal cables shall be minimized to reduce pick-up of EMI/RFI by signal circuits. Exposed lengths of less than one inch is preferred with a maximum exposed length of two inches only permitted where necessary. No splicing of signal wires shall be permitted.
- D. All signal wiring shall be shielded, both within panels and external to panels. Unless otherwise specified, all signal wiring shall be No. 18 AWG stranded tinned two-conductor twisted pair with 100 percent coverage of aluminized Mylar or aluminized polyester shield and tinned copper drain wire.
- E. The shield on each process instrumentation cable shall be continuous from source to destination, and grounded at one end only. In general, grounding of signal cable shields shall be done at the control panel end. No signal cable shall share a common cable shield grounding wire with any other signal cable or other circuit. The exposed length of cable shield grounding wires shall not exceed two inches prior to termination with less than one-inch maximum length preferred.
- F. All outdoor instruments and all outdoor enclosures shall be grounded using the practice defined in Section 800.40 of the National Electric Code.

END OF SECTION

INSTRUMENTATION AND CONTROL SYSTEM PLC NEW & MODIFIED INPUT/OUTPUT SCHEDULE
MANATEE COUNTY, FLORIDA

NORTHWEST BOOSTER PUMP STATION

TAG	DESCRIPTION	TYPE	INACTIVE	ACTIVE	UNITS	LOCATION	NOTES
DGS-NWB-100-OA-108	Motorized Valve No. 8 Fault	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-100-OA-109	Motorized Valve No. 9 Fault	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-100-OL-108	Motorized Valve No. 8 In Remote Indication	DI	NOT IN REMOTE	IN REMOTE		RTU	New I/O
DGS-NWB-100-OL-109	Motorized Valve No. 9 In Remote Indication	DI	NOT IN REMOTE	IN REMOTE		RTU	New I/O
DGS-NWB-100-ZSO-108	Motorized Valve No. 8 Open Indication	DI	OFF	OPEN		RTU	
DGS-NWB-100-ZSO-109	Motorized Valve No. 9 Open Indication	DI	OFF	OPEN		RTU	
DGS-NWB-100-ZSC-108	Motorized Valve No. 8 Closed Indication	DI	OFF	CLOSED		RTU	
DGS-NWB-100-ZSC-109	Motorized Valve No. 9 Closed Indication	DI	OFF	CLOSED		RTU	
DGS-NWB-100-ZCO-108	Pressure Sustaining Valve No. 8 Call to Open	DO	OFF	CALL TO OPEN		RTU	
DGS-NWB-100-ZCO-109	Pressure Sustaining Valve No. 9 Call to Open	DO	OFF	CALL TO OPEN		RTU	
DGS-NWB-100-ZCC-108	Pressure Sustaining Valve No. 8 Call to Close	DO	OFF	CALL TO CLOSE		RTU	
DGS-NWB-100-ZCC-109	Pressure Sustaining Valve No. 9 Call to Close	DO	OFF	CALL TO CLOSE		RTU	
DGS-NWB-200-OA-112	Pressure Sustaining Valve Fault	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-200-ZSO-112	Pressure Sustaining Valve Open Indication	DI	OFF	OPEN		RTU	Replaces existing Solenoid I/O
DGS-NWB-200-ZSC-112	Pressure Sustaining Valve Closed Indication	DI	OFF	CLOSED		RTU	Replaces existing Solenoid I/O
DGS-NWB-200-ZCO-112	Pressure Sustaining Valve Call to Open	DO	OFF	CALL TO OPEN		RTU	New I/O
DGS-NWB-200-ZCC-112	Pressure Sustaining Valve Call to Close	DO	OFF	CALL TO CLOSE		RTU	Replaces existing Solenoid I/O
DGS-NWB-200-PIT-112-1	Pressure Sustaining Valve Upstream Pressure	AI	0	100	PSI	RTU	New I/O
DGS-NWB-200-PIT-112-2	Pressure Sustaining Valve Downstream Pressure	AI	0	100	PSI	RTU	New I/O
DGS-NWB-200-FIT-112	Pressure Sustaining Valve Flow	AI	0	XXXX	GPM	RTU	New I/O
DGS-NWB-200-ZS-112	Pressure Sustaining Valve Position	AI	0	100	%	RTU	New I/O
DGS-NWB-200-ZC-112	Pressure Sustaining Valve Remote Setpoint	AO	0	100	%	RTU	New I/O
DGS-NWB-100-OL-100-1	Booster Pump No. 1 Run Indication	DI	STOPPED	RUNNING		RTU	
DGS-NWB-100-OL-100-2	Booster Pump No. 1 In Bypass	DI	VFD	RVSS		RTU	
DGS-NWB-100-OL-101-1	Booster Pump No. 2 Run Indication	DI	STOPPED	RUNNING		RTU	
DGS-NWB-100-OL-101-2	Booster Pump No. 2 In Bypass	DI	VFD	RVSS		RTU	
DGS-NWB-100-OL-102-1	Tank Pump Run Indication	DI	STOPPED	RUNNING		RTU	Previously labeled Booster Pump No. 3
DGS-NWB-100-OL-102-2	Tank Pump In Bypass	DI	VFD	RVSS		RTU	Previously labeled Booster Pump No. 3
DGS-NWB-100-OA-100	Booster Pump No. 1 Fault Indication	DI	FAULT	NORMAL		RTU	
DGS-NWB-100-OA-101	Booster Pump No. 2 Fault Indication	DI	FAULT	NORMAL		RTU	
DGS-NWB-100-OA-102	Tank Pump Fault Indication	DI	FAULT	NORMAL		RTU	Previously labeled Booster Pump No. 3
DGS-NWB-100-HS-100	Booster Pump No. 1 Call to Start/ Run	DO	OFF	RUN		RTU	
DGS-NWB-100-HS-101	Booster Pump No. 2 Call to Start/ Run	DO	OFF	RUN		RTU	
DGS-NWB-100-HS-102	Tank Pump Call to Start/ Run	DO	OFF	RUN		RTU	Previously labeled Booster Pump No. 3
DGS-NWB-100-II-100	Booster Pump No. 1 Amps	AI	0	XX	AMPS	RTU	
DGS-NWB-100-II-101	Booster Pump No. 2 Amps	AI	0	XX	AMPS	RTU	
DGS-NWB-100-II-102	Tank Pump Amps	AI	0	XX	AMPS	RTU	Previously labeled Booster Pump No. 3
DGS-NWB-100-SI-100	Booster Pump No. 1 Speed Feedback	AI	0	100	%	RTU	
DGS-NWB-100-SI-101	Booster Pump No. 2 Speed Feedback	AI	0	100	%	RTU	
DGS-NWB-100-SI-102	Tank Pump Speed Feedback	AI	0	100	%	RTU	Previously labeled Booster Pump No. 3
DGS-NWB-100-SC-100	Booster Pump No. 1 Speed Command	AO	0	100	%	RTU	
DGS-NWB-100-SC-101	Booster Pump No. 2 Speed Command	AO	0	100	%	RTU	
DGS-NWB-100-SC-102	Tank Pump Speed Command	AO	0	100	%	RTU	Previously labeled Booster Pump No. 3

INSTRUMENTATION AND CONTROL SYSTEM PLC NEW & MODIFIED INPUT/OUTPUT SCHEDULE
MANATEE COUNTY, FLORIDA

NORTHWEST BOOSTER PUMP STATION

TAG	DESCRIPTION	TYPE	INACTIVE	ACTIVE	UNITS	LOCATION	NOTES
DGS-NWB-400-OA-101	Chemical Building Emergency Eyewash/Shower In Use	DI	NORMAL	ALARM		RTU	New I/O
DGS-NWB-400-OA-131	Sodium Hypochlorite Pump No. 1 Fault	DI	NORMAL	ALARM		RTU	New I/O
DGS-NWB-400-OA-132	Sodium Hypochlorite Pump No. 2 Fault	DI	NORMAL	ALARM		RTU	New I/O
DGS-NWB-400-HS-131	Sodium Hypochlorite Pump No. 1 Call to Start/ Run	DO	OFF	RUN		RTU	New I/O
DGS-NWB-400-HS-132	Sodium Hypochlorite Pump No. 2 Call to Start/ Run	DO	OFF	RUN		RTU	New I/O
DGS-NWB-400-SI-131	Sodium Hypochlorite Pump No. 1 Speed Feedback	AI	0	100	%	RTU	New I/O
DGS-NWB-400-SI-132	Sodium Hypochlorite Pump No. 2 Speed Feedback	AI	0	100	%	RTU	New I/O
DGS-NWB-400-SC-131	Sodium Hypochlorite Pump No. 1 Speed Command	AO	0	100	%	RTU	New I/O
DGS-NWB-400-SC-132	Sodium Hypochlorite Pump No. 2 Speed Command	AO	0	100	%	RTU	New I/O
DGS-NWB-400-LI-135	Sodium Hypochlorite Tank 1 Level	AI	0	XX	FEET	RTU	New I/O
DGS-NWB-400-LI-136	Sodium Hypochlorite Tank 2 Level	AI	0	XX	FEET	RTU	New I/O
DGS-NWB-400-OA-137	Sodium Hypochlorite Tank Containment Leak	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-400-OA-138	Sodium Hypochlorite Pump Skid Containment Leak	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-400-FIT-139	Sodium Hypochlorite Flow	AI	0	XX	GPH	RTU	New I/O
DGS-NWB-400-OA-141	Ammonium Sulfate Pump No. 1 Fault	DI	NORMAL	ALARM		RTU	New I/O
DGS-NWB-400-OA-142	Ammonium Sulfate Pump No. 2 Fault	DI	NORMAL	ALARM		RTU	New I/O
DGS-NWB-400-HS-141	Ammonium Sulfate Pump No. 1 Call to Start/ Run	DO	OFF	RUN		RTU	New I/O
DGS-NWB-400-HS-142	Ammonium Sulfate Pump No. 2 Call to Start/ Run	DO	OFF	RUN		RTU	New I/O
DGS-NWB-400-SI-141	Ammonium Sulfate Pump No. 1 Speed Feedback	AI	0	100	%	RTU	New I/O
DGS-NWB-400-SI-142	Ammonium Sulfate Pump No. 2 Speed Feedback	AI	0	100	%	RTU	New I/O
DGS-NWB-400-SC-141	Ammonium Sulfate Pump No. 1 Speed Command	AO	0	100	%	RTU	New I/O
DGS-NWB-400-SC-142	Ammonium Sulfate Pump No. 2 Speed Command	AO	0	100	%	RTU	New I/O
DGS-NWB-400-LI-145	Ammonium Sulfate Tank 1 Level	AI	0	XX	FEET	RTU	New I/O
DGS-NWB-400-LI-146	Ammonium Sulfate Tank 2 Level	AI	0	XX	FEET	RTU	New I/O
DGS-NWB-400-OA-147	Ammonium Sulfate Tank Containment Leak	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-400-OA-148	Ammonium Sulfate Pump Skid Containment Leak	DI	FAULT	NORMAL		RTU	New I/O
DGS-NWB-400-FIT-149	Ammonium Sulfate Flow	AI	0	XX	GPH	RTU	New I/O

Notes:

1. Items in bold indicate new work.

SECTION 13140 INSTRUMENTATION & CONTROL, SCADA HARDWARE

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish, test, install and place in satisfactory operation all equipment required to provide a complete and operable Supervisory Control and Data Acquisition (SCADA) system, as specified herein and as shown on the Contract Drawings, even if each needed item is not specifically specified or shown.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. In addition to the requirements specified in this section, the requirements of specification Section 13100 - Instrumentation and Control, General Requirements and the sections referenced therein shall be applied.
- B. An Input/Output (I/O) list is included at the end of this section as an attachment for the PLC(s). For bidding purposes, the I/O list is intended to provide information to the CSI which includes a description of the supplied control system I/O provided under this contract.

1.03 SUBMITTALS

- A. All submittals shall be in accordance with Specification 01340 - Shop Drawings, Project Data and Samples and as specified in Section 13100 - Instrumentation and Control, General Requirements. In addition, the following specific submittals items shall be provided.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. The SCADA hardware configuration as specified herein, as specified in related sections and as shown on the Contract Drawings depicts overall system configuration requirements. Unless otherwise specified, designs which vary from this concept will be rejected.
- B. All discrete and analog data acquisition, pre-processing, storage and process control functions shall be performed at the PLC level.
- C. PLC-to-PLC communication protocols shall be Ethernet based.
- D. The Controls System Integrator shall provide all software, operating systems, network interface, special drivers and network integrations required and shall perform all configuration, commissioning, troubleshooting and diagnostics required for a complete and functional system.
- E. The equipment specifications included herein define a level of performance based on current technology to establish a basis of bid. However, it is recognized that computer technology changes rapidly and that this technology level, while leading edge today, will be surpassed by the time equipment will be purchased. It is

therefore expected that a comparable, leading edge, value in computer technology will be provided at the time of purchase.

- F. The intent of this section is to provide the components to implement a fully functional SCADA monitoring and control system with an Ethernet-based network, linking all of the plant control equipment and providing for complete monitoring, control and data analysis for the plant operations and process control.
- G. Cable systems shall be provided for various requirements, including but not limited to data network, fiber optic, printer, power cables, and others as required. Cables shall be routed in suitable conduits, cable ducts, channels and wire ducts to provide a clean, safe, non-obtrusive and workmanlike installation.
- H. All software licenses and support contracts shall be registered to Manatee County Public Utilities. The particular contact person and address shall be coordinated with the County prior to purchasing of any equipment or software. The CSI shall provide documentation within the SCADA System Hardware and Control Panel Submittal which states that any software provided and purchased under this contract will be registered in the County's name and that this coordination has been done. Proof of this ownership shall be provided prior to Substantial Completion.

2.02 TOOLS, SUPPLIES, AND SPARE PARTS

- A. Tools, supplies and spare parts shall be provided as specified in Section 13100 - Instrumentation and Control, General Requirements, and as specified for each equipment item. In addition, the following items shall be provided.
 - 1. One (1) of each type of CPU module for PLC equipment furnished under this Contract.
 - 2. Two (2) of each type of communication module for PLC equipment furnished under this Contract.
 - 3. Two (2) of each type of input/output module for PLC equipment furnished under this Contract.
 - 4. Two (2) of each type and size of PLC and equipment power supply furnished under this Contract.
 - 5. One (1) of each type of control panel mounted network switch and/or media converter furnished under this Contract.
 - 6. One (1) of each type of Operator Interface Terminal (OIT) furnished under this contract.

2.03 SURGE PROTECTIVE DEVICES (SPDs)

- A. Refer to specification section 13130 - Instrumentation and Control, Control Enclosures for surge protective devices requirements.

2.04 UNINTERRUPTABLE POWER SUPPLIES (UPS), CONTROL PANEL

- A. UPS units shall be line interactive units provided for new PLC control panels as specified herein or shown elsewhere within the Contract Documents.
- B. UPS units for locations without Automatic Transfer Switch (ATS) and generators shall be sized to provide a minimum of two (2) hours backup time for all connected

equipment. At sites with ATS and generators, UPS units shall be sized for a minimum of twenty (20) minute backup for all connected equipment. Each UPS shall consist of a UPS module and battery modules as required to meet backup run time requirements.

- C. UPS units provided for PLC cabinets shall be provided with a dry contact output to alarm on UPS trouble or failure. This fail output shall be wired into the PLC I/O to represent UPS status.
- D. Where located in a control or PLC enclosure, the UPS shall be located at the bottom of the enclosure but mounted on a raised shelf or platform.
- E. Provide network interface for network management support and power management.
- F. Each UPS shall be sized to match the maximum power requirements of the associated digital equipment, control panel power supplies and accessories plus twenty (20) percent spare capacity. Upon loss of the AC supply, the inverter shall continue to supply normal power to the device, drawing DC from the batteries.
- G. Each UPS shall meet the following requirements:
 - 1. Input voltage shall be 120 VAC, single phase, 60 Hz.
 - 2. Operating temperature range shall be 0 to 40 degree C.
 - 3. Voltage regulation shall be plus or minus five percent (+/-5%) for line and load changes.
 - 4. The output frequency shall be phase-locked to the input AC line on AC operation and shall be 60 hertz (+/-0.5%) when on battery operation.
 - 5. The batteries shall be of the sealed, lead acid or lead calcium gelled electrolyte type, suitable for high temperatures.
 - 6. Sound absorbing enclosure.
 - 7. EMI/RF noise filtering.
 - 8. Surge protection shall be provided on the AC input circuit, which shall have a UL TVSS clamping voltage rating of 400 V with a <5 ns response time.
 - 9. Adjustment allowed to prevent UPS from going offline when on a standby generator supplied power source.
- H. UPS systems shall be equal to Tripp Lite OMNI Series, APC, Eaton or approved equal.

2.05 PROGRAMMABLE LOGIC CONTROLLERS (PLC), GENERAL

- A. The Control System Integrator shall furnish programmable controllers (PLCs) and components as specified herein and as shown on the Drawings. PLCs shall be provided complete with rack, power supply, Input/Output (I/O) modules, special function cards, instructions, memory, input/output capacity and appurtenances to provide all features and functions as described herein. PLC I/O cards may be supplied by third party vendors if approved by the PLC manufacturer and the County. No substitutions will be permitted.
- B. All components of the PLC system shall be of the same manufacturer; who shall have fully tested units similar to those being furnished, in an industrial environment

with associated electrical noise. The PLC system shall have been tested to meet the requirements of NEMA Standard ICS 2-230 (Arc Test) and IEEE C37.90.1 (SWC). The processing unit shall perform the operations functionally described herein, based on the program stored in memory and the status of the inputs and outputs.

- C. The programmable controller shall be designed to operate in an industrial environment. The PLC shall operate in an ambient temperature range of 0°-60°C and a relative humidity of five to ninety-five percent (5% - 95%), non-condensing. The PLC shall operate on supply voltages of 90-132 VAC at 47-63 Hz, or 24 VDC if provided with a battery backup system. Overcurrent and undervoltage protection shall be provided on the power supply.
- D. System configuration shall be as shown on the Contract Drawings. PLC types shall be designated on the system block diagram and correspond to the specifications herein. Only a single type of processor shall be supplied for all PLCs of a designated type. Memory, processor and PLC type shall be adequate for all control functions specified. Memory backup shall be provided during loss of power for the configuration, logic program and current operating parameters/addresses.
- E. The processor and its associated memory shall be enclosed in a modular enclosure. A multiple-position selector switch or equivalent shall be used to select processor operating mode. LED-type indicating lights shall be provided to indicate processor, memory and battery status. Errors in memory shall be recognized, and shall activate the memory error indicating lights. Memory shall consist of battery-backed RAM or EEPROM, which shall retain the control program for at least one (1) year, in the event of power loss. Visual indication shall be provided if battery charge is insufficient to maintain the program in RAM memory for at least two (2) weeks.
- F. All PLC processors shall be provided with the latest manufactured firmware revision level installed.
- G. The instruction set for the PLC shall include the following, as a minimum.
 - 1. Relay type instructions
 - 2. Counter and timer instructions
 - 3. Comparison instructions (equal, greater than, limit tests, etc.)
 - 4. Integer, long integer and floating point mathematical instructions
 - 5. Advanced math and trigonometric functions
 - 6. Matrix and array instructions
 - 7. Logical instructions (and, not, or, etc.)
 - 8. Bit modification, moving and shift instructions
 - 9. Diagnostic instructions
 - 10. Sequencer instructions
 - 11. Program control instructions (jump, goto, subroutine, etc.)
 - 12. PID control loops
 - 13. Block read and write capability
 - 14. Master and slave communications capabilities
 - 15. Immediate I/O and communications update instructions
 - 16. Real-time clock and date

- H. In addition to a port for communications as shown on the Contract Documents, additional communication ports shall be provided for any other devices as required (i.e., operator interface unit, connection to a notebook computer for programming and configuration.)

2.06 PLC - REMOTE STATION TYPE

- A. Remote Station PLCs as specified or shown in the Contract Documents, shall meet the general requirements for PLCs, and shall meet but not be limited to the following requirements:
 - 1. Two (2) 10/100 Mbps Ethernet IP Port, one (1) USB serial port.
 - 2. I/O Module Expansion Capacity: Up to four (4) local expansion Point I/O modules.
 - 3. Embedded 24VDC power supply
 - 4. Embedded I/O: 16 Digital inputs, 16 digital outputs, 4 analog inputs, and 2 analog outputs.
 - 1. I/O module shall be of a dedicated type, i.e., AI, AO, DI, DO. No mixed I/O modules shall be acceptable.
 - 2. One (1) MB of Memory with 1 GB compact flash card for memory backup.
- B. PLC shall be Allen Bradley CompactLogix 5370 L2 Controller, (1769-L27ERM).

2.07 PLC INPUT/OUTPUTS

- A. Input/output hardware shall be either plug-in modules in associated I/O rack assemblies or add-on modules for remote station type PLCs. Each PLC within an enclosure shall handle the required number of process inputs and outputs, plus a minimum of ten percent (10%) pre-wired spares for each I/O type furnished except discrete inputs which shall have a minimum of twenty percent (20%) pre-wired spares, plus a minimum of twenty percent (20%) spare I/O rack expansion space for the addition of future circuit cards or modules.
- B. PLC input/output systems and processing modules shall be of the same model series. No third party manufacturer models will be accepted.
- C. Discrete inputs (DI) shall be 16-point module, 24 VDC developed from dry field contacts, for CompactLogix - 1769-IQ16 (24VDC Input module) or 1769-IA16 (120VAC Input module).
- D. Discrete outputs (DO) shall be 16-point, 120 VAC / 28 VDC 5A relay contact modules, for the PLC. Output contacts may be powered from the field equipment or powered from 24 VDC / 120 VAC sourced from PLC control panel's power system, as required to interface with field equipment. Outputs to solenoid valves shall be 120 VAC, powered from the PLC or control panel unless specified or shown otherwise. Provide interposing relays as specified in Section 13130 as required to meet dry contact rating. CompactLogix - 1769-OW16.
- E. Analog input (AI) circuits shall be isolated, 12-bit (minimum) resolution type. Analog input hardware shall be provided as required for all types of analog inputs being transmitted to the PLC. In general, analog input modules shall be capable of receiving 4-20 mA signals. Each input circuit shall have optical isolation to

protect the equipment against high voltage transients. CompactLogix - 1769-IF4I.

- F. Analog outputs (AO) shall be coordinated with the receivers but shall generally be isolated 24 VDC, 4-20mA outputs powered from the PLC. Each output circuit shall have optical isolation to protect the equipment against high voltage transients. CompactLogix - 1769-OF4CI.
- G. Input/output modules shall be configured for ease of wiring and maintenance. The modules shall be connected to wiring arms which can be disconnected to permit removal of a module without disturbing field wiring. Covers shall be provided to prevent operator personnel from inadvertently touching the terminals. The process interface modules shall be provided with screw-type terminal blocks with barriers between adjacent terminals for connection of field inputs. Terminals shall be suitable for accepting up to and including No. #22...#12 AWG (0.2...4 mm²) wire.
- H. Output failure mode shall be selectable so that upon station or communication system failure, all outputs shall be placed in the non-conducting mode or remain as they were prior to failure. Light-emitting diodes shall be provided for status indication for each input and output point.
- I. Signal and control circuitry to individual input/output boards shall be arranged such that board failure shall not disable more than one half ($\frac{1}{2}$) of the control loops within any group of controlled equipment (e.g., one pump out of a group of three pumps, two pumps out of four, etc.). Where possible, individual control loops and equipment shall be assigned to individual boards such that failure of the board will disable only one (1) loop or piece of equipment.
- J. External power supplies shall be provided with the PLC as required to meet specified installed I/O power requirements, plus spares. Power supplies shall be modular units, shall be fully redundant and shall alarm to the PLC upon failure. Power supplies shall have a line regulation of 0.05% and meet the environmental and power requirements specified herein.
- K. Control circuits and signals entering hazardous areas shall be provided with intrinsically safe barriers meeting the requirements of the NEC and UL698.

PART 3 EXECUTION

3..01 REQUIREMENTS

- A. In addition to the requirements specified in this section, refer to Section 13100 - Instrumentation and Controls, General Requirements.

END OF SECTION

SECTION 15051 PIPE AND PIPE FITTINGS - GENERAL STATEMENT

PART 1 GENERAL

1.01 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. 02615 - Ductile Iron Pipe and Fittings
2. 02617 - Installation and Testing of Pressure Pipe

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

D. Building piping diagrams. Submit sealed drawings showing locations and dimensions of all piping inside structures. Show all pipeline-mounted devices, connections to equipment, hangers and supports, anchors, and related appurtenances. Information shall include but not be limited to the following:

1. Dimensions of piping and end connections
 2. Invert of centerline dimensions
 3. Location and type of pipe supports and anchors
 4. Locations of valves and valve operator type
 5. Details of fittings, tapping locations, equipment connections, flexible expansion joints, connections to equipment, and related appurtenances.
 6. Acknowledge valve and equipment tag numbers and instrument tag numbers.
 7. Show provisions for expansion and contraction
 8. Show line slopes and air release vents
- E. Include on fabrication drawings location of jointed sections to permit maintenance of connected equipment and to permit removal of connected equipment without disturbance of main piping system.
- F. Provide copies of any manufacturer's written directions regarding material handling, delivery, storage and installation.
- G. As work progresses and again when work is complete, submit "As-Builts" of piping systems in project including project items and pre-existing items. Identify complete location, elevations, description of piping systems. Relate piping systems to identified structures and appurtenances. Submit four (4) copies.
- H. Submit written verification of required pressure testing.

1.03 WARRANTY

- A. Per General Condition Article 9, the Contractor shall provide a 3-year warranty from substantial completion.

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
RS -Raw Sewage IR - Internal Recycle (Mixed Liquor) PDFM - Plant Drain Force Main SN- Supernate RAS - Return Activated Sludge TS - Thickened Sludge WAS - Waste Activated Sludge	PIPE	
	4 to 48	Above ground - AWWA C115 and C151 Class 53 ductile iron pipe, Tnemec 431 Perma-Shield PL or Permox CTF lining, flanged joints
	4 to 12	Below ground - AWWA C150 and C151 ductile iron pipe, push-on joints, Tnemec 431 Perma-Shield PL or Permox CTF lining, 350 psi pressure class
	14 to 20	Below ground - AWWA C150 and C151 ductile iron pipe, Tnemec 431 Perma-Shield PL or Permox CTF lining, push-on joints, 250 psi pressure class.
	24	Below ground - AWWA C150 and C151 ductile iron pipe, Tnemec 431 Perma-Shield PL or Permox CTF lining, push-on joints, 200 psi pressure class.
	30 to 54	Below ground - AWWA C150 and C151 ductile iron pipe, Tnemec 431 Perma-Shield PL or Permox CTF lining, push-on joints, 250 psi pressure class.
	FITTINGS	
	4 to 48	Above ground - AWWA C110 or AWWA C153 compact ductile fittings, Tnemec 431 Perma-Shield PL or Permox CTF lining, flanged joints, 250 psi working pressure
	54	Above ground - AWWA C110 or AWWA C153 compact ductile fittings, Tnemec 431 Perma-Shield PL or Permox CTF lining, flanged joints, 150 psi working pressure
	4 to 24	Below ground - AWWA C153 compact ductile iron fittings, Protecto Tnemec 431 Perma-Shield PL or Permox CTF lining, mechanical joints, 350 psi working pressure
30 to 42	Below ground - AWWA C110 or AWWA C153 compact ductile iron fittings, Tnemec 431 Perma-Shield PL or Permox CTF lining, mechanical joints, 350 psi working pressure	
	48 to 54	Below ground - AWWA C110 or AWWA C153 compact ductile iron fittings, Tnemec 431 Perma-Shield PL or Permox CTF lining, mechanical joints, 150 psi working pressure
GR- Grit	PIPE / FITTINGS	
	4	Above ground- AWWA C115 and C151 Class 53 ductile iron pipe, glassed lined, flanged joints with long radius (LR), glassed lined, flanged fittings, 350 psi working pressure

PD - Plant Drain Gravity Sewer D- Drain	PIPE	
	4 to 12	Below ground - AWWA C150 and C151 ductile iron pipe, 350 psi pressure class, push-on or mechanical joints, Tnemec 431 Perma-Shield PL or Permox CTF lining, flanged joints
	14 to 18	Below ground - AWWA C150 and C151 ductile iron pipe, 250 psi pressure class, push-on or mechanical joints, Tnemec 431 Perma-Shield PL or Permox CTF lining, flanged joints
	FITTINGS	
	4 to 18	Below ground - AWWA C153 compact ductile iron fittings, 350 psi working pressure, Tnemec 431 Perma-Shield PL or Permox CTF lining, flanged joints, mechanical joints.
CLE - Clarifier Effluent EFF - Treated Effluent (Reclaimed Water Chlorinated) FW - Filter Water Effluent RCW - Reclaimed Water RJ - Reject SRCW - Stored Reclaimed Water SPW - Storage Pond Water	PIPE / FITTINGS	
	1 to 3	Above ground - SCH 80 PVC solvent weld
	PIPE	
	4 to 48	Above ground - AWWA C115 and C151 Class 53 ductile iron, cement-lined, flanged, AWWA C110 and C111 flanged ductile iron fittings, cement-lined
	4 to 12	Below ground - AWWA C150 and C151 ductile iron pipe, push-on or mechanical joints, cement-lined, 350 psi pressure class
	14 to 20	Below ground - AWWA C150 and C151 ductile iron pipe, cement-lined, push-on joints, 250 psi pressure class
	24	Below ground-AWWA C150 & C151 DIP cement-lined, push-on joints, 200 psi pressure class
	FITTINGS	
	4 to 24	Above ground - AWWA C110 or AWWA C153 compact ductile fittings, cement-lined, flanged joints, 250 psi working pressure
	4 to 24	Below ground - AWWA C153 compact ductile iron fittings, mechanical joints, 350 psi working pressure, cement-lined
30 to 54	Below ground - AWWA C150 and C151 ductile iron pipe, cement-lined, push-on joints, 150 psi pressure class, AWWA C110 and C111 ductile iron fittings, mechanical joint, 250 psi working pressure, cement-lined	
NaOCl (Sodium Hypochlorite - 12.5%)	PIPE / FITTINGS	
	½ to 3	Above ground - Schedule 80 PVC, threaded or solvent weld.
	½ - 3	Below ground - Schedule 80 PVC carrier pipe, Schedule 40 PVC containment pipe, threaded or solvent weld.

(NH ₄) ₂ SO ₄ (Liquid Ammonium Sulfate - 39%)	PIPE / FITTINGS	
	½ to 3	Above ground - Schedule 80 PVC, threaded or solvent weld.
	½ to 3	Below ground - ½" i.d. ChemFluor 367 tubing for carrier pipe, Schedule 40 PVC containment pipe, threaded or solvent weld.
EFF - Treated PW - Potable Water	PIPE / FITTINGS	
	½ to 3	Above ground - Schedule 80 PVC, Type K copper.
	½ to 3	Below ground - AWWA C901 HDPE tubing, DR-9, 200 psi working pressure.

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. 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 on PVC piping systems or 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 frostproof 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 PIS 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 bibbs 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 County.
- 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 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 the County.

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 County.

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 as specified on piping specification sheets and in conformance with Section 02617. 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 as-builts of the subject potable water pipelines must be submitted to the County/Engineer prior to starting the bacteriological testing.
- B. Prior to being placed in service, all potable water pipe lines shall be chlorinated in accordance with AWWA 651, "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 pipeline for a minimum of 24 hours. Water for flushing, filling and disinfecting the new lines will be provided by the County 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 as-builts must be submitted to the Health Department (FDEP) within 30 days of the tests.
- E. Special disinfecting procedures when approved by the County 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 "As-Built 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. Dirt strainers:
1. Provide Y-type strainers to locations shown on drawings and/or scheduled.
 2. Furnish composition bronze strainers rated for 150 psi working pressure at 450°F. Provide a 20-mesh monel screen. Install a threaded bronze plug in the blowoff outlet. Furnish threaded NPT end connections.
 3. Subject to compliance with these specifications, furnish Mueller No. 351 strainers or equal.
- C. Welding:
1. Have each welding operator affix an assigned symbol to all their 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°F 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 ANSI B31.1 or other codes and requirements per local building and utility requirements.
- D. 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 Tnemec 431 Perma-Shield PL or Permox CTF 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.
 - 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.
- E. 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:

<u>Film Legend</u>	<u>Film Color</u>
Electric line below	Red
Telephone line below	Orange
Water line below	Blue
Sewer line below	Green
Nonpotable water below	Brown
Reclaimed water below	Purple

- F. Install tape directly above each buried utility at a as shown on the Drawings.

END OF SECTION

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 County.
- C. All power interruptions to existing equipment shall be at the County'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 County.
- F. It shall be the responsibility of each bidder or their 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 they have complied with this requirement and accepts all responsibility for a complete knowledge of all factors governing their 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 and acquire all necessary permits for securing temporary electrical power for their use in accordance with Section 01510 of these Specifications.
- B. Refer to drawings for additional temporary power requirement specific to project.

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, county 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. Contractor shall employ a third-party NETA certified testing firm to test all components of cables greater than 1/0, MCC, VFD, Switchgear (MV & LV), MV Switches and Switchboards including power breakers (sec 7.6.1.1) per the latest version of **“Standard for Acceptance Testing Specification for Electrical Power Equipment and Systems” ANSI/NETA**. The Contractor shall test all items individually and as a system for proper operation. Test results for wire, breakers and grounding shall be provided to the ENGINEER for approval.
- 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 County shall be present during all testing. The County 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. Contractor shall coordinate all penetrations with structural Engineer.

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 to accommodate the exact conditions as found in the field. Any deviations from the arrangements shown must be approved by the Engineer and the County 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 ensure 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 County 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 County 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 County.

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 their 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 County.
 - 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 County and the Engineer.

2. The County's and 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 County and the Engineer have 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 County.

- 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 County 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 County.
- B. In addition to the duties of Item 1.11.A above, the manufacturer's representative shall also instruct the County'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 County, 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 their 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 County and the Engineer shall be the determiners 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 16062 LIGHTNING PROTECTION SYSTEM FOR STRUCTURES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. The contractor shall employ qualified Lightning Protection System Subcontractor to provide all labor, materials, equipment, services, and incidentals shown, specified, and required to furnish and install lightning protection systems for:
 - a. New or modified buildings and outdoor structures.
 - b. New or modified above grade tanks and access platforms
 - c. Light poles

B. Coordination:

1. Review installation procedures included under other Sections and coordinate installation of items to be installed with or before lightning protection systems.

C. Related Sections:

1. Section 16450, Grounding and Bonding for Electrical Systems.

1.02 REFERENCES

A. Standards referenced in this Section are:

1. Lightning Protection Institute (LPI), LPI 175, Standard of Practice.
2. LPI 176, Standard of Materials.
3. NFPA 70, National Electrical Code.
4. NFPA 780, Standard for the Installation of Lightning Protection Systems.
5. UL 96A, Installation Requirements for Lightning Protection Systems.
6. UL 651, Schedule 40 and 80 PVC Conduit.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Lightning Protection System Subcontractor:
 - a. Retain services of lightning protection Subcontractor regularly engaged in providing Master Labeled lightning protection systems.
2. Subcontractor shall be LPI-certified Master Installer or Inspector.
3. Subcontractor shall be listed with UL.

B. Component Supply and Compatibility:

1. Obtain all materials equipment included in this Section regardless of component manufacturer from a single lightning protection system manufacturer.
2. Lightning protection system manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for specified service conditions and shall be integrated into the overall system by lightning protection system manufacturer.

1.04 SUBMITTALS

- A. Shop drawings and product data as described in Division 1.
- B. Operation and maintenance data as described in Division 1.
- C. Action Submittals: Submit the following:
 1. Shop drawings:
 - a. Complete scaled drawings showing proposed routing and layout of lightning protection system with installation details. Drawings shall include equipment connection details and downlead details.
 2. Product Data:
 - a. Manufacturer's catalog cuts and technical information.
 - b. Technical specifications.
- D. Informational Submittals: Submit the following:
 1. Certificates of LPI code compliance provided by manufacturer, together with UL Master Label certificate or letter of finding.
 2. Master Installer or Inspector's final inspection report following installation.
 3. Qualification statements by Lightning protection system Subcontractor.

1.05 GUARANTEE

- A. Lightning protection system shall be guaranteed by lightning protection system manufacturer against defective parts and installation for three years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM PERFORMANCE

- A. System Description
 1. Each lightning protection system shall consist of a complete cable network on the roof or top of structure involving all air terminals, splices, and bonds with cable downleads routed concealed either directly in the building construction or in conduit to ground, and ground rods all

connected together in an appropriate manner and certified by LPI to provide a zone of protection to entire building against lightning strikes, in accordance with NFPA 780.

2. Provide complete, certified lightning protection system. Provide bonding connections and miscellaneous items for complete system.

2.02 MANUFACTURERS

A. Manufacturers: Provide products of one of the following:

1. Heary Brothers Lightning Protection Company
2. Thompson Lightning Protection, Inc.
3. Robbins Lightning Inc.
3. Or approved equal.

2.03 MATERIALS

A. General:

1. Size materials in accordance with NFPA 780, UL 96A, and LPI 176.
2. Materials and equipment shall be labeled or listed by UL for use in Master Labeled lightning protection systems. Completed system shall conform to NFPA 70, NFPA 780, LPI 175, LPI 176, and UL96A.
3. Materials shall comply in weight, size, and composition for class of structure to be protected in accordance with the following:
 - a. Use Class I materials for systems on structures not exceeding 75 feet in height.
 - b. Use Class II materials for systems on structures exceeding 75 feet above grade.
4. Materials shall be corrosion-resistant, heavy-duty type. Unless otherwise specified, materials shall be Type 316 stainless steel, copper, or high copper-content bronze castings. Bolts, screws, and hardware shall be Type 316 stainless steel.
5. Use aluminum materials in locations where system components are mounted on aluminum surfaces to avoid electrolytic corrosion of dissimilar metals.
6. Provide fittings, mounting bases, couplings, connectors, fasteners, and other system devices required for complete system.

B. Ground Rods: Comply with Section 16450, Grounding and Bonding for Electrical Systems.

C. Ground Cables:

1. Ground cables shall be copper, except in connections to aluminum surfaces as required to prevent dissimilar metals reaction.
2. Ground cable stranding, number and size shall be suitable for classification of structure to be protected.
3. Exposed ground cable shall be corrosion resistant.

- D. Air Terminals:
 - 1. Air terminals shall be stainless steel 3/4-inch diameter and minimum of 12 inches long.
 - 2. Air terminals shall include a cast bronze point protector, stainless steel adapter, and copper base.
- E. Non-Metallic Conduit and Fittings:
 - 1. Non-metallic conduit shall be Schedule 80 PVC plastic, rated for 90 degrees C, conforming to UL 651.
 - 2. Non-metallic fittings shall be of same material and manufacturer as base conduit. Provide cement for joining fittings to conduit. Fittings shall be by same manufacturer as base conduit.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine the conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install main conductors to provide two-way path from each air terminal horizontally or downward to connections with ground terminals.
- B. Install conductors free of excessive splices and sharp bends. Conductor bends shall form an included angle of not less than 90 degrees and shall not have bend radius less than eight inches. Secure conductors to structure at intervals not exceeding three feet.
- C. Conceal down conductors where possible in exterior wall construction. Space down conductors at intervals averaging not more than 100 feet around perimeter of structure. Provide at least two down conductors for each protected structure.
- D. For structural steel frame construction, down conductors at upper and lower extremities and at intervals not exceeding 200 feet shall be connected to structural steel. Make connections to steel frame with bonding plates having eight square inches of contact, or by exothermic weld connections.
- E. Provide air terminals at intervals not exceeding 20 feet along ridges and around perimeter of flat or gently-sloping roofs. Air terminals shall project a minimum of 10 inches above the area protected.
- F. Protect flat or gently-sloping roofs exceeding 50 feet in width, by providing additional air terminals at intervals not exceeding 50 feet on flat or gently-sloping area. Locate air terminals within two feet of roof edges and outside corners of protected areas. Air terminal spacing exceeding these dimensions will be allowed if the area protected is within a "zone of protection" from lightning strikes.

- G. Provide air terminals for stacks, flues, mechanical equipment, and other objects, having metal thickness less than 3/16-inch and not located within a “zone of protection”. Connect objects having metal thickness 3/16-inch or greater to lightning protection system.
- H. Do not connect copper equipment to aluminum surfaces, except using bimetal transition fitting. Lead coating is unacceptable for bimetal transition.
- I. Install roof penetrations using through-roof assemblies with solid bars and appropriate roof flashing. Conductors shall not pass directly through roof.
- J. Grounded metal bodies shall be bonded to the system using bonding connections and fittings. When ground conductors are installed in conduit, conduit shall be non-metallic.
- K. Bond building ground systems including electrical, communication, and telephone services and arresters.
- L. Bond metal pipes and roof mounted metal structure to the roof ground loop or to downlead cables.
- M. Provide ground electrodes for each down conductor dedicated for lightning protection system and bond electrodes to building or structure grounding system. Connect down conductor to ground rod using high-strength, removable ground clamp. Provide bronze ground rod clamp having at least 1.5 inches of contact between rod and conductor, measured parallel to the axis of the rod, at ground test wells.

3.03 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. During installation, lightning protection system shall be inspected by Master Installer or Inspector at several stages during installation in accordance with LPI requirements.
 - 2. Do not conceal system components until inspection has been completed and successfully inspected, and observed by ENGINEER.
 - 3. Upon completion of lightning protection system, arrange for final lightning system inspection and submit final inspection report to ENGINEER. Final lightning system inspection shall be performed by Master Installer or Inspector in accordance with LPI requirements.

END OF SECTION

SECTION 16075 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install identification for electrical apparatus and electrical Work. All manufactured equipment shall have nameplates in accordance with drawing naming conventions.

B. Related Sections:

1. 16120 Wires and Cables.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:

1. NEC Article 110, Requirements for Electrical Installation.
2. NEC Article 210, Branch Circuits.
3. NEC Article 215, Feeders.
4. NEC Article 504, Intrinsically Safe Systems.
5. NEC Article 700, Emergency Systems.
6. NEC Article 701, Legally Required Standby Systems.
7. NEC Article 702, Optional Standby Systems.
8. 40 CFR 1910.145 (OSHA) - Specification for Accident Prevention Signs and Tags.
9. NFPA 70E, Electrical Safety in the Workplace.
10. NFPA 79, Electrical Standard for Industrial Machinery.

1.03 SUBMITTALS

A. Submit shop drawings and product data as described in Division 1 and following:

1. Shop Drawings: Submit the following:
 - a. Complete description and listing of proposed electrical identification and electrical identification devices for associated equipment or systems.
 - b. Conduit and wire identification numbering system and equipment signage.
2. Product Data:
 - a. Manufacturer's literature, cut sheets, specifications, dimensions and technical data for all products proposed under this Section.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Engraved Identification Devices (Nameplates and Legend Plates):

1. Nameplates: (To be put on all manufactured equipment including panelboards, disconnects, control cabinets, junction and terminal boxes 12" and larger.)
 - a. Laminated thermoset plastic, 1/16-inch thick, engraved condensed block black lettering on white background, square corners, and beveled front edges, or match existing. Nameplate shall have glued backing with stainless screws in each corner. Provide sufficient spacing for mounting screws.
 - b. Size: As required.
 - c. Letter Size: Minimum 3/16-inch.
 - d. Nameplates one-inch or less in height shall have one mounting hole at each end. Nameplates greater than one-inch in height shall have mounting holes in the four corners.
2. Legend Plates:
 - a. Legend plates for pushbuttons, pilot lights, selector switches, and other panel-mounted devices shall be large size with dimensions of approximately 2-7/16 inches wide by 2-13/32 inches tall (similar to Allen Bradley large automotive size), plastic, custom engraved with black letters on white background.
 - 1) Provide standard-size legend plates where devices are mounted on motor control centers and motor controllers and spacing of devices precludes using automotive-size legend plates.
 - b. Lettering size and line weight shall be the same for all legend plates on the same panel or enclosure. Maximum size shall be 1/4-inch and minimum size shall be 1/8-inch.

B. Safety Signs and Voltage Markers:

1. Provide high voltage signs for equipment operating over 600 volts.
2. High-Voltage Safety Signs for Outdoor Applications:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) B-120-45471 by Brady.
 - 2) Or approved equal.
 - b. Unless otherwise shown or indicated, high voltage safety signs shall be not less than 10 inches high by 14 inches wide, of fiberglass reinforced plastic, and shall comply with 40 CFR 1910.145. Signs shall resist fading from exposure to temperature

- extremes, ultraviolet light, abrasive, and corrosive environments, and shall read, "DANGER - HIGH VOLTAGE - KEEP OUT"
- c. Mounting hardware shall be Type 316 stainless steel.

3. Cable Tray Safety Signs:

- a. Products and Manufacturers: Provide one of the following:
 - 1) B-302-86139 by Brady.
 - 2) Or approved equal.
- b. Cable tray safety signs shall be pressure-sensitive vinyl conforming to 40 CFR 1910.145, 5 inches by 3.5 inches in size, and shall read, "DANGER - HIGH VOLTAGE"
- c. Low voltage safety signs shall be pressure-sensitive vinyl complying with 40 CFR 1910.145, five inches by 3.5 inches in size, and shall read, "DANGER - 480 VOLTS"

4. Low-Voltage Safety Signs:

- a. Products and Manufacturers: Provide one of the following:
 - 1) B-302-86060 by Brady.
 - 2) Or approved equal.
- b. Low voltage safety signs shall be pressure-sensitive vinyl complying with 40 CFR 1910.145, five inches by 3.5 inches in size, and shall read, "DANGER - 480 VOLTS".

5. Low-Voltage Markers:

- a. Products and Manufacturers: Provide one of the following:
 - 1) CV442xx by Brady.
 - 2) Or approved equal.
- b. Low voltage markers shall be either pressure-sensitive vinyl or vinyl cloth with black lettering on orange background and shall read, "120 VOLTS", "208 VOLTS", "120/208 VOLTS", or "240 VOLTS" as required.

C. Arc-flash Safety Signs:

- 1. Products and Manufacturers: Provide one of the following:
 - a. Brady.
 - b. Or approved equal.
- 2. Warning signs shall be adhesive-backed polyester.
- 3. Warning signs shall read, "Warning - Arc Flash and Shock Hazard". Appropriate PPE Required. Arc flash warning signs at a minimum shall

indicate the flash protection boundary, incident energy in calories per square centimeter, hazard level, description of required protective clothing, shock hazard, limited approach boundary, restricted approach boundary, prohibited approach boundary, and equipment name. Refer to latest issue of NFPA 70E for label requirements.

D. Voltage System Identification Directories:

1. General:

- a. Directories shall be laminated thermoset plastic, 1/16-inch thick, engraved block black letters on white background, square corners, and beveled front edges.
- b. Directories shall identify all voltage systems within building or structure.
- c. Directories shall list the colors that identify ungrounded and grounded conductors of each system.
- d. Colors shall be in accordance with Section 16120, Wires and Cables
- e. Example Directory Text:

Voltage System Identification		
System	A, B, C	Neutral
277/480	Brown, Orange, Yellow	Gray
120/208	Black, Red, Blue	White
CONTROL	COLOR	REMARKS
120V	Yellow	External Powered
24VDC	Blue	Discrete Signal
120V	Red	Powered from PLC
24VAC	Orange	Discrete Signal

2. Large directories for rooms shall have text height not less than 1/2-inch.
3. Small directories for equipment shall have text height of not less than 1/4-inch.

E. Conduit Labels:

1. Products and Manufacturers: Provide one of the following:
 - a. Stainless Steel Tags and Strapping by Brady.
 - b. Or approved equal.
2. Tags shall be engraved or stamped with ID designation consisting of conduit designation number indicated on drawings and as outlined in Section 3.01, F. Verify conduit numbers match numbers shown on drawings. Same number on both ends of conduit.
3. Utilize stainless steel strapping with a minimum of 32 mil thickness to securely attach conduit labels to conduits.

F. Wire Identification:

1. Heat Shrinkable Wire and Cable Labeling System

a. Products and Manufacturers: Provide one of the following:

- 1) ID Pro Plus WMS-xxx- by Brady.
- 2) No equal.

b. White heat-shrinkable irradiated polyolefin shrink-on sleeves. Labels shall be thermal printed. Labels shall be not less than one inch wide. Verify wire numbers match drawings including submitted equipment drawings numbers, install same number on each end of wire.

2. Wrap-Around Wire and Cable Labeling System

a. Products and Manufacturers: Provide one of the following:

- 1) ID Pro Plus WMS-xxx by Brady.
- 2) No equal.

b. Self-laminating white/transparent self-extinguishing vinyl strips. Length shall be sufficient to provide at least 2.5 wraps. Labels shall be thermally printed and not less than two inches wide. Verify wire numbers match drawing numbers, same number on each end of wire.

G. Detectable Underground Warning Tape:

1. Products and Manufacturers: Provide one of the following:

- a. Indentoline by Brady.
- b. Or approved equal.

2. Material: Polyethylene or polyester with detectable metal core and polyester underlamine.

3. Width: Two inches.

4. Color and Labeling: Yellow or red with permanently imprinted black letters: "CAUTION - Buried Electric Line", repeated continuously over full length of tape.

H. Thermal Printing System:

1. Utilize thermal transfer process to provide non-smearing labels and markers.

2. Wire and Cable Markers:

a. Portable, Products and Manufacturers: Provide one of the following:

- 1) ID Pro Plus by Brady.

- 2) No equal.
- b. Desktop, Products and Manufacturers: Provide one of the following:
 - 1) BB72 by Brady.
 - 2) Or approved equal.
- 3. Cable Markers:
 - a. Portable, Products and Manufacturers: Provide one of the following:
 - 1) ID Pro Plus by Brady.
 - 2) No equal.
 - b. Desktop, Products and Manufacturers: Provide one of the following:
 - 1) BBP72 by Brady.
 - 2) No equal.

2.02 FABRICATION

- A. Engraved Identification Devices (Nameplates and Legend Plates):
 - 1. Nameplate and legend plate text is preliminary and subject to change pending final review and approval of nomenclature by Engineer after start-up and testing. Verify device name plate matches drawing device name and/or number.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide electrical identification in accordance with manufacturer recommendations and as required for proper identification of equipment and materials.
- B. Engraved Identification Devices (Nameplates and Legend Plates):
 - 1. Unless otherwise indicated in the Contract Documents, attach permanent nameplates with permanent adhesive and with 3/16-inch diameter, round head, stainless steel machine screws into drilled and tapped holes.
 - 2. Provide nameplate with 1.5-inch high letters to identify each console, cabinet, panel, or enclosure as shown or indicated.
 - 3. Provide nameplates for field-mounted motor starters, disconnect switches, manual starter switches, pushbutton stations, and similar equipment operating components, which shall describe motor or equipment function and circuit number.
 - 4. Provide nameplates with 1/2-inch high letters to identify each junction and terminal box shown or indicated.

5. On switchgear, provide nameplates for each main and feeder circuit including control fuses, and for each indicating light and instrument.
 - a. Provide nameplate with 1.5-inch high letters giving switchgear designation, voltage rating, ampere rating, short circuit rating, manufacturer's name, general order number, and item number.
 - b. Identify individual door for each compartment with nameplate giving item designation and circuit number.

6. Motor Control Centers:
 - a. Provide nameplate with 1.5-inch letters with motor control center designation.
 - b. Identify individual door for each unit compartment with nameplate identifying controlled equipment.

7. Except conduit, all electrical appurtenances including lighting panels, convenience outlets, fixtures, and lighting switches, shall be provided with nameplates indicating appropriate circuit breaker number(s).

8. Push Buttons:
 - a. Provide legend plates for identification of functions.
 - b. Provide nameplates for identification of controlled equipment.
 - c. Provide red buttons for stop function.
 - d. Provide black buttons for other functions.

9. Pilot Lights:
 - a. Provide legend plates for identification of functions.
 - b. Provide nameplates for identification of controlled equipment.
 - c. Shall have lens colors as shown or indicated.

Where no color is indicated, provide the following lens colors:

Color	Legend
Red	Running, Open
Green	Stopped, Closed
Amber	Alarm
Blue	Power
White	Status

10. Selector Switches:
 - a. Provide legend plates for identification of functions.
 - b. Provide nameplates for identification of controlled equipment.

11. Panel Mounted Instruments:
 - a. Provide nameplates for identification of function.

12. Interiors of Cabinets, Consoles, Panels, Terminal Boxes, and Other Enclosures:
 - a. Provide nameplates for identification.
 - b. Provide each item inside cabinet, console, panel, terminal box, or enclosure with laminated plastic nameplate as shown on approved Shop Drawings and Contractor's other submittals. Install nameplates with adhesive.
 - c. Interior items requiring nameplates include:
 - 1) Terminal blocks and strips.
 - 2) Bus bars.
 - 3) Relays.
 - 4) Rear of face-mounted items.
 - 5) Rear of door-mounted items.
 - 6) Interior mounted items that require identification when mounted externally.
 - d. Circuit Breaker Directory:
 - 1) Provide engraved laminated plastic directory listing function and load controlled for each circuit breaker within panel used for power distribution.

13. Re-label existing equipment whose designation have changed.

C. Safety Signs and Voltage Markers:

1. Provide safety signs and voltage markers on and around electrical equipment as shown or indicated.
 - a. Install rigid safety signs using stainless steel fasteners.
 - b. Clean surfaces before applying pressure-sensitive signs and markers.
2. Provide cable tray safety signs on both sides of cable trays at maximum intervals of 20 feet. Install signs on side rails of tray as acceptable to Engineer.
 - a. Cable trays that contain conductors greater than 208 volts and less than 600 volts shall be labeled with low voltage safety signs.
 - b. Cable trays that contain conductors of 120/208 volts shall be labeled with low voltage markers.
 - c. Do not label cable trays that contain only instrument signal cables.
 - d. Label cable trays that contain intrinsically safe wiring or cables in accordance with NEC Article 504.
4. Install low voltage safety signs on equipment doors that provide access to uninsulated 480-volt conductors, including terminal devices.
5. Install low voltage markers on each terminal box, safety disconnect switch, and panelboard installed, modified, or relocated as part of the Work and containing 120/208 volt conductors.

D. Voltage System Identification Directories

1. Provide voltage system identification directories as required by NEC Article 210 and NEC Article 215.
2. Provide in each electrical room voltage system identification directory mounted on wall or door at each entrance to room.
3. For panelboards, switchboards, motor control centers, and other branch circuit or feeder distribution equipment that are not located in electrical rooms, provide voltage system identification directory mounted on equipment.
 - a. Directories shall be affixed using epoxy glue. Screws or bolts shall not penetrate equipment enclosures.
 - b. Directories shall be readily visible and not obscure labels and other markings on equipment.

E. Arc-flash Safety Signs:

1. Provide arc-flash safety signs as required by NEC Article 110.
2. Provide signs for switchboards, panelboards, motor control centers, and industrial control panels. Provide signs for control panels that contain 480 volt equipment. Provide arc flash warning signs on other equipment where the incident energy is greater than 1.2 calories per square centimeter.

F. Conduit Labels:

1. Provide conduits with conduit labels unless otherwise shown or indicated.
2. Do not label flexible conduit.
3. Do not label exposed single conduit runs of less than 25 feet between local disconnect switches and their associated equipment.
3. Conduit labels shall indicate the following information:
 - a. Contract Number: Alphanumeric, three or four digits, as applicable.
 - b. Conduit Number: Alphanumeric as shown on the Drawings, as assigned by Contractor for unlabeled conduits, and in accordance with approved submittals.
4. Conduits that contain intrinsically safe wiring shall have an additional pipe marker provided that has blue letters on white background and reads, "INTRINSICALLY SAFE WIRING".
 - a. Install intrinsically safe pipe markers in accordance with NEC Article 504 along entire installation. Spacing between labels shall not exceed 25 feet.
5. Provide conduit labels at the following locations:
 - a. Where each conduit enters and exits walls, ceilings, floors, or slabs.

- b. Where conduit enters or exits boxes, cabinets, consoles, panels, or enclosures, except pull boxes and conduit bodies used for pull boxes.
 - c. At maximum intervals of 50 feet along length of conduit.
 - 7. Orient conduit labels to be readable.
- G. Wire and Cable Identification:
 - 1. Color-coding of insulated conductors shall comply with Section 16120, Wires and Cables.
 - 2. Use heat-shrinkable wire labels where all wire or cable is terminated. Use wrap-around labels where wire or cable is to be labeled but is not terminated.
 - 3. Provide wire and cable labels for the following:
 - a. New, rerouted, or revised wire or cable.
 - b. Insulated conductors.
 - d. Wire and cable terminations:
 - 1) Wire labels shall be applied between 1/2-inch and one inch of completed termination
 - 2) Apply cable labels between 1/2-inch and one inch of cable breakout into individual conductors.
 - a) Label individual conductors in a cable after breakout as specified for wires.
 - e. Wire or cable exiting cabinets, consoles, panels, terminal boxes, and enclosures.
 - 1) Label wires or cables within two inches of entrance to conduit.
 - f. Wire or cable in junction boxes and pull boxes
 - 1) Label wires or cables within two inches of entrance to conduit.
 - g. Wire and cable installed in cable tray.
 - 1) Wire and cable shall have labels at maximum intervals of 20 feet.
 - h. Wire and cable installed without termination in electrical manholes.
 - 1) Wire and cable shall have wrap-around labels applied within one foot of exiting manhole.
 - i. Vendor supplied equipment wire and cable
 - 1) Wire and cable shall have wire numbers on all wires.

4. Wire and Cable Identification System:
 - a. Wire and cable labels shall be imprinted with an identifying designator.
 - 1) Wire and cable extending between two devices or items and that does not undergo a change of function shall be identified by a single unique designator as specified below. Vendor O&M and panel drawings shall reflect field wire numbering.
 - a. Field Wiring:
 - 1) Wire or cable designator shall consist of
 - a) Three left-most characters shall consist of the Contract number under which wiring or cable was installed.
 - b) Between designations of contract, terminal, and equipment, the group of characters shall be separated by an asterisk (*), a plus sign (+) or a hyphen (-). Do not use other punctuation symbols in a wire designator.
 - c) Remaining characters shall be alphanumeric.
 - (i.) Fifth thru Seventh characters for wires coming from control panel or PLC cabinet to the field, wire number shall match Vendor panel terminal block numbers and have instrument or equipment designation and number. EX. 870-001-FIT-001, 870-001-PUMP-1
 - (ii.) For field wiring at instrument or equipment, fifth thru seventh number shall have terminal block number of control enclosure or terminal box and name of control enclosure or terminal box. EX. 870-001-PLC-7, 870-001-MCC-7
 - d) Numbering shall reflect actual designations used in the Work and shall be documented in record documents.
 - b. Cabinet, Console, Panel, and Enclosure Wiring, Internal:
 - 1) New Cabinets, Consoles, Panels, and Enclosures:
 - a) Wire and cable inside cabinets, consoles, panels, and enclosures shall have designators as shown on the Drawings or be assigned a ten-character designator equivalent to field wire designator, with the exception that Drawing number shall be fifth thru seventh number and terminal block number

shall be ninth thru eleventh number. EX. 870-E21-013-UPS.

2) Modified Cabinets, Consoles, Panels, and Enclosures:

- a) New or rerouted wire or cable in existing cabinets, consoles, panels, and enclosures shall be labeled as shown on the Drawings or be assigned a ten-character designator equivalent to field wire designator, with the exception that Drawing number shall be fifth thru seventh number and terminal block number shall be ninth thru eleventh number. EX. 870-E23-001-HVAC.

H. Terminal Strip Labeling:

- 1. Label panel side of terminal to match panel wire number.
- 2. Label field side of terminal to match field wire number. Terminal number shall not include the Contract number.

END OF SECTION

SECTION 16110 CONDUITS AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install the conduits, fittings, devices and appurtenances as hereinafter specified and/or as shown on the Contract Drawings. This specification applies to both low and medium voltage systems.

1.02 SUBMITTALS

- A. 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. Rigid aluminum conduits (RAC) shall be used at all locations aboveground and within structures and buildings, except where otherwise shown on the Contract Drawings.
- C. Rigid aluminum conduits shall be used at all locations for shielded instrumentation/control and communication wiring, except where otherwise shown on the Contract Drawings.
- D. Schedule 40 PVC conduits shall be used for all power and 120V instrumentation/control wiring when used in concrete steel reinforced ductbanks and in-slab applications except where otherwise shown on the Contract Drawings. Provide conduit spacers by "Carlton" or approved equal, every 6 feet or less to hold separation of conduits.
- E. Schedule 80 PVC shall be used for all power and instrumentation/control wiring in direct bury ductbank applications except where otherwise shown on the Contract Drawings. Provide conduit spacers by "Carlton" or approved equal, every 6 feet or less to hold separation of conduits.
- F. Schedule 80 PVC conduits, fittings, and boxes shall be used in highly corrosive areas such as chemical storage areas, digesters, fluoride storage and handling areas, etc.
- G. All conduits of a given type shall be the product of one manufacturer.
- H. Except where otherwise shown on the Contract Drawings, or hereinafter specified, all boxes shall be metal.
- I. Surface and flush mounted switch, receptacle and control station boxes shall be 316 Stainless Steel.
- J. Devices designated as NEMA Type 4 shall be 316 stainless steel, gasketed.

- K. Devices designated as NEMA Type 4X shall be 316 stainless steel, gasketed, except as otherwise shown on the Contract Documents.
- L. Combination expansion-deflection fittings shall be used where conduits cross structural expansion joints or as recommended by manufacturer for ambient conditions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rigid Conduit
 - 1. Rigid aluminum conduit shall be Aluminum as manufactured by Allied Tube & Conduit, Patriot Aluminum Products or approved equal.
 - 2. PVC Sch 80 & 40 conduit as manufactured by Carlon, Heritage Plastics 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 Aluminum Conduit Fittings:
 - a. Aluminum elbows, bends, sweeps, nipples, couplings, etc., 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.
- 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: Wall sleeves shall be used for all wall penetrations and conform to area classifications. 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 PVC or 316 S.S.
 - b. The boxes shall have continuously welded seams and shall be ground smooth.
 - 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.
- I. Conduit Mounting Devices: Hangers, rods, channel, backplates, clips, straps, beam clamps, etc., shall be 316 stainless steel as manufactured by 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 316 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. Conduits shall be supported at intervals of 8-feet or less, as required to obtain a rigid installation. Flexible conduit supports shall be in accordance with NEC 350.30 and 356.30.
- E. Exposed conduits shall be run parallel with and/or perpendicular to the surrounding surface(s). No diagonal runs will be allowed.
- F. 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.
- G. Multiple horizontal runs of conduits shall be supported by trapeze type hangers (channel) suspended by threaded rod, 3/8-inch minimum diameter.
- H. Multiple vertical runs of conduits shall be supported by structurally mounted channel in combination with conduit clamps.
- I. Conduit support devices shall be attached to structural steel by welding or beam or channel clamps as indicated on the Contract Drawings.
- J. Conduit support devices shall be attached to concrete surfaces by "spot type" concrete inserts.
- K. Conduits terminating in steel interior boxes shall have double locknuts and insulating bushings. Exterior conduits installed in boxes shall have sealed conduit hubs when penetrating in the top or side.
- L. Conduits terminating in gasketed enclosures shall be terminated with sealed conduit hubs weather interior or exterior.
- M. Conduit wall seals, waterproof type, shall be used at all locations where conduits penetrate walls.
- N. Liquidtight, flexible conduit, metal in all metallic conduit runs and non-metallic in all PVC conduit runs, shall be used for all motor / rotative equipment terminations and for all connections/terminations where vibration is anticipated. Liquidtight, flexible conduit shall also be permitted where it is necessary to allow removal of process equipment.
- O. Flexible couplings shall be used in hazardous locations for all motor terminations and for all connections/terminations where vibration is anticipated.
- P. Conduit stubouts for future construction shall be capped at both ends with threaded PVC conduit caps.

- Q. The cement used for PVC conduit installations shall be as manufactured by Carlon, or approved equal.
- R. Provide grounding type bushings for a conduit entering all panels and junction boxes.
- S. Rigid aluminum conduits entering manholes and/or below grade pull boxes shall be terminated with grounding type bushings which shall be connected to a 3/4-inch by 10-foot long driven ground rod with No. 6 AWG bare copper wire.
- T. Rigid aluminum conduit shall be used for all risers. The underground portion of the riser and a 6-inch section of the riser immediately above the ground or slab/floor level shall be painted with a bitumastic coating. All below grade conduit and conduit sweeps shall be PVC coated metallic or 40mil bitumastic coating. No aluminum conduit is to come into direct contact with concrete or earth.

3.02 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 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.
- B. Testing of all cables per section 3.02.

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 County.
- D. NETA Testing Form, in accordance with the ANSI/NETA Standard for Acceptance Testing Specifications.

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 and outdoor tray cable rated.
- E. The analog wire for process instrumentation shall be twisted pair shielded #16 AWG stranded and outdoor tray cable rated.
- F. Power cables to process equipment driven from Variable Frequency Drives shall be multi-conductor VFD cable with an overall metallic shield.
- G. All wiring in tray cable shall be rated as such, with UV resistive outer jacket.

1.04 MINIMUM SIZES

- A. Except for control and signal leads, no power 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.

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 including VFD, 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 No. 14 AWG, stranded, 600 Volt, cross-linked polyethylene insulated, PVC jacketed.
- C. Instrumentation and control wiring shall be as manufactured by Belden, Alpha, or approved equal.

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. Cable puller must have tension gauge for monitoring stress.

- E. All wire and cable shall be installed from terminal to terminal with no splicing at any intermediate point, unless approved by Engineer.
- 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 County 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 County 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. All control wire terminations shall be made using ferrules. Other 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 "Megger Tested" to check insulation resistance. The test voltage shall be not less than 1000 Volts DC for one minute, per NETA Acceptance Testing Standards. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation. Three (3) copies of these test results shall be submitted to the County.
- B. An authorized representative(s) of the County or Engineers representative shall witness all testing. The County 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 County. 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 County.

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 16135 PULL, JUNCTION AND TERMINAL BOXES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install pull, junction, and terminal boxes.

B. Related Sections:

1. Section 16050, Electrical - General Provisions
2. Section 16075, Identification for Electrical Systems.
3. Section 16505, Hangers and Supports for Electrical Systems.

1.02 REFERENCES

A. Standards referenced in this Section are.

1. AASHTO, Standard Specifications for Highway Bridges.
2. UL 886, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:

1. NEC Article 314, Outlet, Device, Pull and Junction Boxes; Conduit Bodies; Fittings; and Handhole Enclosures.

1.04 SUBMITTALS

A. Shop drawings and product data as described in Division 1.

B. Operation and maintenance data as described in Division 1.

C. In addition, submit the following:

D. Action Submittals: Submit the following:

1. Product Data:
 - a. Manufacturer's technical information for pull, junction, and terminal boxes proposed for use.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pull, Junction, and Terminal Boxes:

1. General - Applicable to All Boxes:

a. Description and Performance Criteria:

- 1) Provide pull, junction, and terminal boxes rated at not less than NEMA 12. Boxes shall be appropriate for each location in accordance with NEMA requirements and as required for area classifications specified in NFPA 820 and contract drawings.
- 2) For flush-mounted pull boxes in slabs or pavement potentially or subject to vehicular traffic, boxes and covers shall be constructed for H-20 loading in accordance with AASHTO Standard Specifications for Highway Bridges.

b. Manufacturers: Provide products of one of the following:

- 1) Appleton Electric Company.
- 2) Crouse-Hinds Company.
- 3) Hoffman Engineering Company.
- 4) Or equal.

c. Materials: Pull boxes embedded in concrete slabs shall be cast iron.

d. Terminal strips and terminal blocks in terminal boxes shall be mounted on terminal box sub-panels.

e. Identification: Boxes shall be identified in accordance with Section 16075, Identification for Electrical Systems.

2. Materials and Construction - Dusty Locations:

a. Material: Aluminum.

b. Gasket: Oil-resistant gasket.

c. Access: Lift-off hinges and quick-release latches.

d. Material Thickness as required.

3. Materials and Construction - Wet, Corrosive, or Hazardous Locations:

a. Rating:

- 1) Pull boxes in wet, corrosive, or outdoor areas shall be NEMA 4X.
- 2) Boxes for areas classified as hazardous locations, where required by NEC, shall be explosion-proof and comply with UL 886.

- b. Material:
 - 1) Copper-free aluminum alloy or Type 316 stainless steel, as required by location.
 - 3) In corrosive locations, boxes shall be non-metallic thermoplastic or fiberglass reinforced polyester (FRP) material.
- c. Gasket:
 - 1) Provide neoprene gaskets for wet and corrosive locations.
 - 2) Gaskets shall be an approved type designed for the purpose. Improvised gaskets are not acceptable.
- d. Access: Stainless steel cover bolts.
- e. Features:
 - 1) External mounting lugs.
 - 2) Drilled and tapped conduit holes.
 - 3) Boxes where conduits enter building or structure below grade shall have 1/4-inch drain hole at bottom of the box.
 - 4) Provide threaded connections for explosion proof boxes.

B. Terminal Blocks:

- 1. Products and Manufacturers: Provide one of the following:
 - a. Allen-Bradley Company, Bulletin, Model 1492.
 - b. General Electric Company, Model CR151K.
 - c. Or Approved equal.
- 2. Material and Construction:
 - a. NEMA-rated nylon modular terminal blocks.
 - b. 600-volt rated.
 - c. Control and alarm circuit terminals shall be screwed type with permanently affixed numeric identifiers beside each connection.
 - d. Power terminals shall be copper and rated for the circuit ampacity.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Mount boxes so that sufficient access and working space is provided and maintain clearance of not less than 1/4-inch from walls.

- B. Securely fasten boxes to walls or other structural surfaces on which boxes are mounted. Provide independent supports that comply with Section 16505, Hangers and Supports for Electrical Systems, where boxes will not be mounted on walls or other structural surface.
- C. Install pull boxes where shown or indicated, and provide pull boxes where one or more of the following conditions exist:
 - 1. Conduit runs containing more than 270-degrees of raceway bend.
 - 2. Conduit runs exceeding 200 feet in length.
- D. Provide removable, flame-retardant, insulating cable supports in boxes with any dimension exceeding three feet.
- E. Field-apply PVC touch-up to scratched PVC boxes damaged during installation. Touch-up work shall be in accordance with manufacturer's recommendations and instructions.
- F. Size junction, pull, and terminal boxes in accordance with NEC Article 314 and manufacturer guidelines.
- G. Provide terminal blocks in boxes where shown and where cable terminations or splices are required.

END OF SECTION

SECTION 16140 WIRING DEVICES

PART 1 GENERAL

1.01 REQUIREMENT SUMMARY

- A. Contractor shall furnish and install all Wiring Devices as required, such as: light switches, motor-rated switches, receptacles, GFCI devices, device plates, covers, dimmers, plug-in strips with those voltage and current ratings as shown in the Contract Documents.

1.02 RELATED WORK ELSEWHERE

- A. In addition to the requirements specified in this Section, the requirements of Division 16 and those Project Specification Sections referenced therein shall be applied.
- B. Related Specification Sections include but not limited to:
 - 1. 16120 - Wires and Cables
 - 2. 16110 - Conduits and Fittings

1.03 REFERENCES

- A. Wiring Devices shall conform to all applicable Federal, UL, and NEMA standards. Materials and components shall be new and conform to grades, qualities and standards as specified herein and shown in the Contract Documents.
- B. Codes and Standards:
 - 1. UL Listing/ Approval
 - 2. UL 20 - General-Use Snap Switches
 - 3. UL 943 - Ground-Fault Circuit-Interrupters
 - 4. UL 1681 - Standard for Wiring Device Configurations
 - 5. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Contractor shall reference and provide all documentation for all Division 16 Sections as required per Specification Sections:
 - 1. 01340 - Shop Drawings, Product Data and Samples
- B. Qualifications
 - 1. For approval, manufacturer shall have specialized in the manufacturing and assembly of Wiring Devices for at least twenty-five (25) years.
 - 2. Furnish products listed by Underwriters Laboratories Incorporated and in accordance with standards listed in Section 1.3.

1.05 IDENTIFICATION

A. Wiring Devices shall be identified with the equipment tag number indicated on the Contract Documents and the accepted shop drawings. Nameplates shall be furnished and installed as required Specification Section(s):

1. 16075 - Identification for Electrical Systems

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Light switches (except explosionproof)

- a. Hubbell
- b. Pass & Seymour
- c. Leviton

2. Explosionproof light switches

- a. Appleton Electric Co.
- b. Crouse Hinds
- c. Killark

3. Door Switches

- a. Arrow Hart
- b. General Electric
- c. Pass & Seymour
- d. Slater

4. Receptacles (except explosionproof):

- a. Arrow Hart
- b. Hubbell
- c. General Electric
- d. Pass & Seymour
- e. Slater
- f. Leviton

5. Explosionproof receptacles:

- a. Appleton Electric Co
- b. Crouse Hinds
- c. Killark

6. Dimmers:

- a. General Electric

- b. Lutron
 - c. Pass & Seymour
7. Plug in strip:
- a. Walker
 - b. Wiremold

2.02 MATERIALS

A. Light Switches for Indoor Unclassified Areas:

- 1. Toggle type, quiet action, and specification grade with grounding terminal
- 2. Back and side wired
- 3. Solid silver cadmium oxide contacts
- 4. One-piece switch arm rated 20A, 120/277VAC
- 5. UL listed
- 6. Color: GREY
- 7. Wall Plate: Type 304 stainless steel
- 8. LED Pilot Light as required in Contract Documents
- 9. Type: As indicated in Contract Documents

B. Receptacles for Indoor Unclassified Areas:

- 1. Straight blade, grounding type, specification grade
- 2. Back and side wired with wrap around bridge
- 3. Rated 20A, 125 VAC
- 4. UL listed
- 5. Color:
 - a. For use on normal power: GREY
 - b. For use on UPS systems: RED
 - c. For use on isolated ground systems: ORANGE
- 6. Wall Plate: Type 304 stainless steel
- 7. Type: As indicated in Contract Documents

C. Light Switches for Wet Areas:

- 1. Toggle type, quiet action, and specification grade with grounding terminal
- 2. Back and side wired
- 3. Solid silver cadmium oxide contacts
- 4. One-piece switch arm rated 20A, 120/277VAC
- 5. UL listed
- 6. Color: GREY
- 7. Wall Plate: Die-Cast AL weatherproof, lever-switch type
- 8. Type: As indicated in Contract Documents

D. Receptacles for Wet Areas:

- 1. Reference Section 2.02E

- E. Ground Fault Circuit Interrupter (GFCI) Receptacles:
1. Straight blade, grounding type, Class-A GFCI specification grade
 2. Rated 20A, 125VAC
 3. TEST and RESET buttons
 4. Power On LED indicating light
 5. UL listed
 6. Color: GREY
 7. Wall Plate: Die-Cast AL weatherproof, "IN USE"
 8. Type: As indicated in Contract Documents
- F. Light Switches for Corrosive Areas:
1. Corrosion resistant NEMA 4X enclosure with switch consisting of:
 - a. Fiberglass Reinforced Polyester (FRP) enclosure.
 - b. Toggle type, quiet action, and specification grade with grounding terminal
 - c. Rated 20A, 125VAC with solid silver cadmium oxide contacts
 - d. Grounding bushing
 - e. UL listed
 - f. Gasket: Butyl Rubber or chemical resistant
 - g. Wall Plate/Cover: FRP gasketed wall plate with built in toggle lever-switch with stainless steel shaft
 - h. Color: YELLOW
 - i. Type: As indicated in Contract Documents
- G. Receptacles for Corrosive Areas:
1. Fiberglass Reinforced Polyester (FRP) enclosure.
 2. Corrosion resistant straight blade, grounding type, specification grade
 3. Back and side wired with wrap around bridge
 4. Rated 20A, 125VAC
 5. Gaskets: Butyl Rubber or chemical resistant
 6. UL listed
 7. Color: YELLOW.
 8. Wall Plate/Cover: FRP gasketed, weatherproof, UL listed "IN USE" cover.
 9. Type: As indicated in Contract Documents
- H. Explosion-Proof Light Switches for Use in Hazardous Areas:
1. Explosionproof, UL listed for Class I, Division 1 and 2, Groups B, C, and D; and Class II, Division 1 and 2 areas, Groups E, F, and G
 2. EDS factory sealed
 3. Malleable iron body and cover
 4. Aluminum sealing chamber
 5. Front operated handle with stainless steel shaft
 6. Rated 20A, 125VAC
 7. With grounding screw
 8. Type: As indicated in Contract Documents
- I. Explosion-proof Receptacles for Use in Hazardous Areas:

1. Explosion proof, UL listed for Class I, Division 1 and 2, Groups B, C, and D; and Class II, Division 1 and 2, Groups F and G
 2. Factory sealed malleable iron receptacle with spring loaded cover
 3. Malleable iron mounting box
 4. Rated 20A, 125VAC
 5. "Dead front" construction requiring plug to be inserted and rotated to activate receptacle
 6. Type: As indicated in Contract Documents.
- J. Plug In Strip: Surface steel raceway plug in strip with single 15A, 125VAC, 3-wire grounding type receptacles spaced 18IN on center
1. Pre-wired with two 12AWG and one 12AWG green insulated ground
 2. Minimum 1 1/4IN wide x 3/4IN deep
 3. Suitable fittings and snap in cover
 4. Finish:
 - a. Stainless steel
 5. Receptacle color:
 - a. For use on normal power: GREY
 - b. For use on UPS systems: RED
 - c. For use on isolated ground systems: ORANGE
- K. Door Switches:
1. Rated 5A, 120VAC.
 2. Mode of operation: Door open lights on.
 3. UL listed.
- L. Lighting Dimmers:
1. Electronic solid-state type, rated for load, 120VAC and 277VAC
 2. Circuit design: Silicon symmetrical gate to provide full wave dimming and withstand current and inverse voltage surges
 3. Controls: Linear slide with positive off
 4. Provide built in filter to minimize noise interference in nearby audio lines
 5. Rated 100F maximum, ambient
 6. UL listed
 7. Finish: GREY or WHITE
- M. Pedestal Type Floor Mounted or Counter Mounted Duplex Receptacles:
1. Straight blade, grounding type, specification grade
 2. Back and side wired with wrap around bridge
 3. Rated 15A, 125VAC
 4. Horizontal design housing with threaded conduit fittings in base with satin chromium finish
 5. Install on adjustable 4IN flush floor box.
 6. Color:

- a. For use on normal power: GREY
- b. For use on UPS systems: RED
- c. For use on isolated ground systems: ORANGE.

N. Thermostats:

- 1. Contacts close on falling temperature to cycle unit heater on rising temperature to cycle exhaust fan motor
- 2. Rated 20A, 120VAC.
- 3. Range: 46 - 84F scale.
- 4. Switch: AUTO/OFF/ON
- 5. Provide subbase and mounting plate
- 6. Provide standard outlet box for mounting thermostat

PART 3 EXECUTION

3.01 INSTALLATION

- A. Wiring Devices shall be installed in accordance with the best practices of the trade along with manufacturer's installation instructions and shall operate satisfactorily when installed as shown in the Contract Documents.
- B. Mount Wiring Devices where indicated in the Contract Documents.
- C. Surface mount receptacles and light switches in concrete or pre-cast concrete construction.
- D. In masonry and metal stud construction, recess mount receptacles and light switches unless device precludes recessed mounting or unless otherwise noted in the Contract Documents.
- E. Where more than one receptacle is installed in a room and/or space, receptacles shall be symmetrically arranged.
- F. Set all Wiring Devices including covers plumb and vertical to the floor.
- G. Set recess mounted switches and receptacles flush with face of walls.
- H. Do not connect dimmers to loads in excess of 80% of the rating of the dimmer.
- I. Provide blank plates for empty outlets.
- J. Securely attach top to ceiling grid and base to mating surface.

3.02 PROJECT CLOSE-OUT

- A. All exterior surfaces of the Wiring Devices to include wall plates and covers and shall be cleaned thoroughly to remove all dust, dirt and debris as a result from installation and personnel use during Construction duration. All scratched wall plates and covers will be re-placed by Contractor at no additional cost to Owner.

- B. All painted or coated surfaces near and around Wiring Devices to include wall plates and covers and shall be cleaned thoroughly to remove all dust, dirt and debris as a result from installation and personnel use during Construction duration. Scratched and/or marred surfaces will be re-finished or recoated in accordance with the Project Specifications as required to restore surfaces by Contractor no additional cost to Owner.

END OF SECTION

SECTION 16143 DISCONNECT SWITCHES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install disconnect switches.

B. Related Sections:

1. Section 16050, Electrical - General Provisions
2. Section 16075, Identification for Electrical Systems.

1.02 REFERENCES

A. Standards referenced in this Section are:

1. UL 98, Enclosed and Dead-Front Switches.
2. NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
3. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:

1. NEC Article 404, Switches.
2. Disconnect switches shall bear the UL label.

1.04 SUBMITTALS

A. Shop drawings and product data as described in Division 1.

B. Operation and maintenance data as described in Division 1.

C. In addition, submit the following:

D. Action Submittals: Submit the following:

1. Shop Drawings:

- a. Listing of each switch to be furnished, including location, rating, and NEMA enclosure type for each.

2. Product Data:

- a. Manufacturer's technical information for disconnect switches proposed for use.

- B. Maintenance Material Submittals: Submit the following:
 - 1. Extra Stock Materials:
 - a. Furnish one set of spare fuses for each fused disconnect switch to be installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products of one of the following:
 - 1. Square-D Company.
 - 2. Eaton/Cutler Hammer.
 - 3. Siemens.
 - 4. Or approved Equal

2.02 MATERIALS

- A. Service Entrance Disconnect Switches:
 - 1. Type: Service Entrance Rated, Fused, heavy-duty, single throw, quick-make, quick-break mechanism, visible blades in "OFF" position and safety handle.
 - 2. Rating: Voltage, current and short circuit ratings and number of poles as shown or indicated on the Contract Drawings. Switch shall bear UL label indicating suitability for use as service equipment and shall comply with UL 98, NEMA KS 1, and NEMA 250.
- B. Single Throw, Circuit Disconnect Switches:
 - 1. Type: Fused or unfused (as shown on drawings), horsepower rated, heavy-duty, single throw, quick- make, quick-break mechanism, visible blades in the "OFF" position and safety handle.
 - 2. Rating: Voltage and current ratings and number of poles as required for motor or equipment circuits being disconnected. Switches shall bear a UL label and shall comply with the requirements of UL 98, NEMA KS 1 and NEMA 250.
 - 3. For installations with Variable Frequency Drives (VFD), provide auxiliary contacts to operate prior to the breaking of the main switch contacts, in order to interrupt control power to VFD. Auxiliary contact voltage rating 120V.
- C. Double Throw Safety Switches:
 - 1. For 100A or less - Type: Unfused, double throw with center "OFF" position, quick-make, quick-break mechanism, visible blades in the "OFF" position, and safety handle.
 - 2. Rating: Minimum 22kAIC rated. Coordinate with 16215 Electrical Power Distribution Study for "Withstand" requirements. Voltage and current ratings and number of poles as required for circuits being disconnected.

Switches shall bear UL label and shall comply with UL 98, NEMA KS 1, and NEMA 250.

3. For Over 100A - Type: fused, (see exception below) double throw with center "OFF" position, quick-make, quick-break mechanism, visible blades in the "OFF" position, and safety handle.
 4. Rating: Minimum 22kAIC rated. Coordinate with 16215 Electrical Power Distribution Study for "Withstand" requirements. Voltage and current ratings and number of poles as required for circuits being disconnected. If Power Distribution Study shows less than 10kAIC fault current available, un-fused switch is allowed.
- E. Enclosures: NEMA rating and materials for wet, corrosive, or hazardous areas shall be as required in Specification Section 16050, Electrical General Provisions; Section 16135, Pull, Junction and Terminal Boxes; or as shown on drawings.
- F. Identification:
1. Identify enclosures in accordance with Section 16075, Identification for Electrical Systems.
 2. Provide nameplate to identify the equipment served by disconnect switch and associated source of power.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions under which the Work will be installed and notify the Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.
- B. Securely fasten equipment to walls or other structural supports on which they are mounted. Provide independent stainless steel supports where no wall or other structural surface exists. Mount disconnect enclosures at a height not exceeding six feet.
- C. Provide suitable 1/4-inch spacers to prevent mounting enclosure directly against walls with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.
- B. Securely fasten equipment to walls or other structural supports on which they are mounted. Provide independent stainless steel supports where no wall or other structural surface exists. Mount disconnect enclosures at a height not exceeding six feet.
- C. Provide suitable 1/4-inch spacers to prevent mounting enclosure directly against walls.

END OF SECTION

SECTION 16215 ELECTRICAL POWER DISTRIBUTION STUDIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, professional services, and incidentals required to perform electrical power distribution system studies on the following equipment:
 - a. All 480V equipment being modified or replaced on this project and to the 208/120V panelboard level for new equipment.
 - b. Provide all Arcflash Labels per most recent NFPA 70E requirements.
2. Motor starting and transformer information used in electrical power distribution system studies shall be based on equipment provided by Contractor equipment provided by other contractors on the project and, where applicable, existing equipment ratings and settings.
3. Electrical power distribution system studies shall include the following, as specified in this Section:
 - a. Short-circuit study.
 - b. Protective device evaluation study.
 - c. Protective device coordination study.
 - d. Arc flash analysis

B. Related Sections:

1. Section 16050, Electrical General Provision
2. Section 16075, Identification for Electrical Systems.
4. Section 16423, Motor Control Centers

1.02 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/IEEE C37.91, Guide for Protective Relay Applications to Power Transformers
2. ANSI/NCSL Z540.3 Requirements for the Calibration of Measuring and Test Equipment.
3. IEEE 141, Recommended Practice for Electric Power Distribution in Industrial Plants (IEEE Red Book).
4. IEEE 242, Recommended Practice for Protection and Coord. of Industrial and Commercial Power Systems (IEEE Buff Book).
5. IEEE 399, Analysis (IEEE Brown Book), Recommended Practice for Power System Analysis.
6. IEEE 1584-2018, Guide for Performing Arc-Flash Hazard Calculations.
7. NFPA 70E, Electrical Safety in the Workplace.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Professional Engineer:

- a. Engage a registered professional engineer legally qualified to practice in the jurisdiction where the Project is located and experienced in providing engineering services of the kind indicated. Professional engineer may be employed by independent consulting firm or manufacturer of power distribution equipment.
- b. Professional engineer shall have not less than five years of experience performing electrical power distribution system studies similar in scope and size to the studies required for the Project.
- c. Submit qualifications data.
- d. Responsibilities include but are not necessarily limited to:
 - 1) Performing or supervising the performance of electrical power distribution system studies and related field services.
 - 2) Preparing or supervising the preparation of test plans and test reports, and interpretation and engineering analysis of test data. Test reports shall bear the seal and signature of the professional engineer. State of licensure, license number, and professional engineer's name shall be clearly legible on the seal.
 - 3) Certifying that tests performed and results achieved conform to the Contract Documents.

2. Field Engineer:

- a. Field engineer performing protective device testing shall be experienced in type of testing required and testing equipment used on the Project.
- b. Field engineer may be an employee of the protective device equipment manufacturer.

B. Test equipment and instrument calibration shall comply with accuracy standards of NIST and ANSI/NCSL Z540.3.

1.04 SUBMITTALS

A. Shop drawings and product data as described in Division 1.

B. In addition, submit the following:

C. Action Submittals: Submit the following:

1. Studies:

- a. Calculations and results of the short-circuit study, protective device evaluation, and coordination studies in report format. Report shall be sealed and signed by the professional engineer retained for the studies. Submit preliminary reports (when specified) and final reports.
 - b. Time current curves for protective devices included within the power system studies.
 - c. Calculations and results of arc-flash analysis in report format sealed and signed by professional engineer retained for the studies. Submit preliminary reports (when specified) and final reports.
 - 2. Testing Plan: Submit work plan for field testing. Submit and obtain Engineer's approval prior to performing tests. Plan shall indicate schedule of field testing, time frames for tests, and duration of equipment outage for testing. Submit shutdown requests for each outage in accordance with Section 01040, Coordination with Owner's Operations.
 - 3. Field Survey Plan: Submit work plan for field survey and data gathering prior to beginning work. Plan shall indicate the schedule of work, time frames for data collection, and duration that equipment will be temporarily out of service. Submit shutdown requests for each outage in compliance with Section 01040, Coordination with Owner's Operations.
- D. Informational Submittals: Submit the following:
- 1. Test Reports:
 - a. Results of field testing.
 - 2. Qualifications Statements:
 - a. Professional engineer.
 - b. Field engineer, when required by Engineer.
- E. Closeout Submittals: Submit the following:
- 1. Final settings of protective devices. Submit compilation of final settings for each equipment lineup within 10 days of programming the associated protective devices.
 - 2. Electronic Files:
 - a. Computer software files (SKM) for future use to the County. Provide on CD or lockable flash drive.
 - b. Protective Devices:
 - 1) Settings for all microprocessor-based protective devices.
 - 2) Software versions used to program the protective devices.
 - c. Electrical Power Distribution System Studies:

- 1) Upon Engineer's approval or acceptance, as applicable, of submittals required under this Section, submit for County's use all electronic files developed for the Work under this Section associated with the approved or accepted, as applicable, submittal to the Engineer.
- 2) Electronic files submitted for County's use shall become County's property.
- 3) Source files for power studies performed under this Section.

1.05 ELECTRICAL POWER DISTRIBUTION SYSTEM STUDIES

A. General:

1. Perform a current and complete short-circuit study, protective device evaluation study, and protective device coordination study for the Site's electrical distribution system. Perform studies in accordance with IEEE 141, IEEE 242, and IEEE 399.
2. Studies shall include all portions of high-, medium-, and low-voltage electrical power distribution systems, from the normal and alternate sources of power through low-voltage distribution system. Thoroughly cover in the study normal system operating method, alternate operation, and operations that could result in maximum fault conditions.
3. Perform a complete study to evaluate both new and existing devices, and include recommendations on required adjustments. Studies shall include both the normal utility supply and standby generator systems.
4. Promptly bring to attention of the Engineer and County problem areas and inadequacies in equipment.
5. Perform both preliminary and final short-circuit and coordination studies. Preliminary study shall verify adequacy of equipment's short-circuit ratings and establish preliminary settings required prior for energizing equipment. Perform final short-circuit and coordination study and arc flash analysis after the Engineer's acceptance of preliminary study, but not later than the date when equipment installed under the Project is placed into service. Study data shall include the following:
 - a. Preliminary Short-circuit and Coordination Study: Base the evaluation on the worst case operating mode. Include the utility-confirmed contribution plus an additional 5 percent. Base the evaluation on estimated cable lengths, and proposed equipment and protective devices.
 - b. Final Short-circuit and Coordination Study: Base the evaluation on utility-confirmed contribution. Evaluate the distribution system under each of the various operating modes. Base the evaluation on actual confirmed cable lengths, and installed equipment and protective devices.

B. Short-circuit Study:

1. Perform short-circuit evaluation using SKM computer software specifically designed for such use.

2. Input data shall include electric utility company's short-circuit, single-, and three-phase contributions, with reactance/resistance (X/R) ratio, resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and other applicable circuit parameters.
 3. Calculate short-circuit momentary duties and interrupting duties on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.
 4. Short-circuit tabulations shall include symmetrical fault currents and X/R ratios. For each fault location, total duty on the bus and individual contribution from each connected branch, including motor back electromotive force (EMF) current contributions, shall be listed with its associated X/R ratio.
- C. Protective Device Evaluation Study:
1. Determine adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing short-circuit ratings of these devices with the available fault currents.
 2. Apply appropriate multiplying factors based upon system X/R ratios and protective device rating standards.
- D. Protective Device Coordination Study:
1. Perform study to select or to check selections of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and setting.
 2. Overcurrent device settings estimated in the protective device coordination study shall provide complete, 100 percent selectivity. Selectively coordinate system such that only the device nearest a fault will operate to remove the faulted circuit. System selectivity shall be based on both the magnitude and duration of a fault current.
 3. Study shall include all voltage classes of equipment starting at electric utility's incoming line protective device, down to and including medium- and low-voltage equipment. Phase and ground overcurrent and phase and ground fault protection shall be included, and settings for other adjustable protective devices.
 4. Plot time-current characteristics of installed protective devices on appropriate log-log paper. Maintain reasonable coordination intervals and separation of characteristic curves. Provide coordination plots for phase and ground protective devices for complete system. Use sufficient curves to clearly indicate selective coordination achieved through electric utility's main breaker, power distribution feeder breakers, and overcurrent devices at each major load center.
 5. Show maximum of eight protective devices per plot. Appropriately title each plot and include the following information as required for the circuits shown:

- a. Representative one-line diagram, legends, and types of protective devices selected.
 - b. Power company's relays or fuse characteristics.
 - c. Significant motor starting characteristics.
 - d. Parameters of transformers, magnetizing inrush and withstand curves in accordance with ANSI C37.91.
 - e. Operating bands of low-voltage circuit breaker trip curves, and fuse curves.
 - f. Relay taps, time dial and instantaneous trip settings.
 - g. Cable damage curves.
 - h. Symmetrical and asymmetrical fault currents.
6. Provide selection and settings of protective devices separately in tabular format listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. Provide a tabulation of recommended power fuse selection for all fuses in system.

E. Arc-Flash Analysis:

- 1. Conduct arc flash analysis after acceptance by the Engineer of short-circuit study and coordination study. Perform arc flash analysis for each operating mode of the system, in accordance with IEEE 1584-2018 and the latest NFPA 70E Annex D.4 calculations. Arc-Flash Analysis shall be performed on all new gear and any existing gear touched by the project and down to the 3ph - 208V or 1ph -240V panelboards.
- 2. Document the protection and calculation procedures and coordination review in testing report. Present analysis results in tabular format showing the following:
 - a. Bus and protection device name.
 - b. Bolted and arcing fault values.
 - c. Protective device trip times.
 - d. Arc flash boundary, working distance, and incident energy.
 - e. Required protective flame-resistant (FR) clothing class.
- 3. Arc-Flash labels shall be provided for all equipment where Arc-Flash Analysis is performed, and equipment is not already provided with arc flash labels. Provide labels in accordance with NFPA 70E. Labels shall include at minimum:
 - a. Danger or Warning header
 - b. Working Distance for incident energy calculation
 - c. Minimum Arc Rating (calories/cm² or Joules/cm²)
 - d. Arc Flash Boundary
 - e. PPE Category
 - f. Limited Approach and Restricted Approach boundaries
 - g. Voltage

1.06 STUDY REPORT

- A. Summarize results of electrical power distribution system studies in a typed or computer-printed report that includes the following:
1. One line drawing of system equipment studied showing equipment identity and rating, bus and cable connections with size and labels and breaker settings.
 2. Description, purpose, basis, written scope, and single-line diagram of power distribution systems evaluated.
 3. Tabulations of circuit breaker, fuses, and other equipment ratings versus calculated short-circuit duties. Evaluation of short-circuit calculations and identification of underrated equipment.
 4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, and fuse selection. Include an evaluation and discussion of logical compromises for proposed protection.
 5. Fault current tabulation including definition of terms and guide for interpretation.
 6. Tabulation of appropriate tap settings for relay seal-in units.
 7. Tabulation of equipment survey information.
- B. Electrical power distribution system studies report shall include a separate section addressing arc flash analysis. In addition to protection and calculation procedures, and coordination review and analysis results, report shall include protective device evaluation for each high-incident energy case to determine if adjustments can improve system performance relative to arc flash hazard level.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEST AND EVALUATION FIRM

- A. Power distribution system studies shall be performed by one of the following:
1. Square D
 2. Eaton Cutler Hammer
 3. ABB
 4. Florida Licensed Professional Engineer
 5. No equal.

3.02 PREPARATION

- A. General:
1. Coordinate with professional engineer performing the studies and assist professional engineer with collecting information necessary to complete the specified studies.
 2. Prior to performing studies, obtain information pertaining to existing system necessary for performing studies.

3.03 FIELD SERVICES

- A. Contractor's professional engineer shall conduct an equipment survey and data gathering of existing devices and information necessary to perform electrical power distribution system studies.
- B. To the extent applicable, perform survey that includes the following information:
 - 1. Manufacturer, type, and size of each power fuse.
 - 2. Manufacturer, type, model, and settings for each protective relay, trip unit, and circuit breaker.
 - 3. Current transformer ratios for each protective relay.
 - 4. Appropriate data for motors and transformers included with the study.
- C. Contractor's professional engineer shall confirm and establish proper settings for protective devices. Professional engineer shall collect data and coordinate with equipment Suppliers to establish proper settings for the devices provided. Document in the study all devices and settings.

3.04 FIELD TESTING

- A. Site Tests:
 - 1. Provide protective device field testing for new and existing equipment effected by this project or outlined in this study, in accordance with manufacturers' recommendations. Field testing shall be by Contractor's field engineer or NETA Certified testing firm, after submittal of and the Engineer's acceptance of electrical power distribution system studies. Field testing results shall be documented in a report that shall include final settings of protective devices.
 - 2. Field engineer shall provide necessary tools and equipment and adjust, set, calibrate, and test protective devices. Protective relays and meters in medium- and low-voltage equipment shall be set, adjusted, calibrated, and tested in accordance with manufacturers' recommendations and the coordination study. Provide minor adjustments, repairs, and lubrication necessary for proper operation.
 - 3. Electromechanical protective relays provided in accordance with the Contract Documents shall be set and tested for acceptance. Testing shall include visual and mechanical inspection. Testing shall include overcurrent time and pick-up tests.
 - 4. Solid state and multi-function trip devices shall be set, including required programming necessary for the protection required. Devices shall be checked, configured, and tested for setting and proper operation.

3.05 MAINTENANCE OF OPERATIONS

- A. Field testing may require that certain equipment be temporarily taken out of service. Contractor shall perform the Work with due regard to the need of County for continuance of operations and in accordance with sequencing required in the Contract Documents, and in accordance with Owner's Operations. Submit

testing procedures and schedules and obtain acceptance by Engineer prior to starting testing and related Work.

3.06 INSTALLATION

- A. Provide personnel protective equipment labels in accordance with Section 16075, Identification for Electrical Systems. Arc-Flash labels shall be provided for all equipment where Arc-Flash Analysis is performed unless equipment already provided with arc flash labels.
 - 1. Supplier Services: Provide training for the County's operation and maintenance personnel in personnel protection equipment. Provide at least 2 hours of training.

END OF SECTION

SECTION 16289 SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install surge protective devices (SPD).
2. SPDs furnished under this Section shall be ANSI/UL 1449 Type 2 integrating both surge suppression and high-frequency noise filtering suitable for use on low-voltage distribution systems.

B. Related Sections:

1. Section 16050, Electrical - General Provisions
2. Section 16423, Motor Control Centers.
3. Section 16463, Mini-Power Centers

1.02 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/UL 1449, Surge Protective Devices.
2. IEEE C62.11, Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV)
3. IEEE C62.41, Recommended Practice on Surge Voltages in Low-voltage AC Power Circuits.
4. IEEE C62.45, Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1,000 V and Less) AC Power Circuits.
5. UL 1283, Electromagnetic Interference Filters.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Shall have at least five years of experience manufacturing and servicing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:

1. Obtain all products included in this Section regardless of component manufacturer from a single SPD manufacturer.
2. SPD manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. Components shall be suitable for the specified service conditions and shall be integrated into overall assembly by SPD manufacturer.

- C. Regulatory Requirements: Comply with the following:
 - 1. NEC 110.9, Requirements for Electrical Installations, Interrupting Rating.
 - 2. NEC 240.21, Overcurrent Protection, Location in Circuit.

1.04 SUBMITTALS

- A. Shop drawings and product data as described in Division 1.
- B. Operation and maintenance data as described in Division 1.
- C. In addition, submit the following:
- D. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. Electrical and mechanical drawings for each type of unit, showing electrical ratings, dimensions, mounting provisions, connection details, and layout diagrams.
 - b. Components list and nameplate schedule.
 - c. Summary sheets with schedules of equipment.
 - 2. Product Data:
 - a. Manufacturer's technical information, including catalog information.
 - b. Manufacturer's technical specifications with assembly and component ratings.
- E. Informational Submittals: Submit the following:
 - 1. Certifications:
 - a. Certification that SPD devices comply with standards referenced in this Section.
 - 2. Source Quality Control Submittals:
 - a. Report of results of testing and inspections performed at manufacturer's shop.
 - 3. Supplier Reports:
 - a. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
 - 4. Qualifications Statements:
 - a. Manufacture, when requested by Engineer.

F. Closeout Submittals: Submit the Following

1. Operations and Maintenance Data:

- a. Submit in accordance with Section 01730, Operating and Maintenance Data.
- b. Include acceptable test reports, maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.

2. Warranty Documentation: Submit example warranty at time of shipment of the equipment. Include final warranty accepted by Engineer in the operations and maintenance manual for the equipment.

1.05 STORAGE, AND HANDLING.

A. Delivery:

1. Upon delivery, check for evidence of water that may have entered equipment during transit.

B. Storage:

1. Store SPD equipment in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.
2. Protect equipment from corrosion and deterioration.

1.06 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the County of other rights or remedies the County may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents. The obligations of Contractor under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Materials and Equipment:

1. Provide manufacturer's written warranty, running to the benefit of the County, agreeing to correct, or at option of the County, remove or replace materials or equipment specified in this Section found to be defective during a period of five years after the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Provide equipment of one of the following:

1. Schneider Electric/Square-D Company.
2. Eaton/Cutler-Hammer.

3. General Electric.
4. Or approved equal.

2.02 EQUIPMENT

A. General:

1. SPD shall be modular, high-energy, parallel design with fast-acting transient voltage suppression using metal oxide varistors. Equipment shall provide noise attenuation with electromagnetic interference filter.
2. SPD shall comply with requirements of the following:
 - a. ANSI/UL 1449.
 - b. UL 1283.
 - c. IEEE C62.11, IEEE C62.41 and IEEE C62.45.
3. SPD shall be suitable for operation under the following environmental conditions:
 - a. Relative Humidity: Zero to 95 percent, non-condensing.
 - b. Frequency: 47 to 63 Hertz.
 - c. Temperature: Zero to 149 degrees F.
4. SPD operating voltage and IEEE C62.41 and IEEE C62.45 Category A, B, and C application environments shall be suitable for the associated SPD location(s) shown or indicated on the Drawings.
5. SPD shall be suitable for internal and external mounting. Where shown on the Drawings, SPD shall be factory-mounted and integrated into distribution equipment specified under the following Sections:
 - a. Section 16050, General Provisions for Electrical Systems.
 - b. Section 16423, Motor Control Centers.
 - c. Section 16463, Mini-Power Centers.

B. SPD shall include a surge suppression path for each mode as required for the system configuration shown on the Drawings. Each mode shall be individually fused and equipped with thermal cutouts. SPD short-circuit rating shall be 200 kA. Protection modes shall include, to the extent applicable, the following:

1. Line-to-line.
2. Line-to-neutral.
3. Line-to-ground.
4. Neutral-to-ground.

C. SPD shall include electromagnetic interference/radio frequency interference (EMI/RFI) noise rejection filter with attenuation up to 30 dB from 10 kHz to 100 MHz.

D. SPDs and components in the operating path shall have maximum continuous operating voltage greater than 115 percent of nominal system operating voltage.

- E. ANSI/UL 1449 minimum withstand rating shall be 20 kA per pole, and ANSI/UL 1449 voltage protection rating for SPD shall not exceed the following:

Modes	208Y/120	480Y/277
L-N,L-G, N-G	800	1200
L-L	1200	2000

- F. SPD surge capacity based upon IEEE C62.41 location category shall, as a minimum, be the following:

Category	Application	Per Phase	Per Mode
C	Service entrance	240 kA	120 kA
B	High exposure locations (distribution equipment)	160 kA	80 kA
A	Branch locations	120 kA	60 kA

2.03 ACCESSORIES

- A. Provide SPD equipped with the following accessories:
1. Surge counter with display for indicating the number of surges detected.
 2. LED indicators for monitoring device status.
 3. Audible alarm and silence switch for indicating an inoperative condition.
 4. Dry contacts, "Form C", for remote annunciation of unit status.
 5. Indicators, counter, alarm, and silence switch shall be visible and accessible from front of the SPD. When SPD is integral to switchgear, motor control center, panelboard, or other equipment, indicators, counter, alarm, and silence switch shall be visible and accessible from front of the equipment in which the SPD is installed.

2.04 SOURCE QUALITY CONTROL

- A. Perform manufacturer's standard factory tests on equipment. Tests shall be in accordance with IEEE C62.45 and ANSI/UL 1449.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install SPD at locations shown on the Drawings in accordance with equipment manufacturer's recommendations, Laws, and Regulations, and the Contract Documents.

- B. Conductor length between suppressor and connection point shall be as short and as straight as possible.

END OF SECTION

SECTION 16370 VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work Included in this Section: The Contractor shall provide all the required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, and test equipment for furnishing, installation, adjustment, and full test loading of all the electrical work shown on the Drawings and included in these Specifications.
- B. Variable Frequency Drives shall be installed inside the existing Schneider Electric Model 6 MCC enclosure with all required appurtenances included.
- C. Variable frequency drives shall be 480V, 3-phase, 60Hz, 6-pulse drives with active harmonic front end. Station shall have three pumps of the following.
 - 1. 1-125hp Split Case Pump (Existing pump and VFD to remain - no changes)
 - 2. 2-75hp Split Case Pump (New pumps and VFDs to replace existing 2-125hp pumps)
- D. MANUFACTURER to coordinate with pump supplier for incorporating all pump controls and pump protection. Refer to Specification 11310 Axial Split Case Centrifugal Pumps for more information. Contractor to oversee and be responsible for such coordination.

1.02 DRIVE APPLICATION

- A. The variable frequency drives will be used to control the speed of NEMA B design induction motors for dry submersible centrifugal pump in wastewater pumping station. Refer to pump specification 11310 Axial Split Case Centrifugal Pumps for more information.

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 and circuit breakers.
 - 5. Three (3) sets of control fuses.

6. One (1) enclosure cooling fan.

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) 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 County'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 their normal operating policy.

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 County'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 County's personnel in the proper operation and maintenance techniques to be used with the specific VFD's furnished, two (2) scheduled days.
- B. The manufacturer shall include in their 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 three (3) weeks of receiving the order, the manufacturer shall furnish the County 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.
- C. Failure to comply with Item 1.07.B above shall be entirely at the manufacturer's risk. Any changes required as a result of the County's review will be solely at the

manufacturer's expense with no cost to the County.

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 their own expense with no cost to the County.

PART 2 PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

A. GENERAL

- 1. The variable frequency drives shall be the adjustable frequency (AF), variable torque (VT), 6-pulse width modulated (PWM) type designed to provide continuous speed adjustment of 3-phase NEMA B squirrel cage induction motors, inverter duty rated.
- 2. Drive shall have a 5% line reactor and capacitor bank for harmonic mitigation and capable of capacitor switching ON initially when motor Hz is above 32Hz (adjustable) and OFF at 28Hz (adjustable). Final adjustment will be done in the field.
- 3. The adjustable frequency drives (VFD's) shall be designed and rated for the horsepower (HP) and at full-load current (Amps), at rated speed (RPM) of the motors actually supplied.
- 4. The VFD's shall be furnished in NEMA Type 1 gasketed floor-mounted enclosures. The enclosures shall be forced air ventilated using door-mounted fans. Fan installation shall include cleanable, reusable air filters.

B. CONSTRUCTION

- 1. The VFD'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 full wave rectifier shall be used to prevent input line notching. Internal fast acting semiconductor fuses shall be installed to preclude the necessity for having external AC line fuses.
 - 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 "trip-less" 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 VFD's shall be capable of operating from a 3-phase input voltage of 480 Volts $\pm 10\%$ over a frequency range of 0-63 Hertz while providing a constant volts per Hertz excitation to the motors.
3. The VFD's shall have a one minute overload rating of 150%, minimum.
4. The VFD's shall employ surface mount technology for reduced size, high reliability, ease of maintenance, and resistance to vibration.
5. The VFD's shall incorporate full internal protection against short circuits, ground faults, over- and under voltage, over- and undercurrent, and temperature extremes.
6. The VFD's shall contain an adjustable electronic motor overload (I^2t) circuit to eliminate the need for an external motor overload relay.
7. The VFD's shall utilize advanced diagnostic techniques to simplify trouble shooting and correcting problems.
8. The VFD's shall have a minimum drive efficiency of 97% at full speed and full load.
9. The VFD's shall have a minimum fundamental power factor of 0.98 at all speeds and loads.
10. The VFD's shall be able to operate under the following environmental conditions without modification or derating:
 - a. Temperature: 0 to 40°C.
 - b. Altitude: Up to 3,300' above sea level.
 - c. Humidity: 0 to 95%, non-condensing.
11. The VFD'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. FEATURES

1. The VFD's shall, as a minimum, have the standard features and adjustments listed below:
 - a. The VFD'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. Hand-Off-Auto door mounted function switch. In Hand, local control via potentiometers In Auto, remote control via existing Data Flow Telemetry device.
 - c. Door mounted By-Pass switch to engage bypass soft start and isolate VFD.
 - d. 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.
 - e. In addition to the keypad speeds adjustment provisions, the VFD'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.

- f. 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.
- g. 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.
- h. The VFD'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.
- i. The VFD's shall provide a user selectable option of either displaying a fault or running at a preset speed if a reference input is lost.
- j. The VFD's shall be capable of a "flying start" into a rotating load and accelerating to set-point without safety tripping or damage to the drives or driven equipment.
- k. The user terminal strip shall be isolated from both the line and ground.
- l. The VFD's shall have the ability to automatically restart after an overcurrent, overvoltage, under voltage, 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.
- m. The VFD'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 one-cycle, 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.
- n. The VFD's shall be optimized for a 3 kHz carrier frequency to reduce motor noise.
- o. The VFD'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 VFD'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 VFD's variable torque current rating, minimum setting of 170%.
 - 3) A current switch-off limit circuit which shall be a fixed percentage of the VFD's variable torque current rating, minimum setting of 255% instantaneous.

- n. In addition to any items listed above, the VFD'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) Hand-Off-Auto function switch. In Hand, local control via pushbuttons and potentiometer in addition to the integral keypad. In Auto remote control via existing Data Flow Telemetry device.
- o. The VFD's shall have seven (7) programmable preset speeds as well as unidirectional rotation and coast-to-a-stop features.
- p. The VFD'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 VFD's shall have six (6) programmable digital inputs.
- r. The VFD's shall have two (2) programmable analog outputs proportional to the chosen reference (frequency, motor speed, etc.).
- s. The VFD'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 VFD's shall be equipped with an ethernet port capable of communicating with external PLC's, DCS's, DDC's, and touch-screen graphic operator panels via Modbus TCP/IP.
- u. The VFD'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	Heat sink Temperature
Motor Speed	Analog Input Values
Motor Current	Keypad Reference Values
Calculated Motor Torque	Elapsed Time

Calculated Motor Power Kilowatt-hours

- v. The VFD'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 VFD's variable torque current rating.
 - 2) Overvoltage: Trip set at 130% of the VFD's rated voltage.
 - 3) Under voltage: Trip set at 65% of the VFD's rated voltage.
 - 4) Over temperature: Trip set at +70°C or +85°C dependent upon drive furnished.
 - 5) Ground Fault: Both "running" and "at start".
 - 6) Adaptable Electrical Motor Overload (I²t): Motor protection shall be based on motor speed and load; specifically, circuits which are not speed dependent will not be acceptable under this Specification.
 - 7) RTD analog input motor winding and pump bearing protection module with thermal bias. Provide Solcon model TPR6-14-2-M with a Modbus RTU to Ethernet/IP conversion gateway, or as otherwise shown on contract drawings.
- 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 Hand-Off-Auto switch and speed potentiometer mentioned hereinabove, the VFD's shall include the following factory installed options:
 - a. Circuit Breaker: The circuit breaker shall be the thermal magnetic, thru-the-door interlock type, pad lockable in the Off position.
 - b. 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.
 - c. Numbered Wires: All internal drive wires shall be numbered at both ends to facilitate maintenance and trouble shooting.
 - d. LED Push-to Test pilot lights for "RUN" (red), "OFF" (green), "VFD FAULT" (amber) and "Control Power ON" (white), "In Bypass" (Blue).

E. MANUFACTURERS:

1. Altivar Process Drive as manufactured by Schneider Electric
2. Model iQ Pump Drive as manufactured by Yaskawa Inc.
3. No approved equal.

PART 3 EXECUTION

3.01 FACTORY TESTING

- A. Prior to assembly in the VFD'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 County prior to the shipment of the VFD's. Similarly, any failure(s) of the drives during the load test shall be recorded, analyzed, corrected, and reported to the County before shipment of the VFD's.

3.02 SHIPPING

- A. The VFD's shall be so packaged for shipment that they are maximally protected from both physical and environmental damage.
- B. The VFD's shall be transported to the County's job sites utilizing the manufacturer's customary method of shipment.

3.03 INSTALLATION

- A. The VFD's shall be installed by the Contractor personnel in accordance with the recommendations and procedures set forth in the installation manual furnished by the manufacturer.

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 VFD'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 VFD's.
- C. A copy of the certified start-up form(s) for each drive shall be provided to the County, 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 their own expense

with no cost to the County.

- C. Any time after four (4) hours of acceptance testing, the County may, at their option, curtail further testing and take acceptance of the VFD'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 County to train the County's personnel in the proper operation and maintenance procedures required by the specific VFD's furnished.

3.07 WARRANTY

- A. The manufacturer shall furnish to the County a written warranty which complies with the requirements set forth in Item 1.08 above.

END OF SECTION

SECTION 16423 MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to modify an existing Motor Control Center (MCC).
2. Wiring shall conform to Section 16120, Wires and Cables.

B. The Contractor shall provide the coordination:

1. To properly size circuit breakers, starters, and control power transformers, obtain motor nameplate data on equipment being furnished under this and other contracts as required.
2. To properly size control power transformers, obtain data on motor space heater and other accessories.
3. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before motor control center Work.

C. Related Sections:

1. Section 16075, Identification for Electrical Systems.
2. Section 16120, Wires and Cables
3. Section 16215, Electrical Power Distribution Studies.
4. Section 16289, Surge Protective Devices

1.02 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/IEEE C37.2, Electrical Power System Device Function Numbers and Contact Designations.
2. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
3. NEMA ICS 18, Motor Control Centers.
4. NEMA ICS 1, Industrial Controls and Systems: General Requirements.
5. UL 845, Motor Control Centers.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Shall have not less than twenty years' experience in the United States of producing equipment substantially similar to that required

and shall be able to submit documentation of not less than five installations in satisfactory operation for at least five years each.

2. Independent Field-Testing Firm:
 - a. Retain an independent testing firm to perform field acceptance testing of motor control centers.
 - b. Testing firm and its assigned personnel shall be experienced in inspecting and testing motor control centers.
 - c. Testing firm shall be a member company of NETA.

B. Component Supply and Compatibility:

1. Obtain materials and equipment included in this Section, regardless of component manufacturer, from one motor control center equipment manufacturer.
2. Motor control center equipment manufacturer shall review and approve, or shall prepare, all Shop Drawings and other submittals for components furnished under this Section.
3. Equipment shall be specifically constructed for specified service conditions. Equipment and components shall be integrated into overall motor control center equipment system by motor control center equipment manufacturer.

C. Regulatory Requirements: Comply with the following:

1. NEC Article 430, Motors, Motor Circuits, and Controllers.

1.04 SUBMITTALS

A. Shop drawings and product data as described in Division 1.

B. Operation and maintenance data as described in Division 1.

C. In addition, submit the following:

D. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. Outline and summary sheets with schedules of equipment in each unit.
 - b. One-line diagrams indicating circuit breaker sizes, bus rating, motor controller ratings, and other pertinent information to demonstrate compliance with the Contract Documents.
 - c. Unit control schematic and elementary wiring diagrams showing numbered terminal points and interconnections to other units.
2. Product Data:
 - a. Manufacturer specifications, cut sheets, dimensions, and technical data for all components, materials, and equipment proposed for use.

3. Testing Plans, Procedures, and Testing Limitations:
 - a. Not less than 30 days prior to actual factory testing, submit proposed testing methods, procedures, and apparatus.
 - b. Not less than 30 days prior to actual field testing, submit proposed testing methods, procedures, and apparatus.
- E. Informational Submittals: Submit the following:
1. Supplier Instructions:
 - a. Instructions for shipping, storing and protecting, and handling the materials and equipment.
 - b. Installation data for the equipment, including setting drawings, templates, and directions and tolerances for installing anchorage devices.
 - c. Instructions for start-up and troubleshooting.
 2. Source Quality Control Submittals:
 - a. Reports of completed factory testing, including procedures used and test results.
 3. Site Quality Control Submittals:
 - a. Reports of completed field testing, including procedures used and test results.
 4. Supplier Reports:
 - a. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
 5. Qualifications Statements:
 - a. Independent testing firm.
 - b. Manufacturer, when requested by the Engineer.
- F. Closeout Submittals: Submit the following:
1. Operations and Maintenance Data:
 - a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, and spare parts information.
 - b. Manuals shall include record drawings of control schematics, including point-to-point wiring diagrams.
 - c. Comply with Section 01730, Operating and Maintenance Data.

G. Maintenance Material Submittals: Furnish the following:

1. Spare Parts:

- a. Furnish, tag, and box for shipment and long-term storage the following spare parts and special tools for each motor control center lineup furnished:

Item	Quantity per Switchgear Lineup Furnished
1) Starters and feeder breakers	Quantities and sizes as shown on drawings
2) Fuses	Six of each type and size used
3) Auxiliary control relays	Two, with at least two normally open and two normally closed contacts
4) Control power transformers	Two of each size used
5) Indicating lamps	Twelve
6) Covers for indicating lamps	Six of each color used
7) Starters: Contact kits for Size 1 motor starter	Two sets
8) Starters: Contact kits for Size 2, Size 3, and Size 4 motor starters	One set of each size

- b. Furnish a list of additional recommended spare parts for an operating period of one year. Describe each part, the quantity recommended and current unit price.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Packing:

- a. Inspect prior to packing to assure that assemblies and components are complete and undamaged.
- b. Protect mating connections.
- c. Indoor containers shall be bolted to skids. Breakers and accessories shall be packaged and shipped separately.
- d. Cover all openings into enclosures with-vapor inhibiting, water-repellent material.

2. Upon delivery, check materials and equipment for evidence of water that may have entered equipment during transit.

3. Handling:

- a. Lift, roll or jack motor control center equipment into locations shown.
- b. Motor control centers shall be equipped to be handled by crane. Where cranes are not available equipment shall be suitable for placement on rollers using jacks to raise and lower the groups.

- B. Storage and Protection:
 - 1. Store motor control center equipment in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide equipment by one of the following:
 - 1. Schneider Electric/Square D Company.
 - 2. No equal.

2.02 MATERIALS

- A. General: Motor control center lineups shall comply with NEMA ICS 18 and be provided as shown with the following ratings:
 - 1. Service: Voltage rating and number of wires shall be as shown or indicated on the Drawings. Motor control center shall operate from a three-phase, 60 Hertz system.
 - 2. Wiring: NEMA Class II, Type B.
 - 3. Enclosure: NEMA 1 with gaskets on all doors.
 - 4. Interrupting Capacity Rating: Motor control center shall have an interrupting capacity rating as shown or indicated on the Drawings. Devices shall be suitable for minimum rating indicated.
 - 5. Motor control center lineups shall be UL-rated as suitable for service entrance where shown or indicated on the Drawings and as required.
- B. Construction: Provide equipment with the following:
 - 1. Totally enclosed structure, dead front, consisting of nominal 20-inch deep, 20-inch wide, 7.5-foot high vertical sections bolted together to form a unit assembly.
 - 2. Vertical sections shall have side sheets extending the full height and depth of section.
 - 3. Removable lifting angles for each shipping section.
 - 4. Two removable floor sills for mounting.
 - 5. Horizontal wireways top and bottom, isolated from horizontal bus and readily accessible.
 - a. Wireway openings between sections shall have rounded corners and rolled edges.
 - 6. Isolated vertical wireways with cable supports, accessible through hinged doors, for each vertical section.
 - a. Wireway shall be separate from each compartment and remain intact when compartment is removed.

7. All-metal non-conducting parts electrically continuous.
8. Comply with NEMA ICS 18.

C. Bus System:

1. Rating: Bus bracing and bus current capacities as shown or indicated on the Drawings.
2. Bus bars shall be tin-plated, copper, and comply with UL heat rise standards.
3. Bus bar connections shall be easily accessible with simple tools.
4. Main Horizontal Bus:
 - a. Continuous, edge-mounted, and isolated from wireways and working areas.
 - b. Mount the bus in vertical center of motor control center to provide easy access and even heat distribution.
 - c. Bus shall be supported, braced, and isolated by high-strength, non-tracking, FRP material.
5. Vertical Bus:
 - a. Continuous, and isolated by glass polyester barrier.
 - b. Rated for a minimum 300 amperes continuous minimum, and at least equal to full-load rating of all installed units in the associated stack.
6. Grounding Bus: Full length mounted across the bottom, drilled with lugs of appropriate capacity as required.
7. Neutral Bus: Insulated, continuous through control center for four-wire services, drilled with lugs of appropriate capacity as required.

D. Unit Compartments:

1. Provide individual front door for each unit compartment. Fasten door to stationary structure, instead of the unit itself, so that door can be closed when unit is removed.
2. Starter and feeder unit doors interlocked mechanically with unit disconnect device to prevent unintentional opening of door while energized and unintentional application of power while door is open, with provisions for releasing interlock for intentional access and application of power.
3. Padlocking arrangement permitting locking disconnect device in the "OFF" position with at least three padlocks with door closed or open. Equip unit disconnect devices located in the top compartment, compartment sized 12 inches or higher, with extender handle complying with UL 845. Extender handle shall allow disconnect operating handle to be located above NEC's height limitation of six-feet, seven-inches above floor.
4. Equip compartments as shown or indicated on the Drawings:
 - a. Blank compartments, unused space, and compartments shown or indicated on the Drawings as "SPACE" shall have bus covers and

- be complete with necessary hardware for future installation of a plug-in unit.
- b. Provide shutters for each compartment that automatically open when unit is inserted and automatically close when unit is removed.
5. Provide wiring and device identification:
 - a. Identify compartment doors, devices, and field wiring in accordance with Section 16075, Identification for Electrical Systems.
 - b. Identify internal control conductors with permanent wire markers. Each wire shall be identified by a unique number attached to wire at each termination point.
 - c. Identify internal control devices with permanent markers. Each device shall be identified by a unique number attached to each device.
 - d. Numbering system for each wire and control device shall be identified on the wiring diagrams in the Shop Drawings and shall reflect the actual designations used in the Work.
 6. NEMA 1 minimum motor starter size. Starter units completely draw out type in Sizes 1 and 2 and draw out type after disconnecting power leads only in Sizes 3 and 4.
 7. Motor starters shall be NEMA-rated and include magnetic contactor, with encapsulated magnet coils. Wound coils are unacceptable. Control shall be 120 Vac unless indicated otherwise.
 - a. Starters shall be full-voltage non-reversing unless shown or indicated otherwise on the Drawings.
 - b. Reversing Starters:
 - 1) Single-speed, full-voltage with two contactors and extra interlocking contacts.
 - c. Variable Frequency Drives shall be provided in accordance with section 16370 - Variable Frequency Drives.
 - d. Reduced Voltage Solid-State Starter:
 - 1) General:
 - a) Provide solid-state, step-less, current limiting, soft-start, motor controllers (RVSS) as shown or indicated on the Drawings.
 - b) RVSS shall be three-phase type and shall include an overload relay and at speed isolation contactor.
 - c) Provide NEMA rated full voltage By-Pass contactor as shown on drawings.
 - c) Provide subsystems that will protect RVSS from damage due to phase loss, over-current and over-voltage.

- d) Current Rating: 115 percent of motor nameplate rated current, continuous, minimum.
- 2) Required Features:
- a) Adjustable current limit of not more than 250 percent of motor nameplate full-load current throughout entire motor acceleration period including first three cycles of voltage waveform from instant start signal is engaged.
 - b) Adjustable voltage acceleration, from two to 30 seconds. Acceleration shall be continuous not in steps.
 - c) Adjustable voltage deceleration, from two to 30 seconds. Deceleration should be continuous, not in steps.
 - d) Phase loss detection.
 - e) PUSH-TO-TEST LED diagnostic indicators.
 - f) Static over-current and over-voltage trip.
 - g) Phase reversal, line or fuse loss, and under-voltage protection.
 - h) Power unit over temperature protection.
 - i) Motor inverse time overload protection.
 - j) Input line transient over-voltage protection.
- 3) Enclosure:
- a) Cooling fans, if required, shall incorporate anti-friction bearings and internal impedance type motor protection.
 - b) If cooling fans are used, enclosure for that section shall be NEMA 12 FVF, or NEMA 12 EFVFF force ventilated with filters, in accordance with NEMA ICS 1-110, installed by motor control center manufacturer.
- 4) On start-up, start driven equipment at zero current and allow driven equipment to accelerate to maximum speed without exceeding the set current limit.
- 5) On normal shutdowns, ramp driven equipment down at set deceleration rate that is non-regenerative for motor prior to shutdown.
- 6) On emergency shutdowns, remove power to motor.
- 7) Diagnostic LEDs: Provide LED (Push to Test) on unit front that indicate the following:
- a) Control power on.
 - b) Motor power on.
 - c) Motor running.
 - d) Motor fault.
 - e) High Pressure
 - f) RVSS fault.

- 8) Control Outputs:
 - a) Control output shall be electrically isolated, dry, normally open SPDT contacts, rated 10 amps at 120 vac.
 - b) Provide the following control outputs:
 - i. Motor running.
 - ii. Motor stopped
 - iii. Motor fault.(Overtemp)
 - iv. High Pressure
 - v. RVSS fault.

8. Overload Relays: Provide an overload relay for each motor starter. Overload relays shall be in accordance with the following:
 - a. Electronic Overload Relays: Relays shall be electronic type. Electronic relays shall be multi-function, adjustable, current sensing, type, and include overload, phase-unbalance, phase-loss, and equipment type ground fault in one package.
 - c. Each overload relay shall be manual reset type and shall include provisions for resetting by an insulating button on front of starter unit door.
 - d. Each overload relay shall include a normally-open auxiliary contact for remote alarm purposes.
 - e. Size each overload relay for full-load amperes and service factor of actual motors installed.

9. Individual control power transformers for all starters, capacity as required for all control circuit devices, 150 VA minimum, Class A insulation, two primary fuses, 120-volt secondary, one secondary fuse, and the other secondary leg grounded.
10. Motor horsepower shown are preliminary. Circuit breaker trips and starter overload heaters to be coordinated with the actual equipment installed.
11. Auxiliary contacts, relays, timers as required for specified control functions and those shown on Drawings.
12. Starter devices, including spare contacts, shall be wired to numbered terminal blocks.
13. Terminal blocks for field connections to unit compartments shall be plug-in/pull-apart type. Terminals shall be fully accessible from the front. Terminals shall be mounted near the front of vertical wireway.
14. Control devices shall be 600-volt heavy duty, NEMA A600. Relays shall have convertible contacts. Pilot devices shall be oil tight. Pilot lights shall be transformer type with six-volt secondary.
15. Feeder Circuit Breakers: LSI adjustable electronic trip thermal magnetic type 100% Rated.
 - a. Circuit breakers of 100 amp frame or less shall be 100% rated mounted in a dual mount compartment (two breakers in one space factor) or shall mount in one-half space factor, unless otherwise shown or indicated on the Drawings.

16. Motor Starter Circuit Breakers: Magnetic trip only motor circuit protectors.
17. Provide the following diagrams and tables inside of door for each compartment:
 - a. Elementary wiring diagram.
 - b. Table of overload heater sizes with correct heater highlighted.
 - c. Table of motor circuit protector settings with correct setting highlighted.

2.03 SOURCE QUALITY CONTROL

- A. Prior to shipping, perform factory tests on motor control centers. Tests shall include manufacturer's standard tests and the following:
 1. Physical inspection and checking of components.
 2. Mechanical operation and device functionality tests.
 3. Primary, control, and secondary wiring hi-pot tests.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions under which Work is to be installed and notify the Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install materials and equipment at locations shown or indicated on the Drawings. Install equipment on concrete bases in accordance with the Contract Documents and manufacturer's recommendations and instructions.
- B. For installations against masonry walls, provide an insulation board, 1/4-inch minimum thickness, between motor control center and wall for corrosion protection. Trim board neatly within outline of motor control center.
- C. Openings in top or side of motor control centers for other than conduit entrance are not allowed.
- D. Bundle cable circuits together within enclosures and identify with durable tag secured to cabling twine.
- E. Set motor circuit protectors at lowest setting that allows motor starting without nuisance tripping.
- F. Verify that wiring diagrams on inside of door of each compartment reflect the circuitry actually provided and that correct overload heater size and motor circuit protector setting are noted.
- G. Install in conformance with manufacturer's recommendations, Laws and Regulations, and the Contract Documents.

- H. Connections to existing facilities shall be in accordance with Section 01730, Operating and Maintenance Data.

3.03 FIELD QUALITY CONTROL

A. Site Tests:

1. Perform field testing and inspection of motor control centers. Inspect and test each motor control center after installation. Testing and inspection shall be in accordance with the manufacturer's recommendations and the Contract Documents, and be performed by manufacturer's factory-trained representative, Inform the County and the Engineer when equipment is correctly installed, prior to testing. Do not energize equipment without permission of the County.
2. Test Equipment, Calibration and Reporting: All test equipment, instrument calibration and test reports shall be in accordance with ANSI/NETA ATS.
3. Perform the following minimum tests and checks before energizing equipment:
 - a. Verify all overload and device settings.
 - b. Inspect mechanical and electrical interlocks and controls for proper operation.
 - c. Check tightness of bolted connections.
 - d. Measure insulation resistance of each bus section, phase-to-phase and phase-to-ground.
 - e. Measure insulation resistance of each starter, phase-to-phase and phase-to-ground.
 - f. Measure insulation resistance of each control circuit with respect to ground.
 - g. Perform other tests recommended by equipment manufacturer.
4. Perform acceptance testing of motor control centers. Inspect and test each motor control center. Testing and inspection shall be performed by the independent testing firm, after completion of field testing specified in Paragraph 3.03.A.3 of this Section.
 - a. Visual and Mechanical Inspection: Perform inspection of each motor control center in accordance with ANSI/NETA ATS. Inspection shall include:
 - 1) Inspect for proper anchorage, damage, and grounding.
 - 2) Verify all overload and device settings.
 - 3) Check tightness of bolted connections.
5. Electrical Tests: Perform electrical testing of each motor control center in accordance with ANSI/NETA ATS. Testing shall include:
 - 1) Measure insulation resistance of each bus section, phase-to-phase and phase-to-ground.
 - 2) Measure insulation resistance of each starter phase-to-phase and phase-to-ground.

- 3) Measure insulation resistance of each control circuit with respect to ground.
- 4) Test motor overload units by current injection.
- 5) Perform operational tests by initiating control devices for proper operation.
- 6) Perform contact resistance test and insulation resistance test for each circuit breaker.
- 7) Determine long-time, short-time, and instantaneous pick-up and delay as required.

B. Manufacturer's Services: Provide a qualified, factory trained serviceman to perform the following:

1. Supervise unloading and installation of equipment.
2. Instruct Contractor in installing equipment.
3. Inspect, test, and adjust equipment after installation and ensure proper operation.
4. Instruct operations and maintenance personnel in operation and maintenance of the equipment.
5. Manufacturer's technician shall make visits to the Site as follows:
 - a. First visit shall be for supervising unloading and handling of equipment and for instructing Contractor in proper equipment installation, and assisting in installing equipment. Technician shall train installing personnel in advance in proper handling and rigging of equipment. Minimum number of hours on-Site: 2 hours.
 - b. Second visit shall be for checking completed installation, start-up of system; and performing field quality control testing. Technician shall test the system as specified in Article 3.03.A of this Section. Technician shall operate and test the system in the presence of the Engineer and verify that equipment complies with the Contract Documents and manufacturer's requirements. Technician shall adjust the system to initial settings as specified in Article 3.04 of this Section. Minimum number of hours on-Site: 4 hours.
 - c. Third visit shall be to instruct operations and maintenance personnel.
 - 1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct the County's operations and maintenance personnel in recommended operation and maintenance of equipment.
 - 2) Training requirements, duration of instruction and qualifications shall be in accordance with Section 01730, Operation and Maintenance Data.
 - 3) Number of hours on-Site shall be in accordance with Section 01730, Operations and Maintenance Data.
 - d. Technician shall revisit the Site as often as necessary until installation is acceptable.
 - e. Furnish services of manufacturer's factory-trained service technicians to correct defective Work within 72 hours of notification by the County during the correction period.

6. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.04 ADJUSTING

- A. Calibrate, set, and program all protective devices. Coordinate protective devices furnished under this Section and provide proper settings of devices in accordance with the study performed under Section 16215, Electrical Power Distribution System Studies.

3.05 GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee and warrant all materials and labor provided under this Section for three (3) years from date of Substantial Completion in accordance with Section 01740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16450 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: ALL SITES

1. The Contractor shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install complete grounding for electrical systems, structures, and equipment.
2. The Contractor to test integrity and performance of existing ground grid including all connections to ground which encompasses equipment grounds and lightning system. Excavation may be necessary. Contractor to correct all deficiencies.

1.02 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
2. ASTM B8, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.
3. UL 467, Grounding and Bonding Equipment.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Field Acceptance Testing Firm: Retain services of independent testing firm to perform acceptance field testing of grounding system. Testing firm shall have experience in testing grounding systems, surge suppression devices, grounding currents, leakage currents, ground loops, wiring errors, and shall be a member company of NETA. Contractor to correct all deficiencies.
2. Lightning Protection System: The Contractor to employ the services of a Master licensed lightning installer to perform, inspection and testing of the lightning system. Contractor to correct all deficiencies.

B. Regulatory Requirements

1. National Electrical Code, (NEC).
 - a. NEC Article 250, Grounding and Bonding.

1.04 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

- a. Listing of grounding connector types identifying where each will be used.
 - b. Layouts of each structure's ground grid.
 - c. Test point construction details.
 2. Product Data:
 - a. Manufacturer's technical information for grounding materials proposed for use.
 3. Testing Plans:
 - a. Ground resistance test procedure.
- B. Informational Submittals: Submit the following:
1. Field Quality Control Submittals
 - a. Results of ground resistance tests at each test point.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Bare Ground Cable:
1. Manufacturers: Provide products of one of the following:
 - a. Cablec Corporation.
 - b. General Cable Corporation.
 - c. Southwire Cable Company.
 - d. Or approved equal.
 2. Material: Soft-drawn, **tinned plated** bare copper stranded cable complying with ASTM B8. No. 4/0 AWG minimum size for connection between ground rods and to busbars, motor housings, MCC's, transformers and switchgear unless otherwise shown or indicated on the Drawings. No. 4 AWG minimum for all others.
- B. Ground Rods:
1. Manufacturers: Provide products of one of the following:
 - a. Copperweld, Bimetallics Division.
 - b. ITT Blackburn Company.
 - c. Or approved equal.
 2. Material: Copper-clad rigid steel rods, 3/4-inch diameter, 10 feet long minimum.

C. Grounding Connectors:

1. Products and Manufacturers: Provide one of the following:
 - a. Pressure Connectors:
 - 1) O.Z./Gedney, Division of General Signal Corporation.
 - 2) Burndy Corporation.
 - 3) Or approved equal.
 - b. Welded Connections:
 - 1) Cadweld by Erico Products, Incorporated.
 - 2) Therm-O-Weld by Burndy Corporation.
 - 3) Or approved equal.
2. Material: Pressure connectors shall be copper alloy castings, designed and fabricated specifically for items to be connected and assembled with Durium or silicone bronze bolts, nuts, and washers. Welded connections shall be by exothermic process utilizing molds, cartridges, and hardware designed specifically for connection to be made.

D. Grounding Additive:

1. Grounding additive, in its set form, shall have resistivity of not more than 20 ohm-cm.
2. Product and Manufacturer:
 - a. Ground Enhancement Material (GEM) by Erico
 - b. Or approved equal.
3. Grounding additive shall be permanent and maintenance-free, without requiring recharging with salts or chemicals that may be corrosive, and shall maintain its earth resistance with time.
4. Grounding additive shall set up firmly and not dissolve or decompose or otherwise pollute soil or groundwater.
5. Grounding additive shall be suitable for installation in dry form or in slurry form.
6. Grounding additive shall not depend on continuous presence of water to maintain its conductivity.

E. Ground Test Well

1. Provide heavy-duty test well suitable for heavy-duty traffic.
2. Manufacturer
 - a. Advanced Lightning Technology
 - b. Or approved equal.
3. Diameter and Material: 12.75-inch outside diameter, Schedule 80 PVC.
4. Depth: Two feet.

- 5. Cover: Provide test well with cast iron cover marked, "Ground" with cast iron ring to support lid.
- F. Ground system components shall comply with UL 467.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions for the Work and notify the Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.02 STRUCTURE GROUND SYSTEM

- A. Inspect and Test ground grids as shown and indicated on the Drawings.
- B. As needed, provide No. 4/0 bare copper cable around exterior perimeter of structures at not less than 2.5 feet below grade, unless otherwise shown or indicated on the Contract Documents.
- C. For structures with steel columns, provide No. 4/0 ground cable from grid to each column around perimeter of structure. Connect cable to steel with exothermic welds.
- D. Connect grids to continuous underground water pipe system, when practical.
- E. For new structures with concrete foundation or footings, connect structure's reinforcing steel or other concrete-encased electrode to grounding grid.
- F. Provide accessible test points for measuring the ground resistance of each grid.
- G. Weld all buried connections except for test points. All welds must conform to manufacturers specifications which extends to the number of welds a mold can be used for and the quality of the weld. Compression connections are unacceptable.

3.03 EQUIPMENT GROUNDING

- A. Ground electrical equipment in compliance with NEC article 250, local regulations and the Contract Documents.
- B. Equipment grounding conductors shall be **tin plated** bare stranded copper cable of adequate size installed in metal conduit where required for mechanical protection. Ground conductors, pulled into conduits with non-grounded conductors, shall be insulated. Insulation shall be green.
- C. Control panels grounding conductors shall be **tin plated** bare stranded copper cable of adequate size to ground grid from AC ground bus, and an insulated stranded copper cable of adequate size to ground grid from DC ground bus.
- D. Connect ground conductors to conduit with copper clamps, straps, or with grounding bushings.

- E. Connect to piping by welding or brazing. Use copper bonding jumpers on gasketed joints.
- F. Connect to equipment by means of lug compressed on cable end. Bolt lug to equipment frame using holes or terminals provided on equipment specifically for grounding. Do not use hold-down bolts. Where grounding provisions are not included, drill suitable holes in locations recommended by equipment manufacturer or designated by the Engineer.
- G. Connect to motors by bolting directly to motor frames, not to soleplates or supporting structures.
- H. Connect to service water piping by means of copper clamps. Use copper bonding jumpers on gasketed joints.
- I. Scrape bolted surfaces clean and coat with conductive oxide-resistant compound.

3.04 FIELD QUALITY CONTROL

- A. Site Tests:
 - 1. Test completed grounding grid system for resistance to earth ground using an electrical three-terminal ground resistance tester and Fall of Potential Method. Test all grounded cables and metal parts for continuity of connection. The Engineer or the County will witness the testing. Provide Test Report.
 - 2. Separately test for AC Ground Impedance using a loop impedance tester. Measure the actual ac impedance of the ground wiring. Impedance should be tested and not exceed 0.25 ohms.
 - 3. Separately test for Ground Currents, and Leakage Currents. The Engineer or the County will witness the testing. Provide Test Report. Report Leakage currents to Engineer if in excess of 10mA.
 - 4. Grounding system maximum resistance shall not exceed five ohms impedance under normally dry conditions (48 hrs. after last rainfall) when measured by ground resistance tester. Resistance values above five ohms shall be brought to the Engineer's attention. Provide additional ground rods as required to attain a resistance to ground of less than five ohms for each ground grid. Add grounding additive installing additional ground rods to increase their effectiveness.
 - 5. Acceptance Testing:
 - a. Perform acceptance testing of grounding system. Testing shall be performed by testing firm in accordance with ANSI/NETA ATS.
 - b. Test Equipment, Calibration and Reporting: Test equipment, instrument calibration, and test reports shall comply with ANSI/NETA ATS.

END OF SECTION

SECTION 16463 MINI-POWER CENTERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. The Contractor shall furnish and install single-phase and three-phase general purpose individually mounted mini-power centers of the two-winding type, self-cooled, as specified herein and as shown on the contract drawings.

B. Related Sections:

1. Section 16050, General Provisions for Electrical Systems.
2. Section 16075, Identification for Electrical Systems.

1.02 REFERENCES

- A. The mini-power center and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL, ANSI and NEMA.

1.03 QUALITY ASSURANCE

A. Qualifications

1. The manufacturer of the assembly shall be the manufacturer of the secondary equipment. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years.

B. Regulatory Requirements:

1. Mini-Power Centers shall bear the UL label.

1.04 SUBMITTALS

- A. Shop drawings and product data as described in Division 1.

- B. Operation and maintenance data as described in Division 1.

- C. In addition, submit the following:

- D. Action Submittals: Submit the following:

1. Shop Drawings:

- a. Listing of each Mini-Power Center to be furnished, including location, rating, and NEMA enclosure type for each.
- b. Dimensional drawings including equipment weights and cable termination sizes.

- c. Transformer ratings shall include kVA, primary and secondary voltage, taps, primary and secondary continuous current, insulation class and temperature rise, sound level.
- d. Component ratings shall include voltage, continuous current, and interrupt ratings.

2. Product Data:

- a. Manufacturer's technical information for Mini-Power Centers proposed for use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products of one of the following:
 - 1. Eaton
 - 2. Schneider Electric
 - 3. Or approved equal
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions.

2.02 RATINGS

- A. kVA and voltage ratings shall be as shown on the drawings.
- B. Units shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
- C. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:
 - 1. Up to 9 kVA: 40 db.
 - 2. 10 to 30 kVA: 45 db.

2.03 CONSTRUCTION

- A. Each mini-power center shall include a primary main breaker, an encapsulated dry-type transformer, and a panelboard with secondary main breaker.
- B. Primary main, secondary main and feeder breakers shall be enclosed with a padlockable hinged door.
- C. Mini-power centers shall be suitable for service entrance application and labeled as such.
- D. Insulation Systems

1. Transformers shall be insulated with a 180 degrees C insulation system and rated at 115 degrees C temperature rise.
2. Required performance shall be obtained without exceeding the above-indicated temperature rise in a 40 degrees C maximum ambient, with a 30 degrees C average over 24 hours.
3. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

E. Core and Coil Assemblies

1. Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade copper with continuous wound construction.
2. The core and coil assembly shall be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moisture proof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level.
3. The core of the transformer shall be grounded to the enclosure
4. Provide two (2) 5% FCBN taps

2.04 BUS

- A. Secondary bus shall be copper.

2.05 WIRING/TERMINATIONS

- A. All interconnecting wiring between the primary breaker and transformer, secondary main breaker and transformer and distribution section shall be factory installed.
- B. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring.

2.06 MAIN DEVICES

- A. Each mini-power center shall include a primary main breaker with an interrupting rating of 65kA at 277/480 volts; and a secondary main breaker with an interrupting rating of 10kA at 120/240 volts, and a panelboard.

2.07 FEEDER DEVICES

- A. The secondary distribution section shall accommodate one-inch bolt-on breakers with 10 kA interrupting capacity.

2.08 ENCLOSURE

- A. The enclosure shall be made of 316L stainless steel and the maximum temperature of the enclosure shall not exceed 90 degrees C.
- B. The enclosure shall be totally enclosed, nonventilated, NEMA 4X, with lifting provisions.

PART 3 EXECUTION

3.01 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA.
 - 1. Ratio tests at the rated voltage connection and at all tap connections
 - 2. Polarity and phase-relation tests on the rated voltage connection
 - 3. Applied potential tests
 - 4. Induced potential test
 - 5. No-load and excitation current at rated voltage on the rated voltage connection

3.02 INSPECTION

- A. Examine conditions under which the Work will be installed and notify the Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.

3.03 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

3.04 INSTALLATION

- A. Install equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.
- B. Securely fasten equipment to walls or other structural supports on which they are mounted. Provide independent stainless steel supports where no wall or other structural surface exists. Mount disconnect enclosures at a height not exceeding six feet.
- C. Provide suitable 1/4-inch spacers to prevent mounting enclosure directly against walls.

3.05 FIELD TESTING

- A. Measure primary and secondary voltages for proper tap setting.

3.06 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

END OF SECTION

SECTION 16500 LIGHTING

PART 1 GENERAL

1.01 REQUIREMENT SUMMARY

- A. Contractor shall furnish all labor, materials, tools and equipment necessary for furnishing, installing, connecting, testing and placing into satisfactory operation all Lighting Systems to include but not limited to lighting fixtures, lamps, contactors, controllers, control panels, control devices, supports, etc. as required for complete and operational Lighting Systems as specified herein and indicated on the Contract Documents.
- B. Lighting Systems shall be in accordance with the latest requirements of the Illuminating Engineering Society, and all lighting fixtures shall have the Underwriters Laboratories, Inc. label of approval.
- C. All wiring shall be placed in conduit and shall comply with all the DIV-16 Specification Sections for conduit, outlet boxes, pull and junction boxes, wires and cables, grounding, etc. and other applicable Sections or as noted herein.

1.02 RELATED WORK ELSEWHERE

- A. In addition to the requirements specified in this Section, the requirements of Division 16 and those Project Specification Sections referenced therein shall be applied.
- B. Related Specification Sections include but not limited to:
 - 1. Division 3 - Concrete

1.03 REFERENCES

- A. Lighting Systems and associated devices referenced herein shall be designed and manufactured according to the following appropriate codes and regulations.
- B. Codes and Standards:
 - 1. ANSI/NFPA 70 - National Electric al Code (NEC).
 - 2. Illuminating Engineering Society of North America (IESNA)
 - a. ANSI/IES RP-7-17 - Recommended Practice for Lighting Industrial Facilities
 - b. ANSI/IES RP-8-18 - Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting
 - 3. International Building Code (IBC) - Latest Edition
 - 4. NECA/IESNA 500, Recommended Practice for Installing Indoor Commercial Lighting Systems
 - 5. NECA/IESNA 501, Recommended Practice for Installing Exterior Lighting Systems

6. NECA/IESNA 502, Recommended Practice for Installing Industrial Lighting Systems
7. UL 1598 - Luminaires
8. U.S. Energy Policy Act and Energy Star requirements for lighting products.

1.04 SUBMITTALS

- A. Contractor shall reference and provide all documentation for all Division 16 Sections as required per Specification Sections:
 1. 01340 - Shop Drawings, Product Data and Samples
- B. Contractor shall provide submittals to include but not limited to the following:
 1. Equipment specifications and product data sheets identifying all materials used and methods of fabrication.
 2. Catalog cuts for each lighting controller, control panel, fixture type showing performance and construction details of standard lighting fixtures, and complete working drawings showing all proposed construction details of special or modified standard lighting fixtures.
 3. Photometric calculations and curves
 4. Photometric plans shall be provided if substitutions are made from the equipment shown or specified. Data shall be submitted electronically in an approved Engineer format.
 5. Data/Information:
 - a. Fixture Assemblies
 - b. Lamp/Tube LED data
 - c. LED Driver, Ballast Information.
 6. Catalog data including applicable coefficients of utilization tables, Isolux chart of illumination on a horizontal plane, beam efficiency, horizontal and vertical beam spread, and beam lumens.
 7. Wind-load calculations for light poles.
- C. Lighting submittal shall include all proposed fixtures, LED drivers, ballasts, and lamps.
- D. Lighting controllers, digital dimming and control systems:
 1. Submit product datasheets for all devices provided to include but not be limited to relay panels, switches, DTC, photocells and other interfaces.
 2. Submittal drawings shall indicate exact location and programming of each device and indicate all time schedules and switch button engraving.
 3. Submit system riser diagrams detailing communication wiring and control wiring.
 4. Submit standard wiring diagrams for the typical lighting fixtures, wall switch and sensor interfaces.
 5. Submit a sequence of operation for each typical space type describing the typical control functions and occupant interactions with the lighting controls.

6. Submit floor plans showing the type and location of each network device and each controlled light fixture zone. Submitted floor plan(s) shall include a bill of material listing all control devices, model numbers and quantities for each floor or location.
 7. Submit screens that are to be provided as part of the PC Ethernet connected system for control and monitoring.
- E. Incomplete submittals will be rejected by the Engineer.

1.05 DELIVERY STORAGE AND HANDLING

- A. Lighting Systems and all components shipped loose shall be handled and stored in accordance with manufacturer's instructions and recommendations to include NECA/IESNA recommendations.
- B. Inspect and report concealed damage to carrier within their required time period. Owner is not responsible for damages incurred during shipping, handling and storage.
- C. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

1.06 OPERATION AND MAINTENANCE MANUALS

- A. Lighting Systems installation manuals shall be provided for each type of assembly shipped, and shall include instruction leaflets and instruction bulletins.

1.07 WARRANTY

- A. Manufacturer shall warrant Lighting Systems to be free from defects in materials and workmanship for the lesser of one (1) year from date of installation or eighteen (18) months from date of purchase.

1.8 IDENTIFICATION

- A. Lighting Systems shall be identified with the equipment tag or type number indicated on the Contract Documents and the accepted shop drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the Specifications, Contract Documents and Shop drawing approvals, the following manufacturers shall be provided for Lighting Systems:
 1. Site/Area Lights
 - a. AEL/ Lithonia

- b. Eaton
- c. Holophane
- d. KIM Lighting

2. Interior /Exterior Lights

- a. Holophane
- b. Lithonia
- c. KIM Lighting
- d. GE Lighting.

3. Or approved equal.

2.02 GENERAL REQUIREMENTS

- A. The Lighting Systems equipment under this Specification is intended to be standard equipment of proven performance as manufactured by reputable firms regularly engaged in the manufacturing of lighting equipment, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three-years (3YR). Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Documents.
- B. Manufacturer's catalog number and description in the lighting fixture schedule on the Contract Documents establishes a level of quality, style, finish, etc. The use of a catalog number describing the various types of light fixtures shall be used as a guide only, and does not exclude all the required accessories or hardware that may be required for a complete installation.
- C. All products shall be UL listed and meet the requirements of the National Electrical Code (NEC). Electrical components shall be listed and labeled by U.L.

2.03 LIGHTING CONTROL SYSTEMS

A. Photocells

- 1. Hermetically sealed cadmium sulfide cell with single-throw contacts rated for 277V for 1800VA. Photocell shall be housed within a die-cast aluminum, vandal and impact resistant enclosure. Designed to turn ON at level below three foot-candles (3fc/32.3lux) and OFF at three to ten foot-candles (3-10fc/32.3-107.6lux). A fifteen second (15SEC) time delay to prevent switching from transient light sources. Directional lens, mounted in front of cell, to prevent fixed light sources from turning unit off. Temperature range -40F to +170F. Power consumption less than 1.4W average.

B. Dimmers

- 1. A lighting dimmer or digital light dimming and control system shall be installed to switch or control dimmable area lighting as identified on the Contract Documents that is suitable for low voltage (0-10VDC) dimming control for LED luminaires.
- 2. A single wall mounted dimmer shall be installed in rooms/areas containing only one zone of lighting that is not scheduled for control via the digital

light dimming and control system. Dimmer shall be suitable for low voltage (0-10Vdc) control for LED luminaires.

2.04 LED LUMINAIRES

A. Electrical

1. Operating voltage: 24VDC, 120VAC at 60Hz, 277VAC at 60Hz, or universal voltage (120, 208, 220/240, 277VAC at 50/60 Hz)
2. Power factor: ≥ 0.90 (at full luminaire output and across specified voltage range)
3. Total harmonic distortion: $\leq 20\%$ (at full luminaire output and across specified voltage range)
4. Transient and surge protection: ANSI C62.41-2002 Category A surge protection standards up to and including 2.5kV for interior fixtures.
5. Sound: Class A not to exceed a measured value of 24dB
6. Maximum standby power: 1W
7. Warranty: Ten-year (10YR) non-prorated on complete fixture including driver.
8. LED arrays in the product(s) will be considered defective in material or workmanship if a total of 10% or more of the individual light-emitting diodes
9. LED Power Supply/Driver
 - a. Driver efficiency (at full load):
 - 1) $\geq 85\%$ for drivers capable of $\geq 50W$
 - 2) $\geq 80\%$ for drivers capable of $< 50W$
 - b. Federal Communications Commission (FCC) compliance: FCC 47 Part 15 Non-Consumer limits for EMI/RFI emissions
 - c. Fixtures that are designated to be controlled by 0V - 10V diming signals shall be fully compatible with the Light Diming and Control System provided under this specification section.
10. Temperature Rating: Each luminaire shall be designed to operate at an average operating temperature of 25C. The operating temperature range shall be 0C to 25C.
11. Thermal management: The driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating temperature. Thermal management shall be passive by design. The use of fans or other mechanical cooling devices shall not be allowed. The use of fans or other mechanical cooling devices shall not be allowed.
12. EMI/RFI: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI Emissions.

B. Performance

1. Photometric

- a. Provide minimum initial delivered luminaire lumens in accordance with Contract Documents.
- b. Provide minimum Luminaire Efficacy (LE) or Luminaire Efficacy Rating (LER) per Contract Documents

2. Colorimetric

- a. Provide Correlated Color Temperature (CCT) as indicated on fixture schedule.:
- b. Acceptable tolerances as shall be per ANSI C78.377-2015 (LED)
- c. Color Rendering Index (CRI) [Ra] ≥ 80 with a positive R9 value
- d. Color shift shall be no less than $\Delta u'v' < 0.007$ during the warranty period.

2.05 INDOOR LIGHTING

- A. Indoor lighting is as specified on Contract Documents. Manufacturer listed in the Contract Drawings may be substituted for manufacturers listed hereinafter.
- B. Construction/Finish: No visible, no plane-protruding screws, latches, springs, hooks, rivets or plastic supports viewed from the occupied (room) side are allowed.
- C. Maintenance: Power supplies, drivers, ballasts, LED arrays, boards and light engines shall be easily replaceable using common hand tools (e.g. screw drivers, pliers, etc.) and without uninstalling the luminaire.

2.06 EXIT SIGNS AND EMERGENCY LIGHTING

- A. Emergency lighting and exit signs are as specified and located on plans.
- B. The emergency power wiring shall be a complete system in itself and shall be kept entirely separate from any other wiring in the project unless indicated otherwise on Contract Documents
- C. Emergency lighting fixtures shall be provided so that failure of any one (1) element, such as lamp, will not result in loss of illumination in fixture used for emergency egress lighting.
- D. Contractor shall perform a test on each battery powered unit after it is permanently installed and charged for a minimum of twenty-four hours (24HR). The battery shall be tested for ninety-minutes (90MIN), in accordance with NEC 700. The battery test shall be done ten-days (10DY) prior to final inspection. Any unit which fails the test must be repaired or replaced, and tested again.

2.07 SITE LIGHTING

- A. A lighting fixture shall be provided for every pole indicated. Any omission shall be brought to the attention of the Engineer before submitting proposal; otherwise a unit selected by the Engineer shall be furnished and installed at no additional charge.

- B. Metal Lighting Poles and Standards: Provide metal, raceway-type, lighting poles and standards, of sizes and types indicated on the Contract Documents, comprised of shaft and bracket; equip with grounding connection readily accessible from handhole. Construct of Extruded Aluminum or steel. All poles shall meet the AASHTO wind loading for the area in which they are installed.
- C. Configuration: Anchor base-type with handhole and base cover. Contractor shall furnish and install concrete foundations for all light poles as required on Contract Documents. All anchor bolts and nuts shall be provided by the light pole manufacturer.
- D. Lighting Pole Accessories: Provide accessories for metal lighting poles and standards, including, luminaire mounting arms, cover plates, anchor base covers, mounting yokes, slip fitter tenon mounts as required for the type of required fixture mounts. Provide anchor bolts, as recommended by lighting standard manufacturer, of sizes and materials needed to meet erection and loading application requirements.
- E. Materials
 - 1. Catalog numbers are for general identification of fixtures only. All related parts, such as plaster rings, junction boxes, louvers, shields, mounting stems, canopies, connectors, straps, nipples, etc., to fit them properly to the construction, shall be furnished and installed.
 - 2. All fixtures and control system components shall be grounded per NFPA 70.
 - 3. Fixtures connected with flex to the rigid raceway portion of the wiring system shall carry a green bonding jumper within the flex. The jumper shall be fastened to both the fixture and the raceway system with a listed grounding clip or approved equivalent. Phase and ground conductors run in a flex shall be #12AWG minimum.
 - 4. Surface-mounted fixtures being installed on combustible material shall be mounted at least 1-1/2IN from the surface of the material; except units which are plainly marked on fixtures as U.L. approved for mounting directly to such surfaces.
 - 5. Mount all fixtures plumb and square. Keep rows in perfect line where applicable.

2.08 TOOLS, SUPPLIES AND SPARE PARTS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide to the Owner within fourteen-days (14DY) of occupancy.
 - 1. Plastic Diffusers and Lenses: One (1) for every five (5) of each type and rating installed. Furnish at least one (1) of each type.
 - 2. LED Drivers: One (1) for every ten (10) of each type and rating installed. Furnish at least one (1) of each type.
 - 3. Globes and Guards: One (1) for every five (5) of each type and rating installed. Furnish at least one (1) of each type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine all surfaces and structural elements and/or concrete bases to receive Lighting Systems for compliance with installation tolerances and other conditions affecting performance of the product as required by the manufacturers installation instructions and recommendations to include Engineer installation details. Do not proceed with installation until unsatisfactory conditions have been met or corrective action has been taken.

3.02 INSTALLATION

- A. Installation shall meet the requirements of all Project Specifications.
- B. Mount all poles, pole fixtures and lighting fixtures plumb and square; keep rows in alignment and symmetrical.
- C. Connect lighting fixtures to branch circuit panel via photocell and time clock-controlled contactor as shown on the Contract Documents.
- D. Install concrete bases for site lighting poles at locations as indicated on the Contract Documents and approved shop drawings.
- E. Install poles plumb. Install double nuts to adjust plumb. Grout around each base and provide weep hole in grout.
- F. Install lamps in each luminaire.
- G. Bond and ground luminaire metal accessories and metal poles in accordance with NFPA 70 and applicable Specification Sections. Install supplementary grounding electrode at each pole.
- H. Lighting fixtures shall be located symmetrically with architectural lines and landscape features as shown on the Contract Drawings. Contractor shall furnish and install the light fixtures to allow convenient access for maintenance such as cleaning, re-lamping, and other activities. Where light fixtures are shown in locations on the Contract Drawings that inhibits maintenance operations, the Contractor shall notify the Engineer.
- I. Contractor shall provide and install all inserts, conduit, structural supports, lamps, LED drivers, ballasts, poles, wiring, and any other items as required for a complete Lighting System. Contractor shall properly adjust and test, to the satisfaction of the Engineer, the entire Lighting System.
- J. Contractor shall furnish and install all pendant trapezes and pendant stem hangers with durable swivel or equivalent trapeze hanger permitting normal light fixture motion and self-alignment. Light fixture pendants shall be type UNJ ball type flexible hanger at the light fixture and supports from a JBLX junction box with JBLX hub cover, or approved equal. Pendant lengths shall be adequate and adjusted to provide uniformity of installation heights above the reference datum. Stems shall be one piece, with matching canopies and fittings.

- K. Light fixtures located on the exterior of the building shall be provided with neoprene gasket and stainless-steel fasteners and hardware finished to match the light fixtures.
- L. The finish or exposed metal parts of light fixtures and finish trims of all recessed light fixtures shall be as directed by the Engineer.
- M. Contractor shall furnish and install recessed light fixtures with a separate junction box concealed and located as to be accessible when the light fixture is removed.
- N. Contractor shall furnish and install all boxes for light fixtures such that the box is not the sole support of the light fixture. The boxes shall be offset to allow maintenance such that access to wiring within the box can be attained without having to consider supporting the light fixture.
- O. All lighting units, when installed, shall be set true and be free of light leaks, warps, dents, and other irregularities. All hangers, cables, supports, channels, and brackets of all kinds for safely erecting this equipment in place, shall be furnished and erected in place by the Contractor.
- P. Contractor shall install light fixtures at mounting heights indicated on the Contract Documents or the Engineer. In areas with exposed ducts and/or piping, installation of light fixtures shall be adapted to field conditions as determined by the Engineer.
- Q. Contractor shall support each light fixture securely. All light fixtures shall be secured to the building structure. Contractor shall not secure light fixtures to the work of other trades, unless specified or noted otherwise, and shall not support light fixtures to plaster. Contractor shall furnish and install all steel members and supports as required to fasten and suspended light fixtures from the structure.
- R. In all mechanical equipment areas, Contractor shall install light fixtures on the ceiling after all piping and equipment therein has been installed. Exact locations for such light fixtures may be determined by the Engineer on the site during the course of the work.
- S. Re-lamping access shall require no special tools. All optical control surfaces such as lenses and reflectors shall be safely and securely attached to lighting fixtures and shall be easily and quickly removed and replaced for cleaning without the use of tools. No light fixture part that may be removed, for maintenance, shall be held in place by metal tabs that must be bent to remove said part.
 - 1. All lighting fixture lamps that have been used during construction shall be replaced by the contractor prior to beneficial occupancy.
- T. Pole mounted light fixtures shall be mounted on poles as designated in the lighting fixture schedule or as indicated on the Contract Documents. All metal poles shall be bonded to the site grounding system. Poles shall have adequate handholes and weatherproof receptacles where indicated.

- U. Contractor shall furnish and install switches as indicated on the Contract Documents. Switches shall be installed in accordance Specification Section 16140, Wiring Devices.
- V. Contractor shall furnish and install time switches or photocells as specified herein or indicated on the Contract Documents.
- W. All exterior light fixtures mounted on concrete or masonry shall be caulked with approved color matching compounds.

3.03 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. Clean, inspect, test, and energize Lighting Systems in accordance with applicable NECA / NEiS standards and recommendations.
- B. Verify circuit breakers designated for Lighting Systems are the proper trip unit to match values indicated on the Contract Documents and/or approved shop drawings.

3.04 PROJECT CLOSE-OUT

- A. Adjustment
 - 1. All light fixtures that require physical adjustment shall be so adjusted in accordance with the directions of the Engineer and/or Owner. Contractor shall also adjust angular direction of light fixtures and/or lamps, as directed.
- B. Cleaning
 - 1. Upon completion of work, and after indoor areas are cleaned, all lighting fixtures shall be made clean and free of dust and all other foreign matter both on visible surfaces, and on surfaces that affect the lighting performance of the light fixture including diffusers, lenses, louvers, reflectors, and lamps.
 - a. Clean all luminaires and light fixture surfaces as recommended by manufacturer.
 - b. Clean photometric control surfaces as recommended by manufacturer.
 - 2. Clean finishes and touch up damage with manufacturer's approved paint or coating materials.
- C. Final Acceptance
 - 1. Contractor shall protect all light fixtures and light poles at all times. Before final acceptance, by the Engineer, all light fixtures, light poles and associated devices shall be:

- a. Fully Operational by Control System Functionality
- b. Free of any scraps, dents or chips in the finish
- c. Cleaned of all dust, dirt or other material
- d. Fully Lamped.

END OF SECTION

SECTION 16505 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install hangers and supports for electrical systems.
2. Area Classifications: Materials shall be suitable for the area classification(s) shown or indicated on the Contract Drawings, and specified in Section 16050, Electrical General Provisions.

B. Related Sections:

1. Section 16050, Electrical - General Provisions
2. Section 16110, Conduits and Fittings

1.02 REFERENCES

A. Standards referenced in this section are:

1. ASTM B221-21, Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles, and Tubes.
2. ASTM B209/B209M-21a, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
3. ASTM E84, Test Method For Surface Burning Characteristics of Building Materials

1.03 QUALITY ASSURANCE

- ##### A.
- The Contractor shall have a minimum of five years in support systems and have installed system based on vibration, seismic and wind load calculations. If required, prepare a listing of such installations in the past five years.

1.04 SUBMITTALS

- ##### A.
- Shop drawings and product data as described in Division 1.

- ##### B.
- Operation and maintenance data as described in Division 1.

- ##### C.
- In addition, submit the following:

- ##### D. Action Submittals: Submit the following:

1. Shop Drawings:

- a. Detailed installation drawings showing dimensions and compatibility with proposed layout.

2. Product Data:
 - a. Manufacturer's name, product designation, and catalog number of each material item proposed for use.
 - b. Manufacturer's specifications including material, dimensional and weight data, and load capacity for each supporting system component proposed for use.
 - c. Pictorial views and corresponding identifying text of each component proposed for installation.
 - d. Documentation that confirms product compatibility with Laws and Regulations.

E. Informational Submittals: Submit the following:

1. Certifications:
 - a. Submit certifications required under this Section.
2. Manufacturer's Instructions:
 - a. Manufacturer's installation instructions, including but not limited to recommended torque values for all fasteners and hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Provide products of one of the following:

1. B-Line.
2. Kindorf.
3. Unistrut
4. Or equal.

2.02 MATERIALS

A. Strut, Fittings, and Accessories:

1. General
 - a. Unless otherwise shown or indicated, strut shall be 1-5/8 inches by 1-5/8 inches. Double struts shall be two pieces of the same strut, welded back-to-back at the factory.
 - b. Attachment holes, when required, shall be factory-punched on hole centers approximately equal to the cross-sectional width and shall be 9/16-inch diameter.
 - c. Fittings, braces, brackets, hardware, and accessories shall be Type 316 stainless steel.
 - d. Strut nuts shall be spring captured Type 316 stainless steel.
 - e. Square and round washers shall be Type 316 stainless steel.

2. Strut materials shall be suitable for area classifications indicated in Section 16050, Electrical - General Provisions and shown or indicated on the Contract Drawings.
 - a. General use and Dusty Locations:
 - 1) Strut shall be 12-gauge aluminum.
 - b. Wet Locations:
 - 1) Strut shall be 12-gage Type 316 stainless steel.
 - c. Corrosive Locations:
 - 1) Strut shall be 12-gage Type 316 stainless steel.
 - d. Chlorine, Ammonia, or Sulfuric Areas:
 - 1) Strut shall be fiberglass-reinforced plastic (FRP) complying with ASTM E84.
 - 2) Fabricate materials either by pultrusion or extrusion process.
 - 3) Strut, fasteners and fittings shall have a surface veil over 100 percent of the surface to protect against UV degradation.
 - 4) Manufacture fasteners and fittings from long glass fiber-reinforced polyurethane or vinyl-ester resins.
 - 5) Thread rods shall be made from fiber-reinforced vinyl-ester resin.

B. Hanger Rods:

1. Material:
 - a. Dry Locations: All-thread, zinc-coated
 - b. Wet, Corrosive, or Hazardous Areas: Stainless steel.
2. Size: Not less than 3/8-inch diameter, unless otherwise shown on the Contract Drawings or specified.

C. Beam Clamps for Attaching Threaded Rods or Bolts to Beam Flanges for Hanging Struts or Conduit Hangers:

1. Beam clamps shall be stainless steel equipped with stainless steel square-head set screw, and shall include threaded hole sized for attaching the all-thread rod or threaded bolt.

D. Miscellaneous Hardware:

1. Bolts, screws, and washers shall be stainless steel.
2. Hex Nuts: Shall be stainless steel and include nylon inserts.
3. Tapcons will not be allowed. Instead use stainless steel wedged anchors.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine conditions under which the Work will be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Provide hangers and supports for electrical systems with necessary channels, fittings, brackets, and related hardware for mounting and supporting materials and equipment. Provide anchor systems, concrete inserts, and associated hardware for proper support of electrical systems.
- B. Install equipment and devices on hangers and supports as shown on the Contract Drawings, as specified, and as required.
- C. Install hangers and supports level, true, free of rack, and parallel and perpendicular to building walls and floors, so that the hangers and supports are installed in a neat, professional, workmanlike manner. Per NECA/NEIS installation standards
- D. Holes in suspended ceilings for rods for hangers and supports and other equipment shall be provided adjacent to bars, where possible, to facilitate removal of ceiling panels.
- E. Coordinate installation of hangers and supports with equipment, cabinets, consoles, panels, enclosures, boxes, conduit, cable tray, wireway, busway, cablebus, piping, ductwork, lighting fixtures, and other systems and equipment. Locate hangers and supports clear of interferences and access ways.
- F. Anchor Bolts, Expansion Anchors, and Concrete Inserts: Shall be in accordance with Section 05500, Metal Fabrications, and requirements of this Section.
- G. Mounting of Conduit:
 - 1. Provide space of not less than 1/4-inch between conduit surfaces and abutting or near surfaces except struts, cable trays, steel beams, and columns.
 - 2. Fasten conduit to struts, cable trays, steel beams, and columns using specified clamps and straps as shown, specified, and required.
 - 3. Devices shall be compatible with size of conduit and type of support. Following installation, size identification shall be visible and legible.
 - 4. Install conduit supports and fasteners in accordance with Section, 16110, Conduits and Fittings.
- H. Supports for Cabinets, Consoles, Panels, Enclosures, and Boxes:
 - 1. Freestanding: Unless otherwise specified or shown on the Contract Drawings, provide supports for floor-mounted equipment, cabinets,

consoles, panels, enclosures, and boxes. Such supports shall be 3.5-inch high concrete equipment base with a 45 degree chamfered edge. Base shall extend 2-inches beyond outside dimensions of equipment on all sides.

2. Wall-Mounted:

- a. Provide space not less than 1/4-inch between cabinets, consoles, panels, enclosures, and boxes and the surface on which each is mounted. Provide non-metallic or stainless steel spacers as required.
- b. Do not mount equipment, enclosures, panels, and boxes directly to beams or columns. Mount struts to beams or columns using beam clamps, and mount equipment, enclosures, panels, and boxes to the struts.

3. Floor Stand Rack:

- a. Where equipment, cabinets, consoles, panels, enclosures, and boxes cannot be wall-mounted, provide an independent floor stand rack.
- b. Floor stand rack shall consist of struts, plates, brackets, connection fittings, braces, accessories, and hardware assembled in a rigid framework suitable for mounting of intended materials and equipment.
- c. Equip floor stand racks with brackets and bases for rigidly-mounting the framework to the ceiling or floor, as applicable; or equip floor stand racks with beam clamps, angle plates, washers, and bolts for fastening to beam flanges, as applicable.
- d. When equipment, cabinets, consoles, panels, enclosures, and boxes weigh more than 100 pounds:
 - 1) Main vertical supports of floor stand rack assemblies shall be back-to-back struts.
 - 2) Bracing, clamping and anchoring of each floor stand rack shall be sufficient to ensure rigidity of the floor stand rack with the intended equipment, enclosures, conduit, cable tray, busway, cablebus, and wireway installed. Floor stand racks shall not be deflected more than 1/8-inch by a 100-pound force applied at any point on the floor stand rack in any direction.

I. Drilling into beams or columns is not allowed unless authorized by the Engineer.

J. Tighten nuts and bolts to the manufacturer's recommended torque values.

K. Field Cutting:

1. Cut edges of strut and hanger rod shall have rounded corners, edges beveled, and burrs removed. If field cutting the strut is required, use clean, sharp, dedicated tools. Remove oil, shavings, and other residue of cuttings prior to installation.

2. Coatings: To prevent corrosion:
 - a. Coat cut edges as recommended by equipment manufacturer.

END OF SECTION

BID ATTACHMENT 3, PLAN SET / DRAWINGS

NOTE - This attachment is uploaded as a separate document on the Procurement page of the County website with the solicitation document and available for download.

**SECTION D, SAMPLE CONSTRUCTION AGREEMENT WITH GENERAL
CONDITIONS OF THE CONSTRUCTION AGREEMENT AND AGREEMENT
EXHIBITS**

CONSTRUCTION AGREEMENT NO. _____

for

STIPULATED SUM

between

MANATEE COUNTY (AS OWNER)

and

_____ (AS CONTRACTOR)

**CONSTRUCTION AGREEMENT FOR
STIPULATED SUM
[PROJECT NAME]**

THIS AGREEMENT (“Agreement”) is made and entered into by and between Manatee County, a political subdivision of the State of Florida, referred to herein as “Owner”, and the firm of _____, incorporated in the State of _____ and registered and licensed to do business in the State of Florida (license # _____), referred to herein as “Contractor.”

WHEREAS, the Owner intends to construct [PROJECT DESCRIPTION], the aforementioned improvements being hereinafter referred to and defined as the “Project”; and

WHEREAS, in response to Owner’s Invitation for Bid Construction No. _____ (the “IFBC”), Contractor has submitted its Bid (the “Contractor’s Bid”) to provide the aforementioned construction services.

NOW THEREFORE, the Owner and the Contractor, in consideration of the mutual covenants hereinafter set forth, the sufficiency of which is hereby acknowledged, agree as follows:

1. Contract Documents. The Contract Documents consist of this Agreement and attached Exhibits, the attached General Conditions of the Construction Agreement, Supplementary Conditions (if any), Special Conditions (if any), Drawings (the titles of which are attached hereto as Exhibit A), Specifications (the titles of which are attached hereto as Exhibit B), Addenda issued prior to execution of this Agreement, the Invitation for Bid (including any Instructions to Bidders, Scope of Work, Bid Summary, Supplements, and Technical Specifications), any interpretations issued pursuant to the Invitation for Bid, the Contractor’s Bid, permits, notice of intent to award, Notice to Proceed, purchase order(s), any other documents listed in this Agreement, and Modifications [to include written Amendment(s), Change Order(s), Work Directive Change(s) and Field Directive(s)] issued after execution of this Agreement. These form the Agreement, and are as fully a part of the Agreement as if attached or repeated herein. This Agreement represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. No other documents shall be considered Contract Documents.

2. Work. The Contractor shall fully execute the Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

3. Date of Commencement and Substantial Completion.

A. Date of Commencement. The date of commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner.

B. Contract Time. The Contract Time shall be measured from the date of commencement.

C. Substantial Completion. The Contractor shall achieve Substantial Completion of the entire Work not later than ___ calendar days from the date of commencement, or as follows:

Portion of Work	Substantial Completion Date
------------------------	------------------------------------

subject to adjustments of this Contract Time as provided in the Contract Documents.

Time is of the essence in the Contract Documents and all obligations thereunder. If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents (to include not only the entire Work but any portion of the Work as set forth above), the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the sum of \$_____ per calendar day, commencing upon the first day following expiration of the Contract Time and continuing until the actual date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur because of delayed completion of the Work. The Owner may deduct liquidated damages as described in this paragraph from any unpaid amounts then or thereafter due the Contractor under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

4. Contract Sum.

A. Payment. The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ Dollars and Zero Cents (\$_____), subject to additions and deductions as provided in the Contract Documents.

B. Alternates. The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner. *(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

C. Unit Prices. Unit prices, if any, are reflected in the Contractor's Bid.

5. Payments.

A. Progress Payments.

(1) Based upon Applications for Payment submitted to the Architect/Engineer by the Contractor and Certificates for Payment issued by the Architect/Engineer, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

(2) The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

- (3) Payments shall be made by Owner in accordance with the requirements of Section 218.735, Florida Statutes.
- (4) Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Owner or Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.
- (5) Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.
- (6) Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:
 - i. Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of five percent (5.00%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 3.3.B. of the General Conditions;
 - ii. Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), supported by paid receipts, less retainage of five percent (5.00%);
 - iii. Subtract the aggregate of previous payments made by the Owner; and
 - iv. Subtract amounts, if any, for which the Architect/Engineer has withheld or nullified an Application for Payment, in whole or in part as provided in Section 3.3.C. of the General Conditions.
- (7) The progress payment amount determined in accordance with Section 5.A(6) shall be further modified under the following circumstances:
 - i. Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect/Engineer shall determine for

incomplete Work, retainage applicable to such work and unsettled claims.

- ii. Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 3.2.B. of the General Conditions.

- (8) Reduction or limitation of retainage, if any, shall be as follows:

Notwithstanding the foregoing, upon completion of at least 50% of the Work, as determined by the Architect/Engineer and Owner, the Owner may, with the concurrence of the Architect/Engineer, reduce to two and one-half percent (2.5%) the amount of retainage withheld from each subsequent progress payment.

- (9) Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

B. Final Payment. Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when:

- (1) The Contractor has fully performed the Work except for the Contractor's responsibility to correct Work as provided in Section 2.4.C. of the General Conditions, and to satisfy other requirements, if any, which extend beyond final payment; and
- (2) A final Application for Payment has been approved by the Architect/Engineer.

6. Termination or Suspension.

A. Termination. The Agreement may be terminated by the Owner or the Contractor as provided in Article XIV of the General Conditions.

B. Suspension by Owner. The Work may be suspended by the Owner as provided in Article XIV of the General Conditions.

7. Other Provisions.

A. Substantial Completion Defined. Substantial Completion shall be defined as provided in Article I of the General Conditions. In the event a temporary certificate of occupancy or completion is issued establishing Substantial Completion, the Contractor shall diligently pursue the issuance of a permanent certificate of occupancy or completion.

B. Project Meetings. There shall be a project meeting, at the jobsite or other location acceptable to the parties, on a regularly scheduled basis. The meeting will be attended by a representative of the Contractor, Architect/Engineer and Owner. These representatives shall be authorized to make decisions that are not otherwise contrary to the requirements of this Agreement.

C. Weather. Any rainfall, temperatures below 32 degrees Fahrenheit or winds greater than 25 m.p.h. which actually prevents Work on a given day, shall be considered lost time and an additional day added to the Contract Time, provided no work could be done on site, and provided written notice has been submitted to the Owner by the Contractor documenting same.

D. Shop Drawings; Critical Submittals. In consideration of the impact of timely review of submittals and shop drawings on the overall progress of the Work, it is hereby agreed that the Owner shall cause his agents and design professionals to accomplish the review of any particular "critical" submittals and/or shop drawings and return same to the Contractor within fourteen (14) days.

E. Applications for Payment. Applications for Payment shall be submitted once monthly at regular intervals and shall include detailed documentation of all costs incurred.

F. Punch List. Within 30 days after obtainment of Substantial Completion, the Owner shall generate a "punch list" of all work items requiring remedial attention by the Contractor. Within 5 days thereafter the Architect/Engineer shall assign a fair value to the punch list items, which sum shall be deducted from the next scheduled progress payment to the Contractor. Upon satisfactory completion of the punch list items, as certified by the Architect/Engineer, the previously deducted sum shall be paid to the Contractor.

G. Closeout documentation. Within 30 days after obtainment of Substantial Completion and before final payment, Contractor shall gather and deliver to Owner all warranty documentation, all manufacturer's product and warranty literature, all manuals (including parts and technical manuals), all schematics and handbooks, and all as-built drawings.

H. Governing Provisions; Conflicts. In the event of a conflict between this Agreement and the Specifications or as between the General Conditions and the Specifications, the Specifications shall govern.

I. E-Verify.

The Contractor, and any subcontractor thereof, shall register with and use the E-Verify system to verify the work authorization status of all new employees of the Contractor or subcontractor. The Contractor hereby represents and warrants that it has, and shall remain throughout the duration of this Agreement, registered with, and uses and shall continue to use, the E-Verify system. The Contractor shall not enter into any contract with a subcontractor for services hereunder unless such subcontractor also has registered with and uses the E-Verify system. If the Contractor enters into a contract with a subcontractor, the subcontractor shall provide the Contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of this Agreement.

Pursuant to Section 488.095(5)(c)3, Florida Statutes, the Owner is authorized to terminate this Agreement if it has a good faith belief that the Contractor has knowingly violated Section 448.09(1), Florida Statutes, regarding the employment of someone not authorized to work by the immigration laws of the United States, the U.S. Attorney General, or the Secretary of the Department of Homeland Security. Such termination action is not considered a breach of contract.

J. Funds for Identification Documents

No funds provided by the Owner pursuant to this Agreement shall be used for the purpose of issuing an identification card or document to an individual who does not provide proof of lawful presence in the United States.

K. Anti-Human Trafficking

Contractor shall provide County with a sworn affidavit signed by an officer or a representative of Contractor under penalty of perjury attesting that Contractor does not use coercion for labor or services, as such terms are defined in Section 787.06, Florida Statutes.

8. Insurance and Bonding. If and to the extent required by the Invitation for Bid documents, the Contractor shall furnish insurance coverage for (but not necessarily limited to) workers' compensation, commercial general liability, auto liability, excess liability, and builder's risk. The Contractor shall furnish to the Owner all appropriate policies and Certificate(s) of Insurance. The Contractor shall also post a Payment and Performance Bond for the Contract Sum, within ten (10) days following notification of intent to award, and otherwise in accordance with the Invitation for Bid documents.

9. Independent Contractor. The Contractor acknowledges that it is functioning as an independent contractor in performing under the terms of this Agreement, and it is not acting as an employee of the Owner.

10. Entire Agreement. This Agreement (inclusive of the Contract Documents incorporated herein by reference) represents the full agreement of the parties.

11. Amendments; Waivers; Assignment.

A. Amendments. This Agreement may be amended only pursuant to an instrument in writing that has been jointly executed by authorized representatives of the parties hereto.

B. Waivers. Neither this Agreement nor any portion of it may be modified or waived orally. However, each party (through its governing body or properly authorized officer) shall have the right, but not the obligation, to waive, on a case-by-case basis, any right or condition herein reserved or intended for the benefit or protection of such party without being deemed or considered to have waived such right or condition for any other case, situation, or circumstance and without being deemed or considered to have waived any other right or condition. No such waiver shall be effective unless made in writing with an express and specific statement of the intent of such governing body or officer to provide such waiver.

C. Assignment. The rights and obligations of either party to this Agreement may be assigned to a third party only pursuant to a written amendment hereto.

12. Validity. Each of the Owner and Contractor represents and warrants to the other its respective authority to enter into this Agreement.

13. Covenant to Defend. Neither the validity of this Agreement nor the validity of any portion hereof may be challenged by any party hereto, and each party hereto hereby waives any right to initiate any such challenge. Furthermore, if this Agreement or any portion hereof is

challenged by a third party in any judicial, administrative, or appellate proceeding (each party hereby covenanting with the other party not to initiate, encourage, foster, promote, cooperate with, or acquiesce to such challenge), the parties hereto collectively and individually agree, at their individual sole cost and expense, to defend in good faith its validity through a final judicial determination or other resolution, unless all parties mutually agree in writing not to defend such challenge or not to appeal any decision invalidating this Agreement or any portion thereof.

14. Disclaimer of Third-Party Beneficiaries; Successors and Assigns. This Agreement is solely for the benefit of the parties hereto, and no right, privilege, or cause of action shall by reason hereof accrue upon, to, or for the benefit of any third party. Nothing in this Agreement is intended or shall be construed to confer upon or give any person, corporation, partnership, trust, private entity, agency, or other governmental entity any right, privilege, remedy, or claim under or by reason of this Agreement or any provisions or conditions hereof. This Agreement shall be binding upon, and its benefits and advantages shall inure to, the successors and assigns of the parties hereto.

15. Construction.

A. Headings and Captions. The headings and captions of articles, sections, and paragraphs used in this Agreement are for convenience of reference only and are not intended to define or limit their contents, nor are they to affect the construction of or be taken into consideration in interpreting this Agreement.

B. Legal References. All references to statutory sections or chapters shall be construed to include subsequent amendments to such provisions, and to refer to the successor provision of any such provision. References to “applicable law” and “general law” shall be construed to include provisions of local, state and federal law, whether established by legislative action, administrative rule or regulation, or judicial decision.

16. Severability. The provisions of this Agreement are declared by the parties hereto to be severable. In the event any term or provision of this Agreement shall be held invalid by a court of competent jurisdiction, such invalid term or provision should not affect the validity of any other term or provision hereof; and all such terms and provisions hereof shall be enforceable to the fullest extent permitted by law as if such invalid term or provision had never been part of this Agreement; provided, however, if any term or provision of this Agreement is held to be invalid due to the scope or extent thereof, then, to the extent permitted by law, such term or provision shall be automatically deemed modified in order that it may be enforced to the maximum scope and extent permitted by law.

17. Governing Law; Venue. This Agreement shall be governed by the laws of the State of Florida. Venue for any petition for writ of certiorari or other court action allowed by this Agreement shall be in the Circuit Court of the Twelfth Judicial Circuit in and for Manatee County, Florida.

18. Attorney’s Fees and Costs. In any claim dispute procedure or litigation arising from this Agreement, each party hereto shall be solely responsible for paying its attorney’s fees and costs.

19. Notices. All notices, comments, consents, objections, approvals, waivers, and elections under this Agreement shall be in writing and shall be given only by hand delivery for

which a receipt is obtained, or certified mail, prepaid with confirmation of delivery requested, or by electronic mail with delivery confirmation. All such communications shall be addressed to the applicable addressees set forth below or as any party may otherwise designate in the manner prescribed herein.

To the Owner:

Email: _____

To the Contractor:

Email: _____

Notices, comments, consents, objections, approvals, waivers, and elections shall be deemed given when received by the party for whom such communication is intended at such party's address herein specified, or such other physical address or email address as such party may have substituted by notice to the other.

20. Public Records Law. The Contractor shall comply with the Florida Public Records Act (Chapter 119, Florida Statutes), and shall:

- A. Keep and maintain public records required by the Owner to perform the services called for in this Agreement.
- B. Upon request from the Owner's custodian of public records, provide the Owner with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes or as otherwise provided by law.
- C. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of this Agreement and following completion of this Agreement if the Contractor does not transfer the records to the Owner.
- D. Upon completion of this Agreement, transfer, at no cost, to the Owner all public records in possession of the Contractor or keep and maintain such public records. If the Contractor transfers all public records to the Owner upon completion of the Agreement, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the Agreement, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the Owner, upon request from the Owner's custodian of

public records, in a format that is compatible with the information technology systems of the Owner.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE OWNER'S CUSTODIAN OF PUBLIC RECORDS AT 941-748-4501, EXT. 5845; LACY.PRITCHARD@MYMANATEE.ORG; POST OFFICE BOX 1000, BRADENTON, FLORIDA 34206.

21. Exhibits. Exhibits to this Agreement are as follows:

Exhibit A—Title(s) of Drawings

Exhibit B—Title(s) of Specifications

Exhibit C—Affidavit of No Conflict

Exhibit D—Certificate(s) of Insurance

Exhibit E—Payment and Performance Bond

Exhibit F—Standard Forms

- 1—Application for Payment
- 2—Certificate of Substantial Completion
- 3—Final Reconciliation / Warranty / Affidavit
- 4—Change Order

(Remainder of page intentionally left blank)

WHEREFORE, the parties hereto have executed this Agreement as of the date last executed below.

Name of Contractor

By: _____

Printed Name: _____

Title: _____

Date: _____

MANATEE COUNTY, a political subdivision
of the State of Florida

By: _____

Printed Name: _____

Title: _____

Date: _____

SAMPLE

GENERAL CONDITIONS
of the
CONSTRUCTION AGREEMENT

SAMPLE

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GENERAL CONDITIONS

ARTICLE I

DEFINITIONS

1.1 Definitions. For purposes of the Contract Documents, the following terms shall have the following meanings.

A. Acceptance: The acceptance of the Project into the Owner's operating public infrastructure.

B. Application for Payment: The form approved and accepted by the Owner, which is to be used by Contractor in requesting progress payments or final payment and which is to include such supporting documentation as is required by the Contract Documents.

C. Architect/Engineer: _____, a _____ corporation or limited liability company, registered and licensed to do business in the State of Florida, OR _____, an employee of Owner.

D. Change Order: A written order signed by the Owner, the Architect/Engineer and the Contractor authorizing a change in the Project Plans and/or Specifications and, if necessary, a corresponding adjustment in the Contract Sum and/or Contract Time, pursuant to Article V.

E. Construction Services: The Construction Services to be provided by Contractor pursuant to Section 2.4, in accordance with the terms and provisions of the Contract Documents.

F. Construction Team: The working team established pursuant to Section 2.1.B.

G. Contract Sum: The total compensation to be paid to the Contractor for Construction Services rendered pursuant to the Contract Documents, as set forth in Contractor's Bid (or Guaranteed Maximum Price Addendum), unless adjusted in accordance with the terms of the Contract Documents

H. Contract Time: The time period during which all Construction Services are to be completed pursuant to the Contract Documents, to be set forth in the Project Schedule.

I. Contractor's Personnel: The Contractor's key personnel designated by Contractor.

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

K. Defective: When modifying the term "Work", referring to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or that does

not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or that has been damaged prior to Owner's approval of final payment (unless responsibility for the protection thereof has been assumed by Owner).

L. Field Directive: A written order issued by Owner which orders minor changes in the Work not involving a change in Contract Time, to be paid from the Owner's contingency funds.

M. Final Completion Date: The date upon which the Project is fully constructed and all Work required on the Project and Project Site is fully performed as verified in writing by the Owner.

N. Float Time: The time available in the Project Schedule during which an unexpected activity can be completed without delaying Substantial Completion of the Work.

O. Force Majeure: Those conditions constituting excuse from performance as described in and subject to the conditions described in Article XII.

P. Notice to Proceed: Written notice by Owner (after execution of Contract) to Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work.

Q. Owner: Manatee County, a political subdivision of the State of Florida.

R. Owner's Project Representative: The individual designated by Owner to perform those functions set forth in Section 7.8.

S. Payment and Performance Bond: The Payment and Performance Bond security posted pursuant to Section 2.4.Y to guarantee payment and performance by the Contractor of its obligations hereunder.

T. Permitting Authority: Any applicable governmental authority acting in its governmental and regulatory capacity which is required to issue or grant any permit, certificate, license or other approval which is required as a condition precedent to the commencement or approved of the Work, or any part thereof, including the building permit.

U. Procurement Ordinance: The Manatee County Procurement Code, Chapter 2-26 of the Manatee County Code of Laws, as amended from time to time.

V. Progress Report: A report to Owner that includes all information required pursuant to the Contract Documents and submitted in accordance with Section 2.4.EE, hereof.

W. Project: The total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by Owner and by separate contractors. For the purposes of the Contract Documents, the term Project shall include all areas of proposed improvements and all areas which may reasonably be judged to have an impact on the Project.

X. Project Costs: The costs incurred by the Contractor to plan, construct and equip the Project and included within, and paid as a component of, the Contract Sum.

Y. Project Manager: Subject to the prior written consent of Owner, the individual designated to receive notices on behalf of the Contractor, or such other individual designated by the Contractor, from time to time, pursuant to written notice in accordance with the Contract Documents.

Z. Project Plans and Specifications: The one hundred percent (100%) construction drawings and specifications prepared by the Architect/Engineer, and any changes, supplements, amendments or additions thereto approved by the Owner, which shall also include any construction drawings and final specifications required for the repair or construction of the Project, as provided herein.

AA. Project Schedule: The schedule and sequence of events for the commencement, progression and completion of the Project, developed pursuant to Section 2.3., as such schedule may be amended as provided herein.

BB. Project Site: The site depicted in the Project Plans and Specifications, inclusive of all rights of way, temporary construction easements or licensed or leased sovereign lands.

CC. Subcontractor: Any individual (other than a direct employee of the Contractor) or organization retained by Contractor to plan, construct or equip the Project pursuant to Article IV.

DD. Substantial Completion and Substantially Complete: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy or completion and other permits, approvals, licenses, and other documents from any governmental authority which are necessary for the beneficial occupancy of the Project or any designated portion thereof.

EE. Substantial Completion Date: The date on which the Project or designated portion thereof is deemed to be Substantially Complete, as evidenced by receipt of (i) the Architect/Engineer's certificate of Substantial Completion, (ii) written Acceptance of the Project by the Owner, and (iii) approvals of any other authority as may be necessary or otherwise required.

FF. Substitute: Materials or equipment offered by the Contractor as an alternative to that set forth in the Project Plans and Specifications, where (i) the Project Plans and Specifications do not authorize an "approved equal", or (ii) the Owner, in its reasonable discretion, determines that a pre-authorized "approved equal" will result in a substantial change to the Work because of cost, quality or other difference in comparison to the materials or equipment specified.

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

HH. Work: The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor,

materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

II. Work Directive Change: A written directive to Contractor, issued on or after the effective date of the Agreement pursuant to Section 5.8 and signed by Owner's Project Representative, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed or responding to emergencies.

ARTICLE II

RELATIONSHIP AND RESPONSIBILITIES

2.1 Relationship between Contractor and Owner. The Contractor accepts the relationship of trust and confidence established with Owner pursuant to the Contract Documents. The Contractor shall furnish its best skill and judgment and cooperate with Owner and Owner's Project Representative in furthering the interests of the Owner. The Contractor agrees to provide the professional services required to complete the Project consistent with the Owner's direction and the terms of the Contract Documents. All services provided hereunder by Contractor, either directly or through Subcontractors, shall be provided in accordance with sound construction practices and applicable professional construction standards.

A. Purpose. The purpose of the Contract Documents is to provide for the provision of construction services for the Project on the Project Site by the Contractor, and construction of the Project by the Contractor in accordance with the Project Plans and Specifications. The further purpose of the Contract Documents is to define and delineate the responsibilities and obligations of the parties to the Contract Documents and to express the desire of all such parties to cooperate to accomplish the purposes and expectations of the Contract Documents.

B. Construction Team. The Contractor, Owner and Architect/Engineer shall be called the "Construction Team" and shall work together as a team commencing upon full execution of the Contract Documents through Substantial Completion. As provided in Section 2.2, the Contractor and Architect/Engineer shall work jointly through completion and shall be available thereafter should additional services be required. The Contractor shall provide leadership to the Construction Team on all matters relating to construction. The Contractor understands, acknowledges and agrees that the Architect/Engineer shall provide leadership to the Construction Team on all matters relating to design.

C. Owner's Reliance on Bid (or Guaranteed Maximum Price Addendum). The Contractor acknowledges that the representations, statements, information and pricing contained in its Bid (or Guaranteed Maximum Price Addendum) have been relied upon by the Owner and have resulted in the award of this Project to the Contractor.

2.2 General Contractor Responsibilities. In addition to the other responsibilities set forth herein, the Contractor shall have the following responsibilities pursuant to the Contract Documents:

A. Personnel. The Contractor represents that it has secured, or shall secure, all personnel necessary to perform the Work, none of whom shall be employees of the Owner. Primary liaison between the Contractor and the Owner shall be through the Owner's Project Representative and Contractor's Project Manager. All of the services required herein shall be performed by the Contractor or under the Contractor's supervision, and all personnel engaged in the Work shall be fully qualified and shall be authorized or permitted under law to perform such services.

B. Cooperation with Architect/Engineer. The Contractor's services shall be provided in conjunction with the services of the Architect/Engineer. In the performance of professional services, the Contractor acknowledges that time is critical for Project delivery. The Contractor acknowledges that timely construction utilizing the services of an Architect/Engineer and a Contractor requires maximum cooperation between all parties.

C. Timely Performance. The Contractor shall perform all services as expeditiously as is consistent with professional skill and care and the orderly progress of the Work, in accordance with the Project Schedule. Verification of estimated Project Schedule goals will be made as requested by the Owner.

D. Duty to Defend Work. In the event of any dispute between the Owner and any Permitting Authority that relates to the quality, completeness or professional workmanship of the Contractor's services or Work, the Contractor shall, at its sole cost and expense, cooperate with the Owner to defend the quality and workmanship of the Contractor's services and Work.

E. Trade and Industry Terminology. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of Bids (or at the time of execution of the Guaranteed Maximum Price Addendum), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of Owner or Contractor, or any of their agents or employees from those set forth in the Contract Documents. Computed dimensions shall govern over scaled dimensions.

2.3 Project Schedule. The Contractor, within ten (10) days after being awarded the Agreement, shall prepare and submit for the Owner's and Architect/Engineer's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of Work.

- A. The Project Schedule shall show a breakdown of all tasks to be performed, and their relationship in achieving the completion of each phase of Work, subject to review of Owner and Architect/Engineer and approval or rejection by Owner. The Project Schedule shall show, at a minimum, the approximate dates on which each segment of the Work is expected to be started and finished, the proposed traffic flows during each month, the anticipated earnings by the Contractor for each month and the approximate number of crews and equipment to be used. The Project Schedule shall include all phases of procurement, approval of shop drawings, proposed Change Orders in progress, schedules for Change Orders, and performance testing requirements. The Project Schedule shall include a construction commencement date and Project Substantial Completion Date, which dates shall accommodate known or reasonably anticipated geographic, atmospheric and weather conditions.
- B. The Project Schedule shall serve as the framework for the subsequent development of all detailed schedules. The Project Schedule shall be used to verify Contractor performance and to allow the Owner's Project Representative to monitor the Contractor's efforts.
- C. The Project Schedule may be adjusted by the Contractor pursuant to Article V. The Owner shall have the right to reschedule Work provided such rescheduling is in accord with the remainder of terms of the Contract Documents.
- D. The Contractor shall prepare a submittal schedule, promptly after being awarded the Agreement and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect/Engineer's approval. The Architect/Engineer's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect/Engineer reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.
- E. The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect/Engineer.

2.4 Construction Services. The Contractor shall provide the following Construction Services:

A. Construction of Project. The Contractor shall work from the receipt of a Notice to Proceed through the Substantial Completion of the Project in accordance with the terms of the Contract Documents to manage the construction of the Project. The Construction Services provided by the Contractor to construct the Project shall include without limitation (1) all services necessary and commensurate with established construction standards, and (2) all services described in the Invitation for Bid (or Request for Proposal) and the Bid (or Guaranteed Maximum Price Addendum).

B. Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Agreement. Contractor shall start to perform the Work on the date specified in the Notice to Proceed, but no Work shall be done at the site prior to the issuance of the Notice to Proceed.

C. Quality of Work. If at any time the labor used or to be used appears to the Owner as insufficient or improper for securing the quality of Work required or the required rate of progress, the Owner may order the Contractor to increase its efficiency or to improve the character of its Work, and the Contractor shall conform to such an order. Any such order shall not entitle Contractor to any additional compensation or any increase in Contract Time. The failure of the Owner to demand any increase of such efficiency or any improvement shall not release the Contractor from its obligation to secure the quality of Work or the rate of progress necessary to complete the Work within the limits imposed by the Contract Documents. The Owner may require the Contractor to remove such personnel as the Owner deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Project is deemed to be contrary to the Owner's interest. The Contractor shall provide good quality workmanship and shall promptly correct construction defects without additional compensation. Acceptance of the Work by the Owner shall not relieve the Contractor of the responsibility for subsequent correction of any construction defects.

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

E. Accountability for Work. The Contractor shall be solely accountable for its Work, including plans review and complete submittals. The Contractor shall be solely responsible for means, methods, techniques, sequences and procedures of construction. If a specific means, method, technique, sequence or procedure of construction is required by the Contract Documents, the Contractor may utilize an alternative means, method, technique, sequence or procedure acceptable to the Architect/Engineer if the Contractor submits sufficient information to allow the Architect/Engineer to determine that the alternative is equivalent to that required by the Contract Documents.

F. Contract Sum. The Contractor shall construct the Project so that the Project can be built for a cost not to exceed the Contract Sum.

G. Governing Specifications. In the absence of specified Owner design standards or guidelines, the Architect/Engineer shall use, and the Contractor shall comply with, the most recent version of the applicable FDOT or AASHTO design standards. In general, the Project shall be constructed by the Contractor in accordance with applicable industry standards. The Contractor shall be responsible for utilizing and maintaining current knowledge of any laws, ordinances, codes, rules, regulations, standards, guidelines, special conditions, specifications or other mandates relevant to the Project or the services to be performed.

H. Adherence to Project Schedule. The development and equipping of the Project shall be undertaken and completed in accordance with the Project Schedule, and within the Contract Time described therein.

I. Superintendent. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project Site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

(1) The Contractor, as soon as practicable after award of the Agreement, shall furnish in writing to the Owner through the Architect/Engineer the name and qualifications of the proposed superintendent. The Architect/Engineer may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect/Engineer has reasonable objection to the proposed superintendent or (2) that the Architect/Engineer requires additional time to review. Failure of the Architect/Engineer to reply within 14 days shall constitute notice of no reasonable objection.

(2) The Contractor shall not employ a proposed superintendent to whom the Owner or Architect/Engineer has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not be unreasonably withheld or delayed.

J. Work Hours. Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours, and Contractor shall not permit overtime work or the performance of Work on a Saturday, Sunday or legal holiday without Owner's written consent given after prior notice to Architect/Engineer (at least seventy-two (72) hours in advance).

K. Overtime-Related Costs. Contractor shall pay for all additional Architect/Engineer charges, inspection costs and Owner staff time for any overtime work which may be authorized. Such additional charges shall be an obligation of Contractor and no extra payment shall be made by Owner because such overtime work. At Owner's option, such overtime costs may be deducted from Contractor's monthly payment request or Contractor's retainage prior to release of final payment. Contractor's obligation to pay all overtime-related costs shall not apply if Contractor is directed by Owner to work overtime solely for Owner's convenience.

L. Insurance, Overhead and Utilities. Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

M. Cleanliness. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project Site.

Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from Contractor.

N. Loading. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

O. Safety and Protection. Contractor shall comply with all applicable federal, state and local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

- (1) All employees on the Work and other persons and organizations who may be affected thereby;
- (2) All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project Site; and
- (3) Other property at the Project Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement during construction.

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

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

Q. Substitutes. For Substitutes not included with the Bid (or Guaranteed Maximum Price Addendum), but submitted after the effective date of the Agreement (or Guaranteed Maximum Price Addendum), Contractor shall make written application to Architect/Engineer for acceptance thereof, certifying that the proposed Substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application

will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provision of such Substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by the Architect/Engineer in evaluating the proposed Substitute. Architect/Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed Substitute. In rendering a decision, Owner, Architect/Engineer and Contractor shall have access to any available Float Time in the Project Schedule. If Substitute materials or equipment not included as part of the Bid (or Guaranteed Maximum Price Addendum), but proposed after the effective date of the Agreement, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the Owner and an appropriate Change Order executed to adjust the Contract Sum.

- (1) Architect/Engineer will be allowed a reasonable time within which to evaluate each proposed Substitute. Architect/Engineer will be the sole judge of acceptability and no Substitute will be ordered, installed or utilized without Architect/Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved shop drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any Substitute.
- (2) Contractor shall reimburse Owner for the charges of Architect/Engineer and Architect/Engineer's Consultants for evaluating each proposed Substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the Work while the Substitute was undergoing review.

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

S. Suitability of Project Site. The Contractor has, by careful examination, satisfied itself as to the nature and location of the Work and all other matters which can in any way affect the Work, including, but not limited to details pertaining to borings, as shown on the drawings. Such boring information is not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the Project Site, approximately at the locations indicated. The Contractor has examined boring data, where available, made its own interpretation of the subsurface conditions and other preliminary data, and has based its Bid (or Guaranteed Maximum Price Addendum) on its own opinion of the conditions likely to be encountered. Except as specifically provided in Sections 2.4.U., 5.4 and 5.5, no extra compensation or extension of time will be considered for any Project Site conditions that existed at the time of bidding (or at the time of execution of the Guaranteed Maximum Price Addendum). No verbal agreement or conversation with any officer, agent or employee of the Owner, before or

after the execution of the Agreement, shall affect or modify any of the terms or obligations herein contained.

T. Project Specification Errors. If the Contractor, during the Work, finds that the drawings, specifications or other Contract Documents cannot be followed, the Contractor shall immediately inform the Owner in writing, and the Owner shall promptly check the accuracy of the information. Any Work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's sole risk of non-payment and delay.

U. Remediation of Contamination. Owner and Contractor recognize that remediation of subsurface conditions may be necessary due to potential hazardous materials contamination. Because the presence or extent of any contamination is not known, Contractor shall include no cost in the Contract Sum, and no time in the Project Schedule, for cost or delays that might result from any necessary remediation. The Project Schedule will provide a period of time between demolition activities and the start of the next activity to commence any remediation if needed. Contractor shall use all reasonable efforts in scheduling the Project to minimize the likelihood that remediation delays construction. Any hazardous materials remediation Work which Contractor agrees to perform shall be done pursuant to a Change Order or amendment consistent with the following:

- (1) The dates of Substantial Completion shall be equitably adjusted based on delays, if any, incurred in connection with remediation efforts.
- (2) Contractor, and any Subcontractors which have mobilized on the Project Site, shall be paid for demonstrated costs of overhead operations at the Project Site during any period of delay of more than seven (7) days, except to the extent that Work proceeds concurrently with remediation. The categories of costs to be reimbursed are limited to those reasonably incurred at the jobsite during the delay period (such as trailers or offices, telephones, faxes, and the like); equipment dedicated to the Project and located at the Project Site; salaries and associated costs of personnel dedicated to the Project to the extent that they do not perform work on other projects; and other jobsite costs that are reasonable and which are incurred during the delay period. Subcontractors and suppliers which have not mobilized are limited to the costs set forth in Section 2.4.U(3).
- (3) Contractor and any Subcontractor or supplier on the Project who is eligible for compensation shall be paid any demonstrated costs of escalation in materials or labor, and reasonable costs of off-site storage of materials identified to the Project, arising because of any delay of more than seven (7) days. Such Contractor, Subcontractors and suppliers are obligated to take all reasonable steps to mitigate escalation costs, such as through early purchase of materials.
- (4) Contractor, for itself and all Subcontractors and suppliers on the Project, hereby agrees that the extension of time for delays under Section 2.4.U(1), and payment of the costs identified in Sections 2.4.U(2) and/or Section 2.4.U(3), are the sole remedies for costs and delays described in this Section, and waives all claims and demands for extended home office

overhead (including, but not limited to, "Eichleay" claims), lost profit or lost opportunities, and any special, indirect, or consequential damages arising as a result of delays described in this Section. The Contract Sum shall be adjusted to reflect payment of allowable costs.

- (5) If any delay described in this section causes the time or cost for the Project to exceed the Contract Time or the Contract Sum, then the Owner may terminate the Agreement pursuant to Section 14.2.
- (6) Contractor and any Subcontractor or supplier seeking additional costs under this Section 2.4.U. shall promptly submit estimates or any costs as requested by Owner, and detailed back-up for all costs when payment is sought or whenever reasonably requested by Owner. All costs are auditable, at Owner's discretion. Bid, estimate and pricing information reasonably related to any request for additional compensation will be provided promptly upon request.
- (7) Contractor shall include provisions in its subcontracts and purchase orders consistent with this Section.

V. Interfacing.

- (1) The Contractor shall take such measures as are necessary to ensure proper construction and delivery of the Project, including but not limited to providing that all procurement of long-lead items, the separate construction Subcontractors, and the general conditions items are performed without duplication or overlap to maintain completion of all Work on schedule. Particular attention shall be given to provide that each Subcontractor bid package clearly identifies the Work included in that particular separate subcontract, its scheduling for start and completion, and its relationship to other separate contractors.
- (2) Without assuming any design responsibilities of the Architect/Engineer, the Contractor shall include in the Progress Reports required under this Section 2.4 comments on overlap with any other separate subcontracts, omissions, lack of correlation between drawings, and any other deficiencies noted, in order that the Architect/Engineer may arrange for necessary corrections.

W. Job Site Facilities. The Contractor shall arrange for all job site facilities required and necessary to enable the Contractor and Architect/Engineer to perform their respective duties and to accommodate any representatives of the Owner which the Owner may choose to have present on the Project Site.

X. Weather Protection. The Contractor shall provide temporary enclosures of building areas to assure orderly progress of the Work during periods when extreme weather conditions are likely to be experienced. The Contractor shall also be responsible for providing weather protection for Work in progress and for materials stored on the Project Site. A contingency plan shall be prepared upon request of the Owner for weather conditions that may affect the construction.

Y. Payment and Performance Bond. Prior to the construction commencement date, the Contractor shall obtain, for the benefit of and directed to the Owner, a Payment and Performance Bond satisfying the requirements of Section 255.05, Florida Statutes, covering the faithful performance by the Contractor of its obligations under the Contract Documents, including but not limited to the construction of the Project on the Project Site and the payment of all obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the Contractor to provide the Payment and Performance Bond shall be approved by the Owner prior to the issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that the surety is rated A or better by Best's Key Guide, latest edition. For Changes in the Work that result in an increase in the Contract Sum, Owner reserves the right to require the Contractor to secure and deliver additive riders to the Payment and Performance Bond.

Z. Construction Phase; Building Permit; Code Inspections. Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

- (1) Building Permit. The Owner and Architect/Engineer shall provide such information to any Permitting Authority as is necessary to obtain approval from the Permitting Authority to commence construction prior to beginning construction. The Contractor shall pull any required building permit, and shall be responsible for delivering and posting the building permit at the Project Site prior to the commencement of construction. The cost of the building permit is included in the Contract Sum. The Owner and Architect/Engineer shall fully cooperate with the Contractor when and where necessary.
- (2) Code Inspections. The Project requires detailed code compliance inspection during construction in disciplines determined by any Permitting Authority. These disciplines normally include, but are not necessarily limited to, structural, mechanical, electrical, plumbing, general building and fire. The Contractor shall notify the appropriate inspector(s) and the Architect/Engineer, no less than 24 hours in advance, when the Work is ready for inspection and before the Work is covered up. All inspections shall be made for conformance with the applicable ordinances and building codes. Costs for all re-inspections of Work found defective and subsequently repaired shall not be included as Project Costs and shall be borne by the Contractor or as provided in the contract between Contractor and Subcontractor.
- (3) Contractor's Personnel. The Contractor shall maintain sufficient off-site support staff and competent full-time staff at the Project Site authorized to act on behalf of the Contractor to coordinate, inspect, and provide general direction of the Work and progress of the Subcontractors. At all times during the performance of the Work, the Owner shall have the right to demand replacement of Contractor Personnel to whom the Owner has reasonable objection, without liability to the Contractor.

- (4) Lines of Authority. To provide general direction of the Work, the Contractor shall establish and maintain lines of authority for its personnel and shall provide this information to the Owner and all other affected parties, such as the code inspectors of any Permitting Authority, the Subcontractors, and the Architect/Engineer. The Owner and Architect/Engineer may attend meetings between the Contractor and his Subcontractors; however, such attendance is optional and shall not diminish either the authority or responsibility of the Contractor to administer the subcontracts.

AA. Quality Control. The Contractor shall develop and maintain a program, acceptable to the Owner and Architect/Engineer, to assure quality control of the construction. The Contractor shall be responsible for and supervise the Work of all Subcontractors, providing instructions to each when their Work does not conform to the requirements of the Project Plans and Specifications, and the Contractor shall continue to coordinate the Work of each Subcontractor to ensure that corrections are made in a timely manner so as to not affect the efficient progress of the Work. Should a disagreement occur between the Contractor and the Architect/Engineer over the acceptability of the Work, the Owner, at its sole discretion and in addition to any other remedies provided herein, shall have the right to determine the acceptability, provided that such determination is consistent with standards for construction projects of this type and generally accepted industry standards for workmanship in the State of Florida.

BB. Management of Subcontractors. All Subcontractors shall be compensated in accordance with Article IV. The Contractor shall solely control the Subcontractors. The Contractor shall negotiate all Change Orders and Field Orders with all affected Subcontractors and shall review the costs and advise the Owner and Architect/Engineer of their validity and reasonableness, acting in the Owner's best interest. When there is an imminent threat to health and safety, and Owner's Project Representative concurrence is impractical, the Contractor shall act immediately to remove the threats to health and safety and shall subsequently fully inform Owner of all such action taken. The Contractor shall also carefully review all shop drawings and then forward the same to the Architect/Engineer for review and actions. The Architect/Engineer will transmit them back to the Contractor, who will then issue the shop drawings to the affected Subcontractor for fabrication or revision. The Contractor shall maintain a suspense control system to promote expeditious handling. The Contractor shall request the Architect/Engineer to make interpretations of the drawings or specifications requested of him by the Subcontractors and shall maintain a business system to promote timely response. The Contractor shall inform the Architect/Engineer which shop drawings or requests for clarification have the greatest urgency, to enable the Architect/Engineer to prioritize requests coming from the Contractor. The Contractor shall advise the Owner and Architect/Engineer when timely response is not occurring on any of the above.

CC. Job Requirements.

- (1) The Contractor shall provide each of the following as a part of its services hereunder:
- (a) Maintain a log of daily activities, including manpower records, equipment on site, weather, delays, major decisions, etc;

- (b) Maintain a roster of companies on the Project with names and telephone numbers of key personnel;
- (c) Establish and enforce job rules governing parking, clean-up, use of facilities, and worker discipline;
- (d) Provide labor relations management and equal opportunity employment for a harmonious, productive Project;
- (e) Provide and administer a safety program for the Project and monitor for subcontractor compliance without relieving them of responsibilities to perform Work in accordance with best acceptable practice;
- (f) Provide a quality control program as provided under Section 2.4.C above;
- (g) Provide miscellaneous office supplies that support the construction efforts which are consumed by its own forces;
- (h) Provide for travel to and from its home office to the Project Site and to those other places within Manatee County as required by the Project;
- (i) Verify that tests, equipment, and system start-ups and operating and maintenance instructions are conducted as required and in the presence of the required personnel and provide adequate records of same to the Architect/Engineer;
- (j) Maintain at the job site orderly files for correspondence, reports of job conferences, shop drawings and sample submissions, reproductions of original Contract Documents including all addenda, change orders, field orders, additional drawings issued after execution of the Agreement, Owner/Architect/Engineer's clarifications and interpretations of the Contract Documents, Progress Reports, as-built drawings, and other project related documents;
- (k) Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures, and provide copies of same to Owner/Architect/Engineer;
- (l) Record names, addresses and telephone numbers of all Contractors, Subcontractors and major suppliers of materials and equipment;

- (m) Furnish Owner/Architect/Engineer periodic reports, as required, of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions;
 - (n) Consult with Owner/Architect/Engineer in advance of scheduling major tests, inspections or start of important phases of the Work;
 - (o) Verify, during the course of the Work, that certificates, maintenance and operations manuals and other data required to be assembled and furnished are applicable to the items actually installed, and deliver same to Owner/Architect/Engineer for review prior to final Acceptance of the Work; and
 - (p) Cooperate with Owner in the administration of grants.
- (2) The Contractor shall provide personnel and equipment, or shall arrange for separate Subcontractors to provide each of the following as a Project Cost:
- (a) Services of independent testing laboratories, and provide the necessary testing of materials to ensure conformance to contract requirements; and
 - (b) Printing and distribution of all required bidding documents and shop drawings, including the sets required by Permitting Authority inspectors.

DD. As-Built Drawings. The Contractor shall continuously review as-built drawings and mark up progress prints to provide as much accuracy as possible. Prior to, and as a requirement for authorizing final payment to the Contractor due hereunder, the Contractor shall provide to the Owner an original set of marked-up, as-built Project Plans and Specifications and an electronic format of those records showing the location and dimensions of the Project as constructed, which documents shall be certified as being correct by the Contractor and the Architect/Engineer. Final as-built drawings shall be signed and sealed by a registered Florida surveyor.

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

FF. Contractor's Warranty. The Contractor warrants to the Owner and Architect/Engineer that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and

will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements will be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

- (1) Contractor shall use its best efforts and due diligence to ensure that during the warranty period, those entities or individuals who have provided direct warranties to the Owner as required by the Contract Documents perform all required warranty Work in a timely manner and at the sole cost and expense of such warranty providers. Any such cost or expense not paid by the warranty providers shall be paid by the Contractor, to include any costs and attorney's fees incurred in warranty-related litigation between Contractor and any Subcontractors.
- (2) The Contractor shall secure guarantees and warranties of Subcontractors, equipment suppliers and materialmen, and assemble and deliver same to the Owner in a manner that will facilitate their maximum enforcement and assure their meaningful implementation. The Contractor shall collect and deliver to the Owner any specific written guaranties or warranties given by others as required by subcontracts.
- (3) At the Owner's request, the Contractor shall conduct, jointly with the Owner and the Architect/Engineer, no more than two (2) warranty inspections within three (3) years after the Substantial Completion Date.

GG. Apprentices. If Contractor employs apprentices, their performance of Work shall be governed by and shall comply with the provisions of Chapter 446, Florida Statutes.

HH. Schedule of Values. Unit prices shall be established for this Agreement by the submission of a schedule of values within ten (10) days of receipt of the Notice to Proceed. The schedule shall include quantities and prices of items equaling the Contract Sum and will subdivide the Work into components in sufficient detail to serve as the basis for progress payments during construction. Such prices shall include an appropriate amount of overhead and profit applicable to each item of Work. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.

II. Other Contracts. The Owner reserves the right to let other contracts in connection with this Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their work, and promptly connect and coordinate the Work with theirs.

ARTICLE III

COMPENSATION

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

A. Adjustments. The Contract Sum may only be changed by Change Order or by a written amendment. Any claim for an increase or decrease in the Contract Sum shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within fifteen (15) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all amounts to which the claimant is entitled as a result of the occurrence of said event. Failure to deliver a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

B. Valuation. The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Sum shall be determined in one of the following ways (at Owner's discretion):

- (1) In the case of Unit Price Work, in accordance with Section 3.1.C, below; or
- (2) By mutual acceptance of a lump sum; or
- (3) On the basis of the cost of the Work, plus a negotiated Contractor's fee for overhead and profit. Contractor shall submit an itemized cost breakdown together with supporting data.

C. Unit Price Work. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment pursuant to a requested Change Order under the following conditions:

- (1) If the total cost of a particular item of Unit Price Work amounts to 5% or more of the Contract Sum and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and
- (2) If there is no corresponding adjustment with respect to any other item of Work; and
 - (i) If Contractor believes that it has incurred additional expense as a result thereof; or
 - (ii) If Owner believes that the quantity variation entitles it to an adjustment in the unit price; or
 - (iii) If the parties are unable to agree as to the effect of any such

variations in the quantity of Unit Price Work performed.

3.2 Schedule of Compensation. All payments for services and material under the Contract Documents shall be made in accordance with the following provisions.

A. Periodic Payments for Services. The Contractor shall be entitled to receive payment for Construction Services rendered pursuant to Section 2.4 in periodic payments which shall reflect a fair apportionment of cost and schedule of values of services furnished prior to payment, subject to the provisions of this Section.

B. Payment for Materials and Equipment. In addition to the periodic payments authorized hereunder, payments may be made for material and equipment not incorporated in the Work but delivered and suitably stored at the Project Site, or another location, subject to prior approval and acceptance by the Owner on each occasion.

C. Credit toward Contract Sum. All payments for Construction Services made hereunder shall be credited toward the payment of the Contract Sum as Contractor's sole compensation for the construction of the Project.

3.3 Invoice and Payment. All payments for services and materials under the Contract Documents shall be invoiced and paid in accordance with the following provisions.

A. Invoices. The Contractor shall submit to the Owner periodic invoices for payment, in a form acceptable to the Owner, which shall include a sworn statement certifying that, to the best of the Contractor's knowledge, information and belief, the construction has progressed to the point indicated, the quality and the Work covered by the invoice is in accord with the Project Plans and Specifications, and the Contractor is entitled to payment in the amount requested, along with the cost reports required pursuant to Article II, showing in detail all monies paid out, Project Costs accumulated, or Project Cost incurred during the previous period. This data shall be attached to the invoice.

B. Additional Information; Processing of Invoices. Should an invoiced amount appear to exceed the Work effort believed to be completed, the Owner may, prior to processing of the invoice for payment, require the Contractor to submit satisfactory evidence to support the invoice. All Progress Reports and invoices shall be delivered to the attention of the Owner's Project Representative. Invoices not properly prepared (mathematical errors, billing not reflecting actual Work done, no signature, etc.) shall be returned to the Contractor for correction.

C. Architect/Engineer's Approval. Payment for Work completed shall be subject to the Architect/Engineer approving the payment requested by the Contractor and certifying the amount thereof that has been properly incurred and is then due and payable to the Contractor, and identifying with specificity any amount that has not been properly incurred and that should not be paid.

D. Warrants of Contractor with Respect to Payments. The Contractor warrants that (1) upon payment of any retainage, materials and equipment covered by a partial payment request will pass to Owner either by incorporation in construction or upon receipt of payment by the Contractor, whichever occurs first; (2) Work, materials and equipment covered by previous

partial payment requests shall be free and clear of liens, claims, security interests, or encumbrances; and (3) no Work, materials or equipment covered by a partial payment request which has been acquired by the Contractor or any other person performing Work at the Project Site, or furnishing materials or equipment for the Project, shall be subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or any other person.

E. All Compensation Included. Contractor's compensation includes full payment for services set forth in the Contract Documents, including but not limited to overhead, profit, salaries or other compensation of Contractor's officers, partners and/or employees, general operating expenses incurred by Contractor and relating to this Project, including the cost of management, supervision and data processing staff, job office equipment and supplies, and other similar items.

ARTICLE IV

SUBCONTRACTORS

4.1 Subcontracts. At the Owner's request, the Contractor shall provide Owner's Project Representative with copies of all proposed and final subcontracts, including the general and supplementary conditions thereof.

A. Subcontracts Generally. All subcontracts shall: (1) require each Subcontractor to be bound to Contractor to the same extent Contractor is bound to Owner by the terms of the Contract Documents, as those terms may apply to the portion of the Work to be performed by the Subcontractor, (2) provide for the assignment of the subcontracts from Contractor to Owner at the election of Owner, upon termination of Contractor, (3) provide that Owner will be an additional indemnified party of the subcontract, (4) provide that Owner will be an additional insured on all insurance policies required to be provided by the Subcontractor, except workers' compensation, (5) assign all warranties directly to Owner, and (6) identify Owner as an intended third-party beneficiary of the subcontract.

(1) A Subcontractor is a person or entity who has a direct contract with Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

(2) A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

B. No Damages for Delay. Except when otherwise expressly agreed to by Owner in writing, all subcontracts shall provide:

“LIMITATION OF REMEDIES – NO DAMAGES FOR DELAY. The Subcontractor's exclusive remedy for delays in the performance of the contract caused by events beyond its control, including delays claimed to be caused by the Owner or Architect/Engineer or attributable to the Owner or Architect/Engineer and including claims based on breach of contract or negligence, shall be an extension of its contract time and shall in no way involve any monetary claim.”

Each subcontract shall require that any claims by the Subcontractor for delay must be submitted to the Contractor within the time and in the manner in which the Contractor must submit such claims to the Owner, and that failure to comply with the conditions for giving notice and submitting claims shall result in the waiver of such claims.

C. Subcontractual Relations. The Contractor shall require each Subcontractor to assume all the obligations and responsibilities which the Contractor owes the Owner pursuant to the Contract Documents, by the parties to the extent of the Work to be performed by the Subcontractor. Said obligations shall be made in writing and shall preserve and protect the rights of the Owner and Architect/Engineer, with respect to the Work to be performed by the Subcontractor, so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its sub-subcontractors.

D. Insurance; Acts and Omissions. Insurance requirements for Subcontractors shall be no more stringent than those requirements imposed on the Contractor by the Owner. The Contractor shall be responsible to the Owner for the acts and omissions of its employees, agents, Subcontractors, their agents and employees, and all other persons performing any of the Work or supplying materials under a contract to the Contractor.

4.2 Relationship and Responsibilities. Except as specifically set forth herein with respect to direct materials acquisitions by Owner, nothing contained in the Contract Documents or in any Contract Document does or shall create any contractual relation between the Owner or Architect/Engineer and any Subcontractor. Specifically, the Contractor is not acting as an agent of the Owner with respect to any Subcontractor. The utilization of any Subcontractor shall not relieve Contractor from any liability or responsibility to Owner, or obligate Owner to the payment of any compensation to the Subcontractor or additional compensation to the Contractor.

4.3 Payments to Subcontractors; Monthly Statements. The Contractor shall be responsible for paying all Subcontractors from the payments made by the Owner to Contractor pursuant to Article III, subject to the following provisions:

A. Payment. The Contractor shall, no later than ten (10) days after receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, pay to each Subcontractor the amount to which the Subcontractor is entitled in accordance with the terms of the Contractor's contract with such Subcontractor. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to sub-Subcontractors in a similar manner. After receipt of payment from Owner, if the need should arise to withhold payments to Subcontractors for any reason, as solely determined by Contractor, the Contractor shall promptly restore such monies to the Owner, adjusting subsequent pay requests and Project bookkeeping as required.

B. Final Payment of Subcontractors. The final payment of retainage to Subcontractors shall not be made until the Project has been inspected by the Architect/Engineer or other person designated by the Owner for that purpose, and until both the Architect/Engineer and the Contractor have issued a written certificate that the Project has been constructed in accordance with the Project Plans and Specifications and approved Change Orders. Before issuance of final payment to any Subcontractor without any retainage, the Subcontractor shall submit satisfactory evidence that all payrolls, material bills, and other indebtedness connected with the Project have been paid or otherwise satisfied, warranty information is complete, as-built markups have been submitted, and instruction for the Owner's operating and maintenance personnel is complete. Final payment may be made to certain select Subcontractors whose Work is satisfactorily completed prior to the completion of the Project, but only upon approval of the Owner's Project Representative.

4.4 Responsibility for Subcontractors. As provided in Section 2.4.BB, Contractor shall be fully responsible to Owner for all acts and omissions of the Subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect Contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions.

4.5 Contingent Assignment of Subcontracts. Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that:

- (1) assignment is effective only after termination of the Contract by the Owner for cause pursuant to Article XIV and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- (2) assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Agreement.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract. Upon such assignment, if the Work has been suspended for more than thirty (30) days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension. Upon such assignment to the Owner, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE V

CHANGES IN WORK

5.1 General. Changes in the Work may be accomplished after execution of the Agreement, and without invalidating the Agreement, by Change Order, Work Directive Change or order for a minor change in the Work, subject to the limitations stated in this Article V and elsewhere in the Contract Documents. A Change Order shall be based upon agreement among the

Owner, Contractor and Architect/Engineer; a Work Directive Change requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect/Engineer alone. Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Work Directive Change or order for a minor change in the Work.

5.2 Minor Changes in the Work. The Owner or Architect/Engineer shall have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such change will be effected by written order signed by the Architect/Engineer and shall be binding on the Owner and Contractor. The Contractor shall abide by and perform such minor changes. Such changes shall be effected by a Field Directive or a Work Directive Change. Documentation of changes shall be determined by the Construction Team, and displayed monthly in the Progress Reports. Because such changes shall not affect the Contract Sum to be paid to the Contractor, they shall not require a Change Order pursuant to Section 5.6.

5.3 Emergencies. In any emergency affecting the safety of persons or property, the Contractor shall act at its discretion to prevent threatened damage, injury, or loss. Any increase in the Contract Sum or extension of time claimed by the Contractor because of emergency Work shall be determined as provided in Section 5.6. However, whenever practicable, the Contractor shall obtain verbal concurrence of the Owner's Project Representative and Architect/Engineer where the act will or may affect the Contract Sum or Contract Time.

5.4 Concealed Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect/Engineer before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. The Architect/Engineer will promptly investigate such conditions and, if the Architect/Engineer determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer shall promptly notify the Owner and Contractor in writing, stating the reasons. If the Contractor disputes the Architect/Engineer's determination or recommendation, the Contractor may proceed as provided in Article VIII. If the Owner disputes the Architect/Engineer's determination or recommendation, the Owner may appeal directly to the Purchasing Official and shall thereafter follow the process set forth in Section 8.5.

5.5 Hazardous Materials. In the event the Contractor encounters on the Project Site material reasonably believed to be hazardous, petroleum or petroleum related products, or other hazardous or toxic substances, except as provided in Section 2.4.U, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect/Engineer in writing. The Work in the affected area shall not thereafter be resumed except by Change Order or written amendment, if in fact the material or substance has not been rendered

harmless. The Work in the affected area shall be resumed when the Project Site has been rendered harmless, in accordance with the final determination by the Architect/Engineer or other appropriate professional employed by Owner. The Contractor shall not be required to perform without its consent any Work relating to hazardous materials, petroleum or petroleum related products, or other hazardous or toxic substances. In the event the Contractor encounters on the Project Site materials believed in good faith to be hazardous or contaminated material, and the presence of such hazardous or contaminated material was not known and planned for at the time the Contractor submitted its Bid (or Guaranteed Maximum Price proposal), and it is necessary for the Contractor to stop Work in the area affected and delays Work for more than a seven (7) day period, adjustments to the Contract Sum and/or Contract Time shall be made in accordance with this Article V.

5.6 Change Orders; Adjustments to Contract Sum.

A. Change Orders Generally. The increase or decrease in the Contract Sum resulting from a change authorized pursuant to the Contract Documents shall be determined:

- (1) By mutual acceptance of a lump sum amount properly itemized and supported by sufficient substantiating data, to permit evaluation by the Architect/Engineer and Owner; or
- (2) By unit prices stated in the Agreement or subsequently agreed upon; or
- (3) By any other method mutually agreeable to Owner and Contractor.

If Owner and Contractor are unable to agree upon increases or decreases in the Contract Sum and the Architect/Engineer certifies that the work needs to be commenced prior to any such agreement, the Contractor, provided it receives a written Change Order signed by or on behalf of the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined on the basis of the reasonable expenditures of those performing the Work attributed to the change. However, in the event a Change Order is issued under these conditions, the Owner, through the Architect/Engineer, will establish an estimated cost of the Work and the Contractor shall not perform any Work whose cost exceeds that estimated without prior written approval by the Owner. In such case, the Contractor shall keep and present in such form as the Owner may prescribe an itemized accounting, together with appropriate supporting data of the increase in overall costs of the Project. The amount of any decrease in the Contract Sum to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in costs will be the amount of the actual net decrease.

5.7 Owner-Initiated Changes. Without invalidating the Agreement and without notice to any Surety, Owner may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a written amendment, a Field Directive, a Change Order, or a Work Directive Change, as the case may be. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided). A Work Directive Change may not change the Contract Sum or the Contract Time; but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Sum or Contract Time.

5.8 Unauthorized Work. Contractor shall not be entitled to an increase in the Contract Sum or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents.

5.9 Defective Work. Owner and Contractor shall execute appropriate Change Orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work, without adjustment to the Contract Sum.

5.10 Estimates for Changes. At any time Architect/Engineer may request a quotation from Contractor for a proposed change in the Work. Within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract Sum or Contract Time for the proposed change. Architect/Engineer shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in sufficient detail to reasonably permit an analysis by Architect/Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, added, changed or impacted. Notwithstanding the request for quotation, Contractor shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.

5.11 Form of Proposed Changes. The form of all submittals, notices, Change Orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the Owner. Standard Owner forms shall be utilized.

5.12 Changes to Contract Time. The Contract Time may only be changed pursuant to a Change Order or a written amendment to the Contract Documents. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled to because of the occurrence of said event. The Contract time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by Owner or others performing additional Work; or to fires, floods, epidemics, abnormal weather conditions or acts of God. Failure to deliver a written notice of claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

ARTICLE VI

ROLE OF ARCHITECT/ENGINEER

6.1 General.

A. Retaining. The Owner shall retain an Architect/Engineer (whether an individual or an entity) lawfully licensed to practice in Florida. That person or entity is identified as the Architect/Engineer in the Agreement and is referred to throughout the Contract Documents as if singular in number.

B. Duties. Duties, responsibilities and limitations of authority of the Architect/Engineer as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner and Architect/Engineer. Consent shall not be unreasonably withheld.

C. Termination. If the employment of the Architect/Engineer is terminated, the Owner shall employ a successor Architect/Engineer as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect/Engineer.

6.2 Administration. The Architect/Engineer will provide administration of the Agreement as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect/Engineer approves the final Application for Payment. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

A. Site Visits. The Architect/Engineer will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work complete, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. Unless specifically instructed by Owner, the Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect/Engineer will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

B. Reporting. Based on the site visits, the Architect/Engineer will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

6.3 Interpretation of Project Plans and Specifications. The Architect/Engineer will be the interpreter of the requirements of the Project Plans and Specifications. Upon receipt of comments or objections by Contractor or Owner, the Architect/Engineer will make decisions on all claims, disputes, or other matters pertaining to the interpretation of the Project Plans and Specifications.

6.4 Rejection of Non-Conforming Work. Upon consultation with Owner, the Architect/Engineer shall have the authority to reject Work which does not conform to the Project Plans and Specifications.

6.5 Correction of Work. The Contractor shall promptly correct all Work rejected by the Architect/Engineer for being defective or as failing to conform to the Project Plans and Specifications, whether observed before or after the Substantial Completion Date and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for Architect/Engineer's additional services made necessary thereby.

6.6 Timely Performance of Architect/Engineer. The Contractor shall identify which requests for information or response from the Architect/Engineer have the greatest urgency and those items which require prioritizing in response by the Architect/Engineer. The Contractor shall also identify the preferred time period for response and shall request a response time which is reasonably and demonstrably related to the needs of the Project and Contractor. If Architect/Engineer claims that Contractor's expectations for a response are unreasonable, Owner shall require Architect/Engineer to communicate such claim to Contractor in writing together with the specific time necessary to respond and the date upon which such response will be made. If Contractor believes that Architect/Engineer is not providing timely services or responses, Contractor shall notify Owner of same in writing not less than two (2) weeks before Contractor believes performance or response time from Architect/Engineer is required without risk of delaying the Project.

ARTICLE VII

OWNER'S RIGHTS AND RESPONSIBILITIES

7.1 Project Site; Title. The Owner shall provide the lands upon which the Work under the Contract Documents is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same. The Owner hereby represents to the Contractor that it currently has and will maintain up through and including the Substantial Completion Date, good title to all of the real property constituting the Project Site. Owner agrees to resolve, at its expense, any disputes relating to the ownership and use of the Project Site which might arise during construction.

7.2 Project Plans and Specifications; Architect/Engineer. The parties hereto acknowledge and agree that Owner has previously entered into an agreement with Architect/Engineer. Pursuant to the terms of such agreement, the Architect/Engineer, as an agent and representative of Owner, is responsible for the preparation of Project Plans and Specifications which consist of drawings, specifications, and other documents setting forth in detail the requirements for the construction of the Project. All such Project Plans and Specifications shall be provided either by Owner or the Architect/Engineer, and Contractor shall be under no obligation to provide same and shall be entitled to rely upon the accuracy and completeness of the Project Plans and Specifications provided by the Architect/Engineer and all preliminary drawings prepared in connection therewith. The Contractor will be furnished a reproducible set of all drawings and

specifications reasonably necessary for the performance of Contractor's services hereunder and otherwise ready for printing. The Contractor shall be notified of any written modification in the agreement between Owner and Architect/Engineer.

7.3 Surveys; Soil Tests and Other Project Site Information. Owner shall be responsible for providing a legal description and certified land survey of the Project Site in a form and content and with such specificity as may be required by the Architect/Engineer and Contractor to perform their services. To the extent deemed necessary by Owner and Architect/Engineer, and solely at Owner's expense, Owner may engage the services of a geotechnical consultant to perform test borings and other underground soils testing as may be deemed necessary by the Architect/Engineer or the Contractor. Contractor shall not be obligated to provide such surveys or soil tests and shall be entitled to rely upon the accuracy and completeness of the information provided; subject, however, to the provisions of Section 2.4.S hereof. Owner shall provide Contractor, as soon as reasonably possible following the execution of the Contract Documents, all surveys or other survey information in its possession describing the physical characteristics of the Project Site, together with soils reports, subsurface investigations, utility locations, deed restrictions, easements, and legal descriptions then in its possession or control. Upon receipt of all surveys, soils tests, and other Project Site information, Contractor shall promptly advise Owner of any inadequacies in such information and of the need for any additional surveys, soils or subsoil tests. In performing this Work, Contractor shall use the standard of care of experienced contractors and will use its best efforts timely to identify all problems or omissions. Owner shall not be responsible for any delay or damages to the Contractor for any visible or disclosed site conditions or disclosed deficiencies in the Project Site which should have been identified by Contractor and corrected by Owner prior to the execution of the Contract Documents.

7.4 Information; Communication; Coordination. The Owner's Project Representative shall examine any documents or requests for information submitted by the Contractor and shall advise Contractor of Owner's decisions pertaining thereto within a reasonable period of time to avoid unreasonable delay in the progress of the Contractor's services. Contractor shall indicate if any such documents or requests warrant priority consideration. However, decisions pertaining to approval of the Project Schedule as it relates to the date of Substantial Completion, the Project Cost, Contractor's compensation, approving or changing the Contract Sum shall only be effective when approved by Owner in the form of a written Change Order or amendment to the Contract Documents. Owner reserves the right to designate a different Owner's Project Representative provided Contractor is notified in writing of any such change. Owner and Architect/Engineer may communicate with Subcontractors, materialmen, laborers, or suppliers engaged to perform services on the Project, but only for informational purposes. Neither the Owner nor the Architect/Engineer shall attempt to direct the Work of or otherwise interfere with any Subcontractor, materialman, laborer, or supplier, or otherwise interfere with the Work of the Contractor. Owner shall furnish the data required of Owner under the Contract Documents promptly.

7.5 Governmental Body. The Contractor recognizes that the Owner is a governmental body with certain procedural requirements to be satisfied. The Contractor has and will make reasonable allowance in its performance of services for such additional time as may be required for approvals and decisions by the Owner and any other necessary government agency.

7.6 Pre-Completion Acceptance. The Owner shall have the right to take possession of and use any completed portions of the Work, although the time for completing the entire Work

or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

7.7 Ownership and Use of Drawings, Specifications and Other Instruments of Service.

- (1) The Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors and owners of their respective instruments of service, including the Project Plans and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the instruments of service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect/Engineer's or Architect/Engineer's consultants' reserved rights.
- (2) The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the drawings and specifications provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Project Plans and Specifications or other instruments of service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the drawings or specifications on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer and the Architect/Engineer's consultants.

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

A. Responsibilities. Except as otherwise instructed in writing by Owner, the Owner's Project Representative will:

- (1) Attend preconstruction conferences; arrange a schedule of progress meetings and other job conferences as required in consultation with Owner/Architect/Engineer and notify those expected to attend in advance; and attend meetings and maintain and circulate copies of minutes thereof;
- (2) Serve as Owner/Architect/Engineer's liaison with Contractor, working principally through Contractor's superintendent, to assist in understanding the intent of the Contract Documents. As requested by Owner/Architect/Engineer, assist in obtaining additional details or information when required at the job site for proper execution of the Work;

- (3) Report to Owner/Architect/Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents;
- (4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to Owner/Architect/Engineer;
- (5) Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Owner/Architect/Engineer; and
- (6) Perform those duties as set forth elsewhere within the Contract Documents.

B. Limitations. Except upon written instructions of Owner, Owner's Project Representative shall not:

- (1) Authorize any deviation from the Contract Documents or approve any substitute materials or equipment;
- (2) Exceed limitations on Owner/Architect/Engineer's authority as set forth in the Contract Documents;
- (3) Undertake any of the responsibilities of Contractor, Subcontractors or Contractor's superintendent, or expedite the Work;
- (4) Advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents;
- (5) Advise on or issue directions as to safety precautions and programs in connection with the Work;
- (6) Authorize Owner to occupy the project in whole or in part; or
- (7) Participate in specialized field or laboratory tests.

ARTICLE VIII

RESOLUTION OF DISAGREEMENTS;

CLAIMS FOR COMPENSATION

8.1 Owner to Decide Disputes. The Owner shall reasonably decide all questions and disputes (with the exception of matters pertaining to the interpretation of the Project Plans and Specifications which shall be resolved by the Architect/Engineer pursuant to Section 6.3) that may

arise in the execution and fulfillment of the services provided for under the Contract Documents, in accordance with the Procurement Ordinance.

8.2 Finality. The decision of the Owner upon all claims, questions, disputes and conflicts shall be final and conclusive, and shall be binding upon all parties to the Contract Documents, subject to judicial review as provided in Section 8.5 below.

8.3 No Damages for Delay. If at any time Contractor is delayed in the performance of Contractor's responsibilities under the Contract Documents as the result of a default or failure to perform in a timely manner by Owner or Owner's agents or employees, Contractor shall not be entitled to any damages except for compensation specifically authorized in Article III. Contractor's sole remedy will be a right to extend the time for performance. Nothing herein shall preclude Contractor from any available remedy against any responsible party other than Owner. Contractor shall be responsible for liquidated damages for delay if otherwise provided for in the Contract Documents.

8.4 Permitted Claims Procedure. Where authorized or permitted under the Contract Documents, all claims for additional compensation by Contractor, extensions of time affecting the Substantial Completion Date, for payment by the Owner of costs, damages or losses due to casualty, Force Majeure, Project Site conditions or otherwise, shall be governed by the following:

- (1) All claims must be submitted as a request for Change Order in the manner as provided in Article V.
- (2) The Contractor must submit a notice of claim to Owner's Project Representative and to the Architect/Engineer within fifteen (15) days of the beginning of such occurrence. Failure to submit a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.
- (3) Within twenty (20) days of submitting its notice of claim, the Contractor shall submit to the Owner's Project Representative its request for Change Order, which shall include a written statement of all details of the claim, including a description of the Work affected.
- (4) After receipt of a request for Change Order, the Owner's Project Representative, in consultation with the Architect/Engineer, shall deliver to the Contractor, within twenty (20) days after receipt of request, its written response to the claim.
- (5) In the event the Owner and Contractor are unable to agree on the terms of a Change Order, the Owner shall have the option to instruct the Contractor to proceed with the Work. In that event, the Owner shall pay for those parts of the Work, the scope and price of which are not in dispute. The balance of the disputed items in the order to proceed will be resolved after completion of the Work, based upon completed actual cost.
- (6) The rendering of a decision by Owner with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any

exercise by Owner or Contractor of such right or remedies as either may otherwise have under the Contract Documents or by laws or regulations in respect of any such claim, dispute or other matter.

8.5 Contract Claims and Disputes. After completion of the process set forth in Section 8.4 above, any unresolved dispute under this Agreement shall be decided by the Purchasing Official in accordance with Section 2-26-63 of the Manatee County Code of Laws, subject to an administrative hearing process as provided in Section 2-26-64. The decision of the hearing officer in accordance with Section 2-26-64 of the Manatee County Code of Laws shall be the final and conclusive decision subject to exclusive judicial review in circuit court by a petition for certiorari.

8.6 Claims for Consequential Damages. The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Agreement. This mutual waiver includes:

- (1) damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons, unless any of such damages or losses are covered by insurance placed by the Contractor; and
- (2) damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article XIV. Nothing contained in this Section 8.6 shall be deemed to preclude assessment of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

ARTICLE IX

INDEMNITY

9.1 Indemnity.

A. Indemnification Generally. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part by a

party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.1.

B. Indemnification; Enforcement Actions. The Contractor's duty to indemnify and hold harmless the Owner in Section 9.1 above shall extend to fines, penalties and costs incurred by the Owner as related to any enforcement action taken by local, state, regional or federal regulatory entities. The Owner may deduct any of such fines, penalties and costs as described in this Section from any unpaid amounts then or thereafter due the Contractor under the Contract Documents. Any of such fines, penalties and costs not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

C. Claims by Employees. In claims against any person or entity indemnified under this Section 9.1 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 9.1.A. shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

9.2 Duty to Defend. The Contractor shall defend the Owner in any action, lawsuit, mediation or arbitration arising from the alleged negligence, recklessness or intentionally wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of the Work. Notwithstanding any other provisions within this Article IX, so long as Contractor, through its own counsel, performs its obligation to defend the Owner pursuant to this Section, Contractor shall not be required to pay the Owner's costs associated with the Owner's participation in the defense.

ARTICLE X

ACCOUNTING RECORDS; OWNERSHIP OF DOCUMENTS

10.1 Accounting Records. Records of expenses pertaining to all services performed shall be kept in accordance with generally accepted accounting principles and procedures.

10.2 Inspection and Audit. The Contractor's records shall be open to inspection and subject to examination, audit, and/or reproduction during normal working hours by the Owner's agent or authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the Contractor or any of its payees during the performance of the Work. These records shall include, but not be limited to, accounting records, written policies and procedures, Subcontractor files (including proposals of successful and unsuccessful bidders), original estimates, estimating worksheets, correspondence, Change Order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to the Contract Documents. They shall also

include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with the Contract Documents. For such audits, inspections, examinations and evaluations, the Owner's agent or authorized representative shall have access to said records from the effective date of the Contract Documents, for the duration of Work, and until three (3) years after the date of final payment by the Owner to the Contractor pursuant to the Contract Documents.

10.3 Access. The Owner's agent or authorized representative shall have access to the Contractor's facilities and all necessary records to conduct audits in compliance with this Article. The Owner's agent or authorized representative shall give the Contractor reasonable advance notice of intended inspections, examinations, and/or audits.

10.4 Ownership of Documents. Upon obtainment of Substantial Completion or termination of the Agreement, all records, documents, tracings, plans, specifications, maps, evaluations, reports, transcripts and other technical data, other than working papers, prepared or developed by the Contractor shall be delivered to and become the property of the Owner. The Contractor at its own expense may retain copies for its files and internal use.

ARTICLE XI

PUBLIC CONTRACT LAWS

11.1 Equal Opportunity Employment.

A. Employment. The Contractor shall not discriminate against any employee or applicant for employment because of race, creed, sex, color, national origin, disability or age, and will take affirmative action to ensure that all employees and applicants are afforded equal employment opportunities without discrimination because of race, creed, sex, color, national origin, disability or age. Such action will be taken with reference to, but shall not be limited to, recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of training or retraining, including apprenticeship and on-the-job training.

B. Participation. No person shall, on the grounds of race, creed, sex, color, national origin, disability or age, be excluded from participation in, be denied the proceeds of, or be subject to discrimination in the performance of the Agreement.

11.2 Immigration Reform and Control Act of 1986. Contractor acknowledges that it is responsible for complying with the provisions of the Immigration Reform and Control Act of 1986, located at 8 U.S.C. Section 1324, et seq., and regulations relating thereto. Failure to comply with the above statutory provisions shall be considered a material breach and shall be grounds for immediate termination of this Agreement.

11.3 No Conflict of Interest. The Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for the Contractor to solicit or secure this Agreement, and that it has not paid or agreed to pay any person, company,

corporation, individual, or firm other than a bona fide employee working solely for the Contractor, any fee, commission, percentage, gift or any other consideration, contingent upon or resulting from the award or making of this Agreement.

A. No Interest in Business Activity. By accepting award of this Agreement, the Contractor, which shall include its directors, officers and employees, represents that it presently has no interest in and shall acquire no interest in any business or activity which would conflict in any manner with the performance of services required hereunder, including without limitation as described in the Contractor's own professional ethical requirements. An interest in a business or activity which shall be deemed a conflict includes but is not limited to direct financial interest in any of the material and equipment manufacturers, suppliers, distributors, or contractors who will be eligible to supply material and equipment for the Project for which the Contractor is furnishing its services required hereunder.

B. No Appearance of Conflict. The Contractor shall not knowingly engage in any contractual or professional obligations that create an appearance of a conflict of interest with respect to the services provided pursuant to the Agreement. The Contractor has provided the Affidavit of No Conflict, incorporated into the Contract Documents as Exhibit "C", as a material inducement for Owner entering the Agreement. If, in the sole discretion of the County Administrator or designee, a conflict of interest is deemed to exist or arise during the term of this Agreement, the County Administrator or designee may cancel this Agreement, effective upon the date so stated in a written notice of cancellation, without penalty to the Owner.

11.4 Truth in Negotiations. By execution of the Contract Documents, the Contractor certifies to truth-in-negotiations and that wage rates and other factual unit costs supporting the compensation are accurate, complete and current at the time of contracting. Further, the original Contract Sum and any additions thereto shall be adjusted to exclude any significant sums where the Owner determines the Contract Sum was increased due to inaccurate, incomplete or non-current wage rates and other factual unit costs. Such adjustments must be made within one (1) year after final payment to the Contractor.

11.5 Public Entity Crimes. The Contractor is directed to the Florida Public Entity Crimes Act, Section 287.133, Florida Statutes, specifically section 2(a), and the Owner's requirement that the Contractor comply with it in all respects prior to and during the term of the Agreement.

ARTICLE XII

FORCE MAJEURE, FIRE OR OTHER CASUALTY

12.1 Force Majeure.

A. Unavoidable Delays. Delays in any performance by any party contemplated or required hereunder due to fire, flood, sinkhole, earthquake or hurricane, acts of God, unavailability of materials, equipment or fuel, war, declaration of hostilities, revolt, civil strife, altercation or commotion, strike, labor dispute, or epidemic, archaeological excavation, lack of or failure of transportation facilities, or any law, order, proclamation, regulation, or ordinance of any

government or any subdivision thereof, or for any other similar cause to those enumerated, beyond the reasonable control and which with due diligence could not have been reasonably anticipated, shall be deemed to be events of Force Majeure and any such delays shall be excused. In the event such party is delayed in the performance of any Work or obligation pursuant to the Contract Documents for any of the events of Force Majeure stated in this Section 12.1, the date for performance required or contemplated by the Contract Documents shall be extended by the number of calendar days such party is actually delayed.

B. Concurrent Contractor Delays. If a delay is caused for any reason provided in Section 12.1.A. and during the same time period a delay is caused by Contractor, the date for performance shall be extended as provided in 12.1.A. but only to the extent the time is or was concurrent.

C. Notice; Mitigation. The party seeking excuse for nonperformance based on Force Majeure shall give written notice to the Owner, if with respect to the Contractor, or to the Contractor if with respect to the Owner, specifying its actual or anticipated duration. Each party seeking excuse from nonperformance based on Force Majeure shall use its best efforts to rectify any condition causing a delay and will cooperate with the other party, except that neither party shall be obligated to incur any unreasonable additional costs and expenses to overcome any loss of time that has resulted.

12.2 Casualty; Actions by Owner and Contractor. During the construction period, if the Project or any part thereof shall have been damaged or destroyed, in whole or in part, the Contractor shall promptly make proof of loss; and Owner and Contractor shall proceed promptly to collect, or cause to be collected, all valid claims which may have arisen against insurers or others based upon such damage or destruction. The Contractor shall diligently assess the damages or destruction and shall prepare an estimate of the cost, expenses, and other charges, including normal and ordinary compensation to the Contractor, necessary for reconstruction of the Project substantially in accordance with the Project Plans and Specifications. Within fifteen (15) days following satisfaction of the express conditions described in subsections (1), (2) and (3) below, the Contractor covenants and agrees diligently to commence reconstruction and to complete the reconstruction or repair of any loss or damage by fire or other casualty to the Project to substantially the same size, floor area, cubic content, and general appearance as prior to such loss or damage:

- (1) Receipt by the Owner or the trustee of the proceeds derived from collection of all valid claims against insurers or others based upon such damage or destruction, and receipt of other sums from any source such that the funds necessary to pay the Project Cost and any additions to the Project Cost necessitated for repair or reconstruction are available;
- (2) Written agreement executed by the Contractor and the Owner, by amendment to the Contract Documents or otherwise, authorizing and approving the repair or reconstruction and any additions to the Project Cost necessitated thereby, including any required adjustment to the Contract Sum; and
- (3) Final approval by the Owner of the Project Plans and Specifications for such repair or reconstruction and issuance of any required building permit.

12.3 Approval of Plans and Specifications. The Owner agrees to approve the plans and specifications for such reconstruction or repair if the reconstruction or repair contemplated by such plans and specifications is economically feasible, and will restore the Project, or the damaged portion thereof, to substantially the same condition as prior to such loss or damage, and such plans and specifications conform to the applicable laws, ordinances, codes, and regulations. The Owner agrees that all proceeds of any applicable insurance or other proceeds received by the Owner or the Contractor as a result of such loss or damage shall be used for payment of the costs, expenses, and other charges of the reconstruction or repair of the Project.

12.4 Notice of Loss or Damage. The Contractor shall promptly give the Owner written notice of any significant damage or destruction to the Project, defined as loss or damage which it is contemplated by Contractor will increase the Contract Sum or extend the Substantial Completion Date, stating the date on which such damage or destruction occurred, the then expectations of Contractor as to the effect of such damage or destruction on the use of the Project, and the then proposed schedule, if any, for repair or reconstruction of the Project. Loss or damage which the Contractor determines will not affect the Contract Sum or Substantial Completion Date will be reported to Owner and Architect/Engineer immediately, and associated corrective actions will be undertaken without delay.

ARTICLE XIII

REPRESENTATIONS, WARRANTIES AND COVENANTS

13.1 Representations and Warranties of Contractor. The Contractor represents and warrants to the Owner each of the following.

A. The Contractor is a construction company, organized under the laws of the State of _____, authorized to transact business in the State of Florida, with _____ as the primary qualifying agent. Contractor has all requisite power and authority to carry on its business as now conducted, to own or hold its properties, and to enter into and perform its obligations hereunder and under each instrument to which it is or will be a party, and is in good standing in the State of Florida.

B. Each Contract Document to which the Contractor is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Contractor enforceable against the Contractor in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally and subject to usual equitable principles in the event that equitable remedies are involved.

C. There are no pending or, to the knowledge of the Contractor, threatened actions or proceedings before any court or administrative agency, within or without the State of Florida, against the Contractor or any partner, officer, or agent of the Contractor which question the validity of any document contemplated hereunder, or which are likely in any case, or in the

aggregate, to materially adversely affect the consummation of the transactions contemplated hereunder, or materially adversely affect the financial condition of the Contractor.

D. The Contractor has filed or caused to be filed all federal, state, local, or foreign tax returns, if any, which were required to be filed by the Contractor, and has paid, or caused to be paid, all taxes shown to be due and payable on such returns or on any assessments levied against the Contractor.

E. Neither Contractor nor any agent or person employed or retained by Contractor has acted fraudulently or in bad faith or in violation of any statute or law in the procurement of this Agreement.

F. The Contractor shall timely fulfill or cause to be fulfilled all of the terms and conditions expressed herein which are within the control of the Contractor or which are the responsibility of the Contractor to fulfill. The Contractor shall be solely responsible for the means and methods of construction.

G. It is recognized that neither the Architect/Engineer, the Contractor, nor the Owner has control over the cost of labor, materials, or equipment, over a Subcontractor's methods of determining bid prices, or over competitive bidding, market, or negotiating conditions.

H. During the term of the Contract Documents, and the period of time that the obligations of the Contractor under the Contract Documents shall be in effect, the Contractor shall cause to occur and to continue to be in effect those instruments, documents, certificates, and events contemplated by the Contract Documents that are applicable to, and the responsibility of, the Contractor.

I. The Contractor shall assist and cooperate with the Owner and shall accomplish the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, or orders that are or will be applicable thereto.

J. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective, and that Owner, representatives of Owner, and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. Contractor shall give Architect/Engineer timely notice of readiness of the Work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by Owner.

K. If any Work (including Work of others) that is to be inspected, tested, or approved is covered without written concurrence of Architect/Engineer, it must, if requested by Architect/Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Architect/Engineer timely notice of Contractor's intention to cover the same and Architect/Engineer has not acted with reasonable promptness in response to such notice. Neither observations by Architect/Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract Documents.

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

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

N. If within three (3) years after the Substantial Completion Date or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work or if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instruction, Owner may have the defective Work corrected/removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor. Failing payment by the Contractor and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall have the right to bring a direct action in the Circuit Court to recover such costs.

13.2 Representations of the Owner. To the extent permitted by law, the Owner represents to the Contractor that each of the following statements is presently true and accurate:

- A. The Owner is a validly existing political subdivision of the State of Florida.
- B. The Owner has all requisite corporate or governmental power and authority to carry on its business as now conducted and to perform its obligations under the Contract Documents and each Contract Document contemplated hereunder to which it is or will be a party.
- C. The Contract Documents and each Contract Document contemplated hereby to which the Owner is or will be a party has been duly authorized by all necessary action on the part of, and has been or will be duly executed and delivered by, the Owner, and neither the

execution and delivery thereof nor compliance with the terms and provisions thereof or hereof: (a) requires the approval and consent of any other person or party, except such as have been duly obtained or as are specifically noted herein; (b) contravenes any existing law, judgment, governmental rule, regulation or order applicable to or binding on the Owner; or (c) contravenes or results in any breach of, default under, or result in the creation of any lien or encumbrance upon the Owner under any indenture, mortgage, deed of trust, bank loan, or credit agreement, the charter, ordinances, resolutions, or any other agreement or instrument to which the Owner is a party, specifically including any covenants of any bonds, notes, or other forms of indebtedness of the Owner outstanding on the date of the Contract Documents.

D. The Contract Documents and each document contemplated hereby to which the Owner is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Owner enforceable against the Owner in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally, and subject to usual equitable principles in the event that equitable remedies are involved.

E. There are no pending or, to the knowledge of the Owner, threatened actions or proceedings before any court or administrative agency against the Owner which question the validity of the Contract Documents or any document contemplated hereunder, or which are likely in any case or in the aggregate to materially adversely affect the consummation of the transactions contemplated hereunder or the financial or corporate condition of the Owner.

F. The Owner shall use due diligence to timely fulfill or cause to be fulfilled all of the conditions expressed in the Contract Documents which are within the control of the Owner or which are the responsibility of the Owner to fulfill.

G. During the pendency of the Work and while the obligations of the Owner under the Contract Documents shall be in effect, the Owner shall cause to occur and to continue to be in effect and take such action as may be necessary to enforce those instruments, documents, certificates and events contemplated by the Contract Documents that are applicable to and the responsibility of the Owner.

H. The Owner shall assist and cooperate with the Contractor in accomplishing the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, orders, contracts, or agreements that are or will be applicable thereto or, to the extent permitted by law, enact or adopt any resolution, rule, regulation, or order, or approve or enter into any contract or agreement, including issuing any bonds, notes, or other forms of indebtedness, that will result in the Contract Documents or any part thereof, or any other instrument contemplated by and material to the timely and effective performance of a party's obligations hereunder, to be in violation thereof.

ARTICLE XIV

TERMINATION AND SUSPENSION

14.1 Termination for Cause by Owner. This Agreement may be terminated by Owner upon written notice to the Contractor should Contractor fail substantially to perform a material obligation in accordance with the terms of the Contract Documents through no fault of the Owner. In the event Owner terminates for cause and it is later determined by a court of competent jurisdiction that such termination for cause was not justified, then in such event such termination for cause shall automatically be converted to a termination without cause pursuant to Section 14.2.

A. Nonperformance. If the Contractor fails to timely perform any of its obligations under the Contract Documents, including any obligation the Contractor assumes to perform Work with its own forces, or if it persistently or repeatedly refuses or fails, except in case for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or fails, without being excused, to maintain an established schedule (failure to maintain schedule shall be defined as any activity that falls thirty (30) days or more behind schedule) which has been adopted by the Construction Team, or it fails to make prompt payment to Subcontractors for materials or labor, or disregards laws, rules, ordinances, regulations, or orders of any public authority having jurisdiction, or otherwise is guilty of substantial violations of the Agreement the Owner may, after seven (7) days written notice, during which period the Contractor fails to perform such obligation, make good such deficiencies and perform such actions. The Contract Sum shall be reduced by the cost to the Owner of making good such deficiencies, and the Contractor's compensation shall be reduced by an amount required to manage the making good of such deficiencies. Provided, however, nothing contained herein shall limit or preclude Owner from pursuing additional damages from Contractor because of its breach.

B. Insolvency. If the Contractor is adjudged bankrupt, or if it makes a general assignment for the benefit of its creditors, or if a receiver is appointed because its insolvency, then the Owner may, without prejudice to any other right or remedy, and after giving the Contractor and its surety, if any, fourteen (14) days written notice, and during which period the Contractor fails to cure the violation, terminate the Agreement. In such case, the Contractor shall not be entitled to receive any further payment. Owner shall be entitled to recover all costs and damages arising because of failure of Contractor to perform as provided in the Contract Documents, as well as reasonable termination expenses, and costs and damages incurred by the Owner may be deducted from any payments left owing the Contractor.

C. Illegality. Owner may terminate the Agreement if Contractor disregards laws or regulations of any public body having jurisdiction.

D. Rights of Owner. The Owner may, after giving Contractor (and the surety, if there is one) seven (7) days written notice, terminate the services of Contractor for cause; exclude Contractor from the Project Site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the Project Site and use the same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the Work all materials and equipment stored at the Project Site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the Work, but delivered and suitably stored,

less the aggregate of payments previously made. If the direct and indirect costs of completing the Work exceed the unpaid balance of the Contract Sum, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Owner in writing; but in finishing the Work, Owner shall not be required to obtain the lowest quote for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement. In such event and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall be entitled to bring a direct action in the Circuit Court to recover such costs.

14.2 Termination without Cause by Owner. The Owner, through its County Administrator or designee, shall have the right to terminate the Agreement, in whole or in part, without cause upon sixty (60) calendar days' written notice to the Contractor. In the event of such termination for convenience, the Owner shall compensate Contractor for payments due through the date of termination, and one subsequent payment to cover costs of Work performed through the date of termination, subject to the terms and conditions of Section 3.1. The Contractor shall not be entitled to any other further recovery against the Owner, including, but not limited to, anticipated fees or profit on Work not required to be performed, or consequential damages or costs resulting from such termination.

A. Release of Contractor. As a condition of Owner's termination rights provided for in this subsection, Contractor shall be released and discharged from all obligations arising by, through, or under the terms of the Contract Documents, and the Payment and Performance Bond shall be released. Owner shall assume and become responsible for the reasonable value of Work performed by Subcontractors prior to termination plus reasonable direct close-out costs, but in no event shall Subcontractors be entitled to unabsorbed overhead, anticipatory profits, or damages for early termination.

B. Waiver of Protest. Contractor hereby waives any right to protest the exercise by Owner of its rights under this Section that may apply under the Procurement Ordinance.

14.3 Suspension without Cause. Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) days by written notice to Contractor, which will fix the date on which Work will be resumed. Contractor shall be allowed an increase in the Contract Sum or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes an approved claim therefor.

14.4 Termination Based Upon Abandonment, Casualty or Force Majeure. If, after the construction commencement date (i) Contractor abandons the Project (which for purposes of this paragraph shall mean the cessation of all construction and other activities relating to the Project, excluding those which are necessary to wind down or otherwise terminate all outstanding obligations with respect to the Project, and no recommencement of same within one hundred twenty (120) days following the date of cessation), or (ii) the Project is stopped for a period of thirty (30) consecutive days due to an instance of Force Majeure or the result of a casualty resulting in a loss that cannot be corrected or restored within one hundred twenty (120) days (excluding the time required to assess the damage and complete the steps contemplated under Section 12.2), the Owner shall have the right to terminate the Agreement and pay the Contractor its compensation earned or accrued to date.

14.5 Vacation of Project Site; Delivery of Documents. Upon termination by Owner pursuant to Section 14.2 or 14.4, Contractor shall withdraw its employees and its equipment, if any, from the Project Site on the effective date of the termination as specified in the notice of termination (which effective date shall not be less than two (2) working days after the date of delivery of the notice), regardless of any claim the Contractor may or may not have against the Owner. Upon termination, the Contractor shall deliver to the Owner all original papers, records, documents, drawings, models and other material set forth and described in the Contract Documents.

14.6 Termination by the Contractor. If, through no act or fault of Contractor, the Work is suspended for a period of more than ninety (90) consecutive days by Owner or under an order of court or other public authority, or Owner fails to act on any Application for Payment or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon fourteen (14) days written notice to Owner terminate the Agreement and recover from Owner payment for all Work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Owner has failed to act on any Application for Payment or Owner has failed to make any payment as aforesaid, Contractor may upon fourteen (14) days written notice to Owner stop the Work until payment of all amounts then due.

EXAMPLE

Exhibit A
Title(s) of Drawings

SAMPLE

Exhibit B
Title(s) of Specifications

SAMPLE

Exhibit C
Affidavit of No Conflict

SAMPLE

Exhibit D
Contractor's Certificate(s) of Insurance

SAMPLE

Exhibit E
Contractor's Payment and Performance Bond

SAMPLE

Exhibit F
Standard Forms

SAMPLE

APPLICATION FOR PAYMENT	Request No.: _____ Project No.: _____
Project: _____	Purchase Order No.: _____
From: _____ To: _____	County Bid No.: _____
	Consultant: _____

CONTRACT PAYMENT SUMMARY					
Original Contract Amount:				\$	-
Change Order(s):				\$	-
Change order summary:					
Number	Date Approved	Additive	Deductive		
SUBTOTALS:		\$	-	\$	-
Net change order subtotal (Additive less Deductive):				\$	-
Current Contract Amount (CCA): (Original Amount + Change Order(s))				\$	-
		Previous Status	Total WIP		
Value of the Work in Place (WIP)		\$	-	\$	-
Value of Stored Materials		\$	-	\$	-
Total Earned (\$ and % of CCA)		\$	-	\$	-
Retainage (\$ and % of CCA)		\$	-	\$	-
Net Earned (Total earned minus retainage)				\$	-
TOTAL PREVIOUS PAYMENTS				\$	-
AMOUNT DUE THIS PAYMENT (Net Earned minus Previous Payments)				\$	-

CONTRACTOR'S AFFIDAVIT OF NOTICE	
<p>CERTIFICATE: The undersigned CONTRACTOR certifies that all items and amounts shown on this Application for Payment are on account of work performed, materials supplied and/or materials stored on site and paid for by Contractor in accordance with the Contract Documents with due consideration for previous Payment(s), if any, received by the Contractor from the County, and that the Amount Due this Payment shown is now due.</p>	
<p>NOTARY:</p> <p>State of Florida, County of _____</p> <p>Sworn to (or affirmed) and subscribed before me this _____ day of _____ by _____</p> <p style="text-align: center;">(Name of person giving notice)</p> <p>_____ (Signature of Notary Public - State of Florida) Print, Type or Stamp Commissioned Name of Notary Public:</p> <p>Personally Known _____ or Produced Identification _____ Type of Identification Produced: _____</p>	<p>CONTRACTOR:</p> <p>_____ Name of person authorized to sign Affidavit of Notice</p> <p>_____ TITLE</p> <p>_____ Contractor name, address and telephone no.:</p> <p>_____ _____ _____</p>

VERIFICATION, RECOMMENDATION, CONCURRENCES AND APPROVALS		
	(Signatures)	(Date)
Quantities verified by:	_____	_____
Consultant/Engineer:	_____	_____
Project Management:	_____	_____
Department Head:	_____	_____
Payment approved by the Board of County Commissioners:	_____	_____
Attested to by the Clerk of Circuit Court:	_____	_____

CERTIFICATE OF SUBSTANTIAL COMPLETION (S.C.)	CHECK ONE:	
	Partial	Total
Project Title:	Date Submitted:	
Contractor Data: Name: Address: City/State/Zip:	Project No:	
	S. C. Date (Proposed)	
<p>If the "Partial" completion box above is checked, the following description applies to the work for which substantial completion is being sought. Otherwise, the work described in the Contract including approved changes, if any, is certified to be substantially complete: (Description of the portion of work substantially completed):</p> <div style="text-align: center; font-size: 2em; opacity: 0.2; transform: rotate(-30deg); pointer-events: none;"> SAMPLE </div> <p style="text-align: center;">(USE CONTINUATION SHEETS IF NECESSARY)</p>		
<p>A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item does not alter the Contractor's responsibility to complete all of the contract work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by the Contractor within _____ days of substantial completion. The approved substantial completion date is: _____</p>		
Contractor Signature	Date	Engineer/Architect Approval
		Date
Printed Name and Title	Printed Name and Title	
<p>The Contractor shall be responsible for security, operation, safety, maintenance, HVAC, insurance and warranties in accordance with the Contract. The County will assume the responsibility for paying the cost of electrical power from midnight of the date of Engineer's approval as indicated above.</p>		
<p>ATTACH THE INSPECTOR'S FINAL WALKTHROUGH LIST OF DEFICIENCIES.</p>		

**FINAL RECONCILIATION, WARRANTY PERIOD DECLARATION
AND CONTRACTOR'S AFFIDAVIT**

Project Title:	Date Submitted:
Contractor Data: Name: Address: City/State/Zip:	Project No:
	Warranty (months):

This Final Reconciliation is for the work performed for Manatee County by the above named contractor, hereinafter called CONTRACTOR, pursuant to the contract dated _____ as amended, and acts as an addendum thereto.

It is agreed that all quantities and prices in the attached Final Pay Estimate No. _____ are correct and that the amount of \$ _____ including retainage is due to the CONTRACTOR, that no claims are outstanding as between the parties, and that the above stated sum represents the entirety of monies owed the CONTRACTOR.

It is further agreed that the warranty period for CONTRACTOR'S work pursuant to the Contract is from _____ to _____

As (title) _____ for CONTRACTOR, I have authority to bind said CONTRACTOR, and as such make this final reconciliation, declaration and affidavit for the purpose of inducing Manatee County to make final payment to CONTRACTOR for work done at/upon _____ under said contract:

CONTRACTOR has paid all social security and withholding taxes accrued in connection with the construction project.

CONTRACTOR has paid all workers' compensation and other insurance premiums incurred in connection with this construction project.

CONTRACTOR has paid for all required permits in connection with this construction project.

All laborers, material, men, suppliers, subcontractors and service professionals who worked for and/or supplied materials, equipment and/or services to the CONTRACTOR under this construction contract have been paid in full.

(Affiant Signature)

NOTARY:
State of Florida, County of _____, Sworn to (or affirmed) and subscribed before me this _____ day of _____, _____, by _____ (person giving notice).

Signature of Notary Public - State of Florida: _____
Print, Type or Stamp Commissioned Name of Notary Public:

Personally Known or Produced Identification
Type of Identification Produced _____

CONTRACT CHANGE ORDER

Change Order No.:

Contract Amount
(Present Value)

Project Number:

PROJECT:

NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
	SAMPLE		

BY EXECUTION OF THIS CHANGE ORDER THE CONTRACTOR AGREES THAT ALL CLAIMS FOR ADDITIONAL CONTRACT TIME AND FEES FOR THE ITEMS IN THIS CHANGE ORDER HAVE BEEN SATISFIED.

TOTAL DECREASE:

TOTAL INCREASE:

Contractor: _____
Address: _____
City / State: _____

Contractor Signature: _____ **Date:** _____

THE NET CHANGE OF
 ADJUSTS THE CURRENT CONTRACT AMOUNT FROM _____
 TO _____
 _____ CALENDAR DAYS ARE ADDED TO THE SCHEDULE
 WHICH CHANGES THE FINAL COMPLETION DATE TO
 MONTH DAY, YEAR

RECOMMENDATION, CONCURRENCES AND APPROVALS

SIGNATURES

DATE

Consultant / Engineer: _____

Project Manager: _____

Division Manager: _____

Project Management Division Manager

Manatee County Purchasing: _____

Purchasing Official

Authority to execute this contract per Manatee County Code, Chapter 2-26,
 and per the delegation by the County Administrator effective 1/26/2009

JUSTIFICATION FOR CHANGE

Change Order No :

Project Number:

1. NECESSITY FOR CHANGE:



2. Is change an alternate bid? (If yes, explain)

3. Does change substantially alter the physical size of the project? (If yes, explain)

4 Effect of this change on other "Prime" contractors?

5 Has the Surety and insurance company been notified, if applicable? CONTRACTOR RESPONSIBILITY