INVITATION FOR BIDS (IFB) #13-1274CD
PURCHASE OF JET AERATION EQUIPMENT FOR NITROGEN REMOVAL AND DIGESTER MODIFICATIONS AT SWWRF

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

INFORMATION CONFERENCE: **None. (All clarification requests are to be directed to contact person at bottom of this page).**

DEADLINE FOR CLARIFICATION: Wednesday, April 3, 2013

TIME AND DATE DUE: **Friday, April 12, 2013 at 3:00 PM**

CONTENTS OF THIS INVITATION FOR BIDS:

Important Note: **A prohibition of Lobbying has been enacted. Please review paragraph A.07 carefully to avoid violation and possible sanctions.**

FOR INFORMATION CONTACT:
CHRIS DALEY, CPPB- CONTRACT SPECIALIST
Phone (941) 749-3048 - Fax (941) 749-3034
chris.daley@mymanatee.org

AUTHORIZED FOR RELEASE:

INFORMATION TO BIDDERS

A.01 OPENING LOCATION

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

Any bids received after the stated time and date will not be considered. It shall be the sole responsibility of the bidder to have their bid delivered to the Manatee County Purchasing Division for receipt on or before the stated time and date. If a bid is sent by U.S. Mail, the bidder shall be responsible for its timely delivery to the Purchasing Division. Bids delayed by mail shall not be considered, shall not be opened at the public opening, and arrangements shall be made for their return at the respondent's request and expense.

A.02 SEALED & MARKED

One original and two copies of your **signed bid** shall be submitted in one **sealed** package, clearly marked on the outside "**Sealed Bid #13-1274CD- Purchase of Jet Aeration Equipment for Nitrogen Removal and Digester Modifications at SWWRF"** with your company name.

Address package to: Manatee County Purchasing Division
1112 Manatee Avenue West, Suite 803
Bradenton, Florida 34205

A.03 BID INFORMATION AND BID DOCUMENTS

Bids on http://www.mymanatee.org, Bid documents and the Notices of Source Selection related to those Bids are available for download in a portable document format (.PDF) file on the Manatee County web page on the Purchasing tab under "Bids." You may view and print these files using Adobe Acrobat software. You may download a free copy of this software (Adobe) from the Owner's web page if you do not have it.

Manatee County collaborates with the Manatee Chamber of Commerce on distributing solicitations using the RFP Tool web page on the Chambers website: http://www.Manateechamber.com to post Bid documents in a portable document format (.PDF) file. This step is in addition to the posting on Manatee County Government web pages.

Manatee County may also use an internet service provider to distribute Bids. A link to that service, http://www.DemandStar.com, is provided on this website under the Tab "DemandStar". Participation in the DemandStar system is not a requirement for doing business with Manatee County.

Note: The County posts the Notice of Source Selection seven (7) calendar days prior to the effective date of the award.

IT IS THE RESPONSIBILITY OF EACH VENDOR, PRIOR TO SUBMITTING THEIR BID, TO CONTACT THE MANATEE COUNTY PURCHASING OFFICE (see contact information on page one of this document) TO DETERMINE IF ADDENDA WERE ISSUED AND TO MAKE SUCH ADDENDA A PART OF THEIR BID .

A.04 MODIFICATION OF BID SPECIFICATIONS

If a bidder wishes to recommend changes to the bid specifications, the bidder shall furnish in writing, data and information necessary to aid the Owner in evaluating the request to modify the specifications. The Owner is not obligated to make any changes to the bid specifications. Unless an addendum is issued, the bid specifications shall remain unaltered. **Bidders must fully comply with the bid specifications, terms, and conditions.**

A.05 DEADLINE FOR CLARIFICATION REQUESTS

April 3, 2013 at 3:00 PM shall be the deadline to submit all inquiries, suggestions, or requests concerning interpretation, clarification or additional information pertaining to the Invitation for Bids to the Manatee County Purchasing Office.

This deadline has been established to maintain fair treatment for all potential bidders, while maintaining the expedited nature of the Economic Stimulus that the contracting of this work may achieve

A.06 CLARIFICATION & ADDENDA

Each bidder shall examine all Invitation for Bids documents and shall judge all matters relating to the adequacy and accuracy of such documents. Any inquiries, suggestions or requests concerning interpretation, clarification or additional information pertaining to the Invitation for Bids shall be made through the Manatee County Purchasing Office. The County shall not be responsible for oral interpretations given by any County employee, representative, or others. The issuance of a written addendum is the only official method whereby interpretation, clarification or additional information can be given.

If any addenda are issued to this Invitation for Bid, the County will Broadcast the addenda on the Demand Star distribution system to "Planholders" on this web service, and post the documents on the Purchasing Division's web page at http://www.mymanatee.org which can be accessed by clicking on the "Purchasing" button on the left side of the screen and then clicking on the "Bids and Proposals" button. It shall be the responsibility of each bidder, prior to submitting their bid, to contact Manatee County Purchasing (see contact on page 1) to determine if addenda were issued and to make such addenda a part of their bid.

A.07 LOBBYING

After the issuance of any Invitation for Bid, prospective Bidders, or any agent, representative or person acting at the request of such Bidder shall not contact, communicate with or discuss any matter relating in any way to the Invitation for Bid with any officer, agent or employee of Manatee County other than the Purchasing Official or as directed in the Invitation for Bid. This prohibition includes the act of carbon copying officers, agents or employees of Manatee County on email correspondence. This requirement begins with the issuance of an Invitation for Bid, and ends upon execution of the final Contract or when the invitation has been canceled. Violators of this prohibition shall be subject to sanctions as provided in the Manatee County Purchasing Code of Law Chapter 2-26.

A.08 UNBALANCED BIDDING PROHIBITED

Manatee 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 specifications and industry and market conditions, the bid will be presumed to be unbalanced. Examples of unbalanced bids will include:

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

2. 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.

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

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

A.09 WITHDRAWAL OF OFFERS

Vendors may withdraw offers as follows: a) Mistakes discovered before the opening of a solicitation may be withdrawn by written notice from the Bidder submitting the offer. This request must be received in the office designated for receipt of offers in the solicitation document prior to the time set for delivery and opening of the offers. A copy of the request shall be retained and the unopened offer returned to that vendor. b) After the responses to a solicitation are opened or a selection has been determined, but before a Contract is signed, a vendor alleging a material mistake of fact may be permitted to withdraw their offer if: (1) the mistake is clearly evident on the solicitation document; or (2) the Bidder submits evidence which clearly and convincingly demonstrates that a mistake was made. Request to withdraw an offer must be in writing and approved by the Purchasing Official.

A.10 IRREVOCABLE OFFER

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

A.11 BID EXPENSES

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

A.12 RESERVED RIGHTS

The County reserves the right to accept or reject any and/or all bids, to waive irregularities and technicalities and to request resubmission. Also, the 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 the County. Any sole response received by the first submission date may or may not be rejected by the County depending on available competition and current needs of the 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 attached specifications or otherwise required by the County, and who is fit and capable to perform the bid as made.

To be responsive, a bidder shall submit a bid which conforms in all material respects to the requirements set forth in the Invitation For Bid. To be a responsible bidder, the bidder shall have the capability in all respects to perform fully the Contract requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance. Also, the 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 the 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.13 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 any Manatee County procurement shall be in accordance with Manatee County Purchasing Ordinance as amended. Any actual or prospective bidder who is aggrieved in connection with the solicitation or award of a Contract may protest to the Board of County Commissioners of Manatee County as required in Manatee County Code of Laws.

A.14 COLLUSION

By offering a submission to this Invitation For Bid, the bidder certifies that he has not divulged, discussed or compared their bid with other bidder, and has not colluded with any other bidder or parties to this bid whatsoever. Also, bidder certifies, and in the case of a joint bid each party thereto certifies as to their own organization, that in connection with this bid:

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

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

A.14 COLLUSION (Continued)

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

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

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

A.15 CODE OF ETHICS

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

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

A.16 BID FORMS

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

A.17 LEGAL NAME

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

A.18 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES

A person or affiliate who has been placed on the State's convicted vendor list following a conviction for a public entity crime, as that term is defined in Florida Statute § 287.133, may not submit a bid, proposal, or reply on a Contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a Contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals or replies on leases of real property to a public entity; may not be awarded or perform work as a Contractor, supplier, subcontractor, or consultant under a Contract with

A.18 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES (Continued)

any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Florida Statute § 287.017 for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted list.

In addition, the Manatee County Code prohibits the award of any Contract to any person or entity who/which has, within the past 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 insure compliance with the foregoing, the Code requires all persons or entities desiring to Contract with the 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 the 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 are attached for this purpose.

A.19 DISCOUNTS

Any and all discounts must be incorporated in the prices contained in the bid; and not shown separately. The prices as shown on the bid form shall be the price used in determining award(s).

A.20 TAXES

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

A.21 DESCRIPTIVE INFORMATION

Unless otherwise specifically provided in the specifications, all equipment, materials and articles incorporated in the work covered by this Contract shall be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in the specifications, 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.22 AMERICAN DISABILITIES ACT

The Board of County Commissioners of Manatee County, Florida, does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of the 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 first page of this bid document at least twenty-four (24) hours in advance of either activity.

A.23 EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

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

A.24 MBE/WBE

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

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

A.25 MATHEMATICAL ERRORS

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

A.26 DISCLOSURE

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

Bids become subject to disclosure thirty (30) days after the opening or if a notice of intended Award decision is made earlier than this time as provided by Florida Statute 119.071(1)(b). No announcement or review of the offer shall be conducted at the public opening. If the County rejects all offers and concurrently notices its intent to reissue the solicitation, initial offers are exempt until the County provide notice of its intended decision, or thirty (30) days after the opening of the new offers.

Based on the above, Manatee County will receive bids at the date and time stated, and will make public at the opening the names of the business entities of all that submitted an offer and any amount presented as a total offer without any verification of the mathematics or the completeness of the offer. Upon the expiration of the statutory term for exemption the actual documents may be inspected or copied. When County staff have completed a mathematic validation and inspected the completeness of the offers, tabulation shall be posted on www.mymanatee.org.

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

END OF SECTION A

GENERAL TERMS AND CONDITIONS

B.01 CONTRACT FORMS

Any agreement, contract, or Purchase Order resulting from the acceptance of a bid shall be made by a purchase order and be bound by the terms and conditions herein.

B.02 AUTHORIZED PRODUCT REPRESENTATION

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

B.03 QUALITY GUARANTEE

If any product/service delivered does not meet performance representations or other quality assurance representations as published by manufacturers, producers or distributors of such products or the specifications listed in this bid, the vendor shall pick up the product from the County at no expense to the County. The County reserves the right to reject any or all materials if, in its judgment, the item reflects unsatisfactory workmanship or manufacturing or shipping damage. Also, the vendor shall refund to Manatee County any money which has been paid for same. The vendor will be responsible for attorney fees in the event the supplier defaults and court action is required.

B.04 ROYALTIES AND PATENTS

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

B.05 INDEMNIFICATION

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

B.06 REGULATIONS

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

B.07 MANUALS, SCHEMATICS, HANDBOOKS

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

END OF SECTION B

SPECIFIC TERMS & CONDITIONS

C.01 PURPOSE

It is the intent of the County of Manatee to purchase jet aeration equipment to be installed by others for nitrogen removal and digester modifications project at the Southwest Water Reclamation Facility located at 5101 65th Street West, Bradenton, Florida in accordance with the specifications detailed in this bid.

C.02 QUANTITIES

The quantity to be purchased is listed on the bid form.

C.03 DELIVERY TIME

Delivery by the vendor shall be made in two stages; (1) Stage One- Vendor shall deliver the jet aeration equipment for digesters #1 and #3 within ninety eight (98) days of receipt of a valid purchase order number from the County, (2) Stage Two- Vendor shall deliver the jet aeration equipment for digesters #2 and #4 no sooner than one hundred fifty two (152) days of receipt of a valid purchase order number from the County. The vendor shall coordinate with the Engineer on delivery of the equipment and components.

All deliveries shall be made between the hours of 8:00 A.M. and 3:00 P.M., Monday through Friday, excluding holidays, to the predesignated location agreed to by the County's representative. Large shipments, i.e., truckloads requiring material handling equipment, must be preceded by no less than 24 hours notice.

All services shall be completed during the times indicated in the specifications, or as otherwise agreed upon with the County's representative.

C.04 PRICES & TERM

Bidders shall bid unit prices, F.O.B. Destination, including all discounts in accordance with unit of quantity indicated on Bid Form. The prices bid shall be used for payment and shall be deemed to include payment in full for all transportation, labor, equipment, and lighting plans used in delivering all supplies and materials to the point of delivery.

C.05 PAYMENT

Within forty-five (45) days after delivery by the vendor, acceptance by the County, and presentation of an appropriate invoice, the County shall pay the total amount as indicated on the Bid Form for Jet Aeration Equipment.

Payment for certification of proper installation, system start-up, and system training on operation and maintenance will be made by the County within forty-five (45) days after services have been rendered, accepted, and presentation of an appropriate invoice.

C.06 CANCELLATION

It is mutually understood and agreed that any award made as a result of this bid may be canceled by the vendor upon 90 days written notice by Certified Mail to the County. However, the County is hereby authorized to purchase, in accordance with the prices bid, any quantity of materials and/or services during this 90 day interim provided the County requests delivery during this period.

The County reserves the right to terminate a contract by giving 30 days written notice of intention to terminate if at any time the vendor fails to abide by or fulfill any of the terms and conditions of the contract. The County also reserves the right to terminate this contract for the convenience of the County, with or without cause.

C.07 WARRANTY, MAINTENANCE SERVICE AND SUPPORT

If any product/service delivered does not meet performance representations or other quality assurance representations as published by manufacturers, producers or distributors of such products or the specifications listed in this bid, the vendor shall pick up the product from the County at no expense to the County. Also, the vendor shall refund to Manatee County any money which has been paid for same. The vendor will be responsible for attorney fees in the event the supplier defaults and court action is required.

C.08 INSURANCE

The vendor will not commence work under a contract until the vendor has obtained all insurance under this section, and such insurance coverage as might be required by the County. The vendor shall obtain, at his expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy):

a. Workers' Compensation/Employers' Liability

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

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

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

b. Commercial General Liability

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

Products/Completed Operations Aggregate	$1,000,000
Personal and Advertising Injury	$1,000,000
Each Occurrence	$1,000,000
Fire Damage (Any One Fire)	$ Nil

Medical Expense (Any One Person) $ Nil

C.08 INSURANCE (Continued)

c. Business Auto Policy

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

d. Owners Protective Liability Coverage

The minimum OPC Policy limits per occurrence and, if subject to an aggregate, annual aggregate to be provided by the bidder shall be the same as the amounts shown above as the minimum per occurrence and general policy aggregate limits respectively required for the Commercial General Liability coverage. The limits afforded by the OPC Policy and any excess policies shall apply only to the Owner and the Owner's officials, officers, agents and employees and only to claims arising out of or in connection with the work under this contract.

e. Certificates of Insurance and Copies of Policies

Certificates of Insurance in triplicate evidencing the insurance coverage specified in the above paragraphs shall be filed with the Purchasing Director before operations are begun. The required certificates of insurance shall name the types of policy, policy number, date of expiration, amount of coverage, companies affording coverage, and also shall refer specifically to the bid number, project title and location of project. Insurance shall remain in force at least one year after completion and acceptance of the project by the County, in the amounts and types as stated herein, including coverage for all products and services completed under this contract.

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

If the initial insurance expires prior to the completion of operations and/or services by the vendor, renewal certificates of insurance and required copies of policies shall be furnished by the vendor and delivered to the Purchasing Director thirty (30) days prior to the date of their expiration.

Nothing herein shall in any manner create any liability of the County in connection with any claim against the vendor for labor, services, or materials, or of subcontractors; and nothing herein shall limit the liability of the vendor or his sureties to the County or to any workers, suppliers, material men or employees.

C.09 MATERIAL SAFETY DATA SHEET

It shall be the responsibility of the awarded bidder(s) to submit, upon notification of award, a Material Safety Data Sheet (MSDS) for all toxic substances in accordance with Florida Statutes Chapter 442, The Right To Know Law, which mandates on-site MSDS for all toxic substances appearing in the work place.

END OF SECTION C

TECHNICAL SPECIFICATIONS

D.01 PROJECT DESCIPTION

The work described herein shall include the furnishing of all materials, labor, and equipment to supply and deliver four (4) complete jet aeration equipment packages, for installation by others, for the digester conversion at the Southwest Water Reclamation Facility (SWWRF), owned and operated by Manatee County, located at 5101 65th Street West, Bradenton, FL 34210 in accordance with the equipment specifications.

The equipment supplier's responsibilities include, but are not limited to: coordinating delivery of equipment with the County's engineer, installation assistance and inspection, function testing and written certification that the equipment has been installed per equipment manufacturer's recommendations, start-up and performance testing of equipment, and training of Owner personnel on operations and maintenance of the jet aeration equipment.

The equipment supplier shall make separate trips to the project site to complete any of the installation, certification, and training services required by the specifications. The prices bid for these services shall be deemed to include payment in full for all transportation, labor, equipment, and lodging used in delivering equipment supplier's representatives to the project site.

D.02 ENGINEER

The County of Manatee, Public Works Department, is responsible as the OWNER **and CH2MHill** hereinafter referred to as "ENGINEER," designed this project and is responsible for technical/engineering reviews and decisions. The ENGINEER is a member of the OWNER'S project management team which is collectively responsible in ensuring the Work is completed in accordance with the Contract Documents.

All communication involving this project after award will be addressed to Anthony Benitez, P.E., Project Engineer II, Public Works Department. **All invoicing** will be addressed to the attention of Anthony Benitez, P.E. (address noted below) with **invoice copies** sent to Ryan Messer, CH2MHill (address noted below).

Manatee County Public Works Dept.
IFB# 13-1274CD
Attention: Anthony Benitez, PE
Project Engineer II
1022 26th Avenue East
Bradenton, Florida 34208
Phone (941) 708-7450 ext. 7333

CH2MHill
IFB# 13-1274CD
Attn: Thomas V. Waldeck
Project Manager
4350 West Cypress Street
Tampa, Florida 33607
Phone (813) 281-7745

Where the terms ENGINEER and/or OWNER are used in the Contract Documents, it shall mean the OWNER'S project management team.

D.03 WARRANTY AND GUARANTEE

The successful bidder shall furnish a manufacturer's warranty on all equipment furnished hereunder against defect in material and/or workmanship for a minimum period of three (3) years following the date of acceptance by the Owner for full time operation.

D.04 SUBMITAL REQUIREMENTS

Each bidder will be required to submit the following items with their bid in order for their bid to be considered responsive:

1. Complete equipment supplier's specifications, including material description.
2. Preliminary shop drawings for all equipment being provided under this contract to include: layouts, sizing, piping, mechanical and electrical connections, process and instrument diagrams, component list, electrical requirements, catalog data on all components and dimensional data.
3. Structural loading diagram showing all loads and application points for structural design to be completed.

END OF SECTION D

BASIS OF AWARD

E.01 BASIS OF AWARD

Award will be made to the responsive, responsible bidder meeting specifications and having the lowest total bid price for the requirements listed on the bid form as set forth in this Invitation for Bids.

Whenever two or more bids which are equal with respect to price, quality and service are received, a bid received from a local business shall be given preference in award. Whenever two or more bids which are equal with respect to price, quality and service are received, and both bids or neither of these bids are received from a local business, the award shall be determined by a chance drawing conducted by the purchasing office and open to the public.

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

END OF SECTION E

SECTION F

MANATEE COUNTY LOCAL PREFERENCE LAW AND VENDOR REGISTRATION

F.01 Vendor Registration

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

Enclosed is a copy of the current Manatee County law that details the County's Local Preference and definition of a Local Business.

If you assert that your firm meets the stated definition of a Local Business, we ask that in addition to registering on the County's Web page, you fill out the attached "**Affidavit As To Local Business Form"** that is included in this section of the bid, have the completed document notarized, and mail the original to the following address: Manatee County Administration Center, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205.

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

You will note that Manatee County collaborates with the Manatee Chamber of Commerce, posting bids on www.manateechamber.com as well as using the same vendor categories for registration.

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

Quick steps to on line registration: **www.mymanatee.org**

A link to "Purchasing" is listed under the "Quick Links" on page one of this County Web Site.

On the left hand side of the Purchasing Web page, click on "Vendor Registration."

This will bring up the Vendor Registration form for on-line input. Please note that the definition of a "Local Business" changed on March 17, 2009. The Web page will be updated to include the current Law which has been provided in this section of the bid.

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

MANATEE COUNTY LOCAL PREFERENCE LAW AND VENDOR REGISTRATION

F.02 Section 2-26-6. Local preference, tie bids, **local business defined.**

(a) Whenever a responsible local business bidder and a responsible non-local business bidder are found, upon the opening of bids, to have both submitted the lowest responsive bid, the bid of the local bidder shall be awarded the contract. Should more than one responsible local business bidder match the responsible non-local business bidder's lowest responsive bid, or should no responsible local business bidder match the lowest responsive bid but two or more responsible non-local business bidders submit lowest responsive bids for equal amounts, then the award of the contract shall be determined by a chance drawing, coin toss, or similar tie-breaking method conducted by the purchasing office and open to the public. Any bidders seeking to be recognized as local businesses for purposes of this local business preference provision may be required by the terms of the bid announcement to certify they meet the definition of local business set forth in this section, and to register as a local business with the county in the manner prescribed by the county to facilitate the county's ability to track the award of contracts to local businesses and to allow the county to provide future notifications to its local businesses concerning other bidding opportunities.

(b) Nothing herein shall be deemed to prohibit the inclusion of requirements with respect to operating and maintaining a local place of business in any invitation for bids when the bidder's location materially affects the provisions of the services or supplies that are required by the invitation.

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

(d) **Each solicitation for bids made by the county shall contain terms expressly describing the local business preference policies of the county, and shall provide that by electing to submit a bid pursuant to a request for bids, all bidders are deemed to understand and agree to those policies**.

(e) For all contracts for architecture, professional engineering, or other professional services governed by Florida Statute § 287.055, the Consultants' Competitive Negotiation Act, the county shall include the local business status of a firm among the factors considered when selecting which firms are "most highly qualified." In determining which firm is the "most qualified" for purposes of negotiating a satisfactory contract, preference shall be given to a local business where all other relevant factors are equal.

(f) Local preference shall not apply to the following categories of contracts:

1. Goods or services provided under a cooperative purchasing agreement or similar "piggyback" contract;

2. Contracts for professional services subject to Florida Statute § 287.055, the Consultants' Competitive Negotiation Act, except as provided for in subsection (e) above;

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

4. Purchases or contracts made pursuant to a non-competitive award process, unless otherwise provided by this section;

F.02 Section 2-26-6. Local preference, tie bids, **local business defined.** (Continued)

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

(g) To qualify for local preference under this section, **a local business must certify to the County that it:**

1. Has not within the five years prior to the bid announcement admitted guilt or been found guilty by any court or state or federal regulatory enforcement agency of violation of any criminal law, or a law or administrative regulation regarding fraud;

2. Is not currently subject to an unresolved citation or notice of violation of any Manatee County Code provision, except citations or notices which are the subject of a current legal appeal, as of the date of the bid announcement;

3. Is not delinquent in the payment of any fines, liens, assessments, fees or taxes to any governmental unit or taxing authority within Manatee County, except any such sums which are the subject of a current legal appeal.

Ref: Ordinance 09-21 and 09-23 **PASSED AND DULY ADOPTED** in open session, with a quorum present and voting, on the 17th day of March, 2009.

MANATEE COUNTY GOVERNMENT
AFFIDAVIT AS TO LOCAL BUSINESS
(Complete and Initial Items B-F)

A. Authorized Representative

I, [name] _____, am the [title] _____and the duly authorized representative of: [name of business] _____, and that I possess direct personal knowledge to make informed responses to these certifications and the legal authority to make this Affidavit on behalf of myself and the business for which I am acting; and by electing to submit a bid pursuant to this Invitation for Bids, shall be deemed to understand and agree to the local business preference policies of Manatee County; and that I have the direct knowledge to state that this firm complies with all of the following conditions to be considered to be a Local Business as required by the Manatee County Code of Law, Section 2-26-6.

B. Place of Business: I certify that the above business is legally authorized to engage in the sale of goods and/or services and has a physical place of business in Manatee, DeSoto, Hardee, Hillsborough, Pinellas or Sarasota County with at least one (1) fulltime employee at that location. The physical address of the location which meets the above criteria is:_____ [Initial]_____

Business Phone Number: _____

Email Address:_____

C. Business History: I certify that business operations began at the above physical address with at least one fulltime employee on [date] _____ [Initial]_____

D. Criminal Violations: I certify that within the past five years of the date of this Bid announcement, this business has not admitted guilt nor been found guilty by any court or local, state or federal regulatory enforcement agency of violation of any criminal law or administrative regulation regarding fraud. [Initial]_____

E. Citations or Code Violations: I certify that this business is not currently subject to any unresolved citation or notice of violation of any Manatee County Code provision, with the exception of citations or notices which are the subject of a legal current appeal within the date of this bid announcement. [Initial]_____

F. Fees and Taxes: I certify that this business is not delinquent in the payment of fines, liens, assessments, fees or taxes to any governmental unit or taxing authority within Manatee County, with the exception of those which are the subject of a current legal appeal. [Initial]_____

Each of the above certifications is required to meet the qualification of "Local Business" under Manatee County Code of Law, 2-26-6.

Signature of Affiant_____

STATE OF FLORIDA
COUNTY OF_____

Sworn to (or affirmed) and subscribed before me this _____ day of _____, 20_____, by (name of person making statement).

(Notary Seal) Signature of Notary:_____

Name of Notary: (Typed or Printed)_____

Personally Known ____ OR Produced Identification ____ Type of Identification Produced _____

Submit executed copy to Manatee County Purchasing - Suite 803 - 1112 Manatee Avenue West - Bradenton, FL 34205

BID FORM
(Submit in Triplicate)

TO: Manatee County Purchasing
1112 Manatee Avenue West
Bradenton, Florida 34205

RE: "Sealed Bid # 13-1274CD – Purchase of Jet Aeration Equipment for Nitrogen Removal and Digester Modifications at SWWRF"

DESCRIPTION	ESTIMATED QUANITY	UNIT OF MEASURE	UNIT PRICE	EXTENDED PRICE
Jet Aeration Equipment Packages delivered to the SWWRF	4	Each	$_____	$_____
Installation Assistance and Inspection	1	Lump Sum	$_____	$_____
Function Testing and Manufacturer's Certificate of Proper Installation	4	Each	$_____	$_____
On-Site Classroom Training	1	Lump Sum	$_____	$_____
Start-up and Performance Testing	1	Lump Sum	$_____	$_____
TOTAL BID OFFER				$_____

We, the undersigned, hereby declare that we have carefully reviewed the bid documents, and with full knowledge and understanding of the requirements herewith submit this bid, meeting each and every specification, term and condition contained in this Invitation for Bids.

We understand that the bid specifications, terms and conditions in their entirety shall be made a part of any agreement or contract between Manatee County and the successful bidder. Failure to comply shall result in contract default, whereupon, the defaulting vendor shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by the County.

COMPANY NAME: _____

AUTHORIZED SIGNATURE: _____

_____ DATE:_____
(Print Name & Title of Signer)

COMPANY ADDRESS: _____

_____

TEL. NO.: _____ FAX NO.:_____ FEIN NO.:_____

Acknowledge Addendum No. ____ Dated: _____

PRE-PURCHASE DOCUMENTS

FOR THE JET AERATION EQUIPMENT

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS

PREPARED FOR:

MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

VOLUME 1 OF 1
SPECIFICATIONS & DRAWINGS

For Information regarding this project contact:

THOMAS WALDECK, P.E.
4350 West Cypress Street
Suite #600
Tampa, FL 33607-4178
+1 (813) 874-6522 x57745

CH2MHILL

CH2M HILL
Project No. 457133
ISSUE FOR BID
MARCH 2013

MANATEE COUNTY UTILITIES

MANATEE COUNTY, FL

BIDDING REQUIREMENTS
AND
CONTRACT DOCUMENTS

for the construction of the

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS

Contract No. _____

****

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CH2M HILL
Tampa, FL
March 2013

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Project No. 457133

Copy No._____

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DIVISION 44—POLLUTION CONTROL EQUIPMENT

DRAWINGS

END OF SECTION

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TECHNICAL SPECIFICATIONS

SECTION 01 00 01
GENERAL REQUIREMENTS
FOR JET AERATION EQUIPMENT

PART 1 SUBMITTAL MATERIAL

1.01 GENERAL

A. In order to determine if the bidder is responsible and responsive, the following information, plus any additional information called for in the Specifications and the Invitation for Bids, shall be included with the Bid at the time of the Bid opening:

1. Complete Equipment Supplier's specifications, including material description.
2. Preliminary Shop Drawings for design purposes for all equipment being provided under this contract including layouts; sizing; piping, mechanical and electrical connections; process and instrumentation diagrams; component list; electrical requirements; catalog data on all components; and dimensional data.
3. Structural loading diagram showing all loads and application points for structural design to be completed.

B. The following additional information shall be submitted to the Engineer no later than 10 working days after Award of Purchase Order.

1. Description of Equipment Supplier's standard prime and finish coating for any equipment and tanks requiring special coatings.
2. Recommended spare parts including cost and contact information.
3. List of special tools furnished with the equipment.
4. List of materials and supplies furnished with the equipment.
5. Approximate shipping weight of the equipment and, if shipped unassembled, the number of components and approximate weight of each.
6. Shipping method.

C. Time is of the essence. Equipment Supplier shall allow in his schedule for an in-process review for submittals. Equipment Supplier shall provide Engineer with 10-day advance notice of submittal review.

D. Equipment Supplier shall provide a warranty for all components supplied for a period of 3 years following the date of acceptance by Owner for full time operation. The Warranty shall cover repair and replacement of parts due to defective materials of workmanship at no cost to the Owner.

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1.02 GENERAL PROJECT CRITERIA

A. See Supplement-6, General Project Criteria, attached.

1.03 SHOP DRAWINGS

A. The Equipment Supplier shall submit Shop Drawings required by Engineer to complete Engineer's design as outlined in all of the sections and Specifications included with these Specifications.

B. The equipment provided here is on a critical path and special submittal procedures will be required for fast delivery. The Engineer will meet with the Equipment Manufacturer to review preliminary key submittals and will provide conditional approval to begin fabrication.

C. The Equipment Supplier shall submit such Shop Drawings and/or catalog cuts required for the fabrication and installation of the equipment. These Drawings shall be accurate in every detail, and shall contain all information necessary to relate the equipment to the Specifications.

D. Where the installation of the equipment requires coordination with work performed by others, such as installation of required embedded items furnished either by the Equipment Supplier or by others, such coordination shall be clearly identified and indicated on the Shop Drawings.

E. Each Shop Drawing and/or catalog cut shall have been thoroughly checked by the Equipment Supplier for compliance with the Specifications. The Equipment Supplier shall submit at least six sets of Shop Drawings to the Engineer. Two sets will be returned to the Equipment Supplier after review by the Engineer.

F. Engineer's review and approval of Shop Drawings shall not relieve the Equipment Supplier from the responsibility for any variation from the requirements of the Contract Documents unless Equipment Supplier in writing has called Engineer's attention to each such variation at the time of each submittal, and the Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawings or sample approval.

G. Should the Equipment Supplier propose any item on his Shop Drawings, or incorporate an item into the work, and that item should subsequently prove to be defective or otherwise unsatisfactory, regardless of the Engineer's review, the Equipment Supplier shall, at his own expense, replace the item with another item that will perform satisfactorily.

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H. Engineer's review and approval of the submittals and Shop Drawings is expressly limited as provided in the Contract Documents and is only to determine conformance with the Contract Documents and compatibility with the design concept for the completed project as a functioning whole as indicated in the Contract Documents. The Equipment Supplier is, and Engineer/Owner is NOT, responsible for matters relating to fabrication, shipping, and handling. The Construction Contractor, herein referred to as "Contractor" is, and the Engineer/Owner is NOT, responsible for matters relating to overseeing storage, assembly, and installation at the Site; and for coordinating the Work.

I. Furnish six copies of all Submittals. Provide clear, legible, and reproducible copies. Preferred minimum size shall be 8-1/2-inch by 11-inch and 11-inch by 17-inch suitable for photocopying. Larger than 11 inch by 17 inch shall be 22-inch by 34-inch preferred.

J. Text and photos shall all be placed on clearly marked CD-ROMs in a current version of Adobe PDF file system. Shop Drawings, where possible, shall also be provided on clearly marked CD-ROMs in Microstation V8.1 (V8 and V7 are also acceptable).

K. All submittals shall be written in the English language. English translations shall be grammatically correct and readily comprehended by the intended target audience, which can vary from the plant's maintenance mechanics to engineers, depending on the submittal.

1.04 ELECTRICAL SHOP DRAWINGS AND INFORMATION

A. Provide wiring and control diagrams of systems and equipment, including control panels. All controls shall meet the requirements of Section 40 99 90, Package Control Systems.

B. Provide list of special motor features being furnished (i.e., space heaters, altitude corrections, and thermal protectors).

C. Indicate complete motor rating for all motors, including motor no-load, starting, and full-load current at rated voltage; full-load speed and full-load current at 100 percent voltage; motor efficiency and power factor at 1/2, 3/4, and full load at rated voltage.

D. All motors shall meet the requirements of Section 26 20 00, Low-Voltage AC Induction Motors.

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1.05 OPERATION AND MAINTENANCE (O & M) MANUALS

A. Furnish ten copies of a complete instruction manual for installation, operation, maintenance, and lubrication requirements for each component of mechanical and electrical equipment. Each instruction manual furnished shall be fixed in hard-back cover not exceeding 4 inches in thickness which is clearly labeled to designate the equipment for which it is intended with reference to the building and equipment number, and the Specification section where the item is specified. Operation and Maintenance Manuals shall be written in the English language. English translations shall be grammatically correct and readily comprehended by the intended target audience, which can vary from the plant's maintenance mechanics to engineers. Furnish two additional copies of the complete document in electronic format as described in paragraph 1.05E below.

B. Two copies of draft manuals shall be furnished for review at least 30 calendar days prior to the scheduled delivery of equipment. Any deficiencies found by the Engineer to exist in the manuals submitted shall be corrected by the Equipment Supplier within 20 calendar days following notification by the Engineer of the deficiencies.

C. The manual shall be completely indexed and contain detailed Table of Contents for each volume. The manual shall be organized into 2 major sections.

1. Section I shall contain information related to the overall system performance. This shall as a minimum include the following type of information:
   a. System Descriptions.
   b. Engineering Lists.
   c. Parametric Graphs.
   d. Initial system startup procedures.
   e. System operating procedures.
   f. Normal Shutdown procedures.
   g. Emergency Shutdown procedures.
   h. Specific system performance data and curves.
   i. Piping and Instrumentation Diagrams.
   j. Electrical One-Line Diagrams.
   k. Mass balance diagrams.
   l. Detailed description of overall system process control and control loops.
   m. Alarm List and operator responses to alarms.

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2. Section II shall contain all information related to the specific equipment and components comprising the system. This shall as a minimum include the following type of information:
   a. A detailed equipment description.
   b. Design Criteria for various components.
   c. Installation instruction and startup procedures.
   d. Performance curves.
   e. Equipment assembly/disassembly drawings.
   f. Maintenance instructions.
   g. Required lubricants and lubrication schedule.
   h. Manufacturer drawings.
   i. Nameplate information and shop order numbers.
   j. Equipment parts list.
   k. List of special maintenance tools required.
   l. Instrument data sheet.
   m. Pump performance curves showing maximum and minimum flow rates at which the pump can be continuously operated without damage.
   n. Fan, compressor, and blower performance curves.
   o. A listing of each components model number, manufacturer's serial number, and design operating conditions.
   p. Instructions for internal access and routine inspections.
   q. Instructions for routine external inspections.
   r. Instructions for daily inspections and observations of operating equipment.
   s. Instructions for cleaning components
   t. Instructions for testing of components.
   u. Inspection and maintenance requirements during a brief outage.
   v. Inspection and maintenance requirements during a long-term shutdown.
   w. Trouble shooting instructions to diagnose operational problems.
   x. Safety procedures.
   y. Manufacturer's literature and assembly drawings for the sub-components. These are items that the Seller purchases from others such as valves, actuators, couplings, motors, dampers, transformers, instruments, switches, junction boxes, valve position transmitters, limit switches, etc. The literature should include technical specifications, technical bulletins, maintenance instructions, installation instructions, schematics, and diagrams.

D. The manual shall be complete in all respects for all equipment, controls, accessories, and associated appurtenances.

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E. Furnish the final, complete O&M Manual in electronic format on a CD-ROM. Use the latest version of Microsoft Word, Excel, and Adobe PDF formats. The Owner shall have the ability to modify the Adobe PDF format files.

1. Text, photos, and Drawings shall all be placed on clearly marked CD-ROMs in a current version of Adobe PDF file System. A single Adobe PDF file may be used if the total number of pages in the manual does not exceed 50. For manuals with more than 50 pages (text and graphics), each subsection should be a separate Adobe PDF file.
2. The electronic form of the manual shall be provided with a linked Table of Contents, which will serve as the primary navigational aid for the user, from inside an Internet browser.
3. Each Adobe PDF file shall have at least five keywords assigned to it, based on its individual subject material. If an entire manual (less than 50 pages) is contained in one Adobe PDF file, then sufficient keywords should be used to ensure that "searching" for a particular subsection will be successful. (Example: if "calibration" is a subsection, then the word calibrate and/or calibration should be added to the keyword list.) If each subsection is a separate Adobe PDF file, then keywords should be designed to lead the user to all commonly used terms of the text.
4. Cataloging or indexing should not be done. All manuals will be indexed when aggregated in the complete plant O&M Manual.
5. Each Adobe PDF file should be configured in the same way so that users are presented with a standard interface for all manuals, regardless of Equipment Supplier. To accomplish this, follow this procedure for each Adobe PDF file provided:
   a. From the main menu, select File, then open the subject Adobe PDF file.
   b. With the file open, select File, Document Properties, Summary (current version of Adobe Acrobat). Enter the Title, Subject, Author, and Keywords for this file. Make these consistent and descriptive of subject document. Binding should be Left Edge.
   c. Select File, Document Properties, Open Options:
      1) Initial View: Page only.
      2) Page Number: One.
      3) Magnification: Fit Width.
      4) Page Layout: Single page.
      5) Window Options: Resize window to initial page, center window on screen.
      6) User Interface Options: None.

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1.06 MAINTENANCE SUMMARY FORMS

A. In addition to the O & M manuals, furnish Maintenance Summary Forms in the format of the form bound at the end of this Section and described below. The timing of submission of these forms shall be the same as prescribed above for the Operation and Maintenance Manuals.

B. An individual Maintenance Summary Form for each equipment item shall be compiled following the outline furnished and six copies shall be submitted for review by the Engineer. The Equipment Supplier's standard form will not be acceptable as a substitute for the Maintenance Summary Form.

C. The term "Maintenance Operation" as used in the Maintenance Summary Form bound at the end of this section is understood to mean any routine operation required to ensure the satisfactory performance and longevity of the equipment. Examples of some typical Maintenance Operations are lubrication, belt tensioning, adjustment of pump packing glands, routine adjustments, etc.

D. The Maintenance Summary Form may take as many pages as required. However, the order and format shown must be adhered to. Only 8-1/2-inch by 11-inch paper will be accepted.

1.07 BILL OF MATERIALS

A. For each Site prepare a detailed Bill of Materials list to assist field personnel in equipment receipt and storage and to provide a detailed record of all components provided by the Equipment Supplier.

B. The Bill of Materials shall be reviewed and updated on a monthly basis and ten copies shall be submitted upon each revision.

C. Each Item Listed in the Bill of Materials shall be Described as Follows:

1. Component Name.
2. Equipment/Owner's Tag Name.
3. Equipment/Supplier's Tag Name.
4. Equipment/Owner's Purchase Order Number.
5. Quantity.
6. Manufacturer and Model Number.
7. Special Receiving, Handling, and Storage Instructions.

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1.08 SPARE PARTS LISTS

A. For each Site provide a recommended spare part and price list 6 months prior to initial startup for all equipment and components furnished under this Contract.

B. The Spare Parts List shall Contain the Following Information:

1. Component Name.
2. Equipment/Owner's Tag Name.
3. Equipment/Supplier's Tag Name.
4. Recommended Number of Spares.
5. Design/Operating Parameters.
6. Materials of Construction.
7. Manufacturer and Model Number.
8. Part Number.
9. Current lead time.
10. Weight.
11. Special Receiving, Handling, and Storage Instructions.
12. Current Price.

C. Separate lists shall be provided for startup spare parts and recommended for operation.

1.09 LUBRICATION MANUAL

A. Furnish five bound copies of a lubrication manual and provide the Owner with one electronic copy. Two draft copies shall be submitted for review approximately 6 months prior to initial startup. After acceptance, the remaining copies shall be submitted within 2 months.

B. All equipment requiring lubrication shall be identified with the following:

1. Component Name.
2. Amount of Lubricant Required.
3. Listing of Lubricant Points.
4. Diagrams or sketches showing Lubrication Points.
5. Recommended Lubrication Schedule.
6. Three acceptable types of oil by Manufacturer, one of which shall be Mobil Oil.
7. Three acceptable types of grease by Manufacturer, one of which shall be Mobil Oil.

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1.10 CERTIFICATES OF COMPLIANCE WITH SPECIFIED STANDARDS AND CODES

A. A Certificate of Compliance shall be furnished for materials specified to a recognized standard or code prior to the use of any such materials in the work. The Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Specifications. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the certificate.

B. All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Subcontract Documents and any such material not conforming to such requirements will be subject to rejection whether in place or not.

C. The Engineer reserves the right to refuse permission for use of material on the basis of a Certificate of Compliance.

D. The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

1.11 ERECTION MANUALS

A. For each Site furnish ten bound copies of the Erection Manual. Also, for each Site furnish two electronic copies on a CD-ROM of this information for the individual pieces of equipment being supplied under this Contract. Two draft copies shall be submitted for approval 4 weeks prior to equipment shipment. After acceptance, the remaining copies shall be submitted within 2 weeks.

B. Each volume shall be assembled and bound in a hard cover binder not exceeding 4 inches in thickness.

C. The manual shall be completely indexed and contain a detailed Table of Contents. The manual shall include the following type of information:

1. A detailed equipment description.
2. Installation instructions.
3. Equipment assembly and disassembly drawings.
4. Equipment and component erection drawings, including the weight of each individual item.

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5. Maintenance instructions, including any maintenance required during storage or prior to startup.
6. Required lubricant and lubrication schedule, including requirements for lubrication during storage and prior to startup.
7. Listing or bill of material of all supplied components.
8. Nameplate information and shop order numbers.
9. Equipment parts lists and spare parts lists.
10. List of special erection and maintenance tools required.
11. A list of each components model number, manufacturer's serial number, and design operating conditions.
12. A detailed description of erection tolerances, minimum alignment dimensions, and any other such constraints the Contractor installing the equipment shall adhere to without affecting any material warranties. The erection tolerances shall be reasonable when compared to the tolerances governing the fabrication of the equipment.
13. A detailed description of rigging, unloading, over ground transportation and setting of equipment and components.
14. Equipment setting tolerances and torque requirements.

PART 2 EQUIPMENT SUPPLIER'S SERVICES DURING CONSTRUCTION

2.01 GENERAL

A. Competent and experienced technical representatives shall represent the suppliers of all equipment and systems as may be necessary to resolve assembly or installation problems at the worksite which are attributable to, or associated with, the equipment furnished. Equipment Supplier's services onsite shall be limited to supervisory, inspection, or advisory functions. All trades work shall be performed by Contractor.

2.02 EQUIPMENT SUPPLIER'S CERTIFICATION

A. An Equipment Supplier's representative shall certify in writing that the system has been installed in accordance with the Equipment Supplier's recommendation and has been inspected by Equipment Supplier's authorized representative, that it has been serviced with the proper initial lubricants, that applicable safety equipment has been properly installed, and that the proper electrical and mechanical connections have been made.

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2.03 FUNCTIONAL TESTING

A. The Equipment Supplier's representative shall assist with the initial test, which shall include, but not be limited to, checking for proper rotation, alignment, speed, excessive vibration, and noisy operation. Initial equipment and system adjustment and calibrations shall be performed by others in the presence of, and with the assistance of, the Equipment Supplier's representative. The above-mentioned Equipment Supplier's certification shall include the statement that proper adjustments have been made and that the equipment or system is ready for plant startup and operation.

2.04 SERVICES DURING PERFORMANCE TESTING AND PLANT STARTUP

A. Provide startup services or when technical assistance is necessary due to any malfunction of the system furnished, the Equipment Supplier's representative shall furnish such services. The Equipment Supplier's representative shall also conduct and/or assist with final performance and demonstration testing, as required by the Specifications. These services shall continue until such times as the applicable system has been successfully performance tested and has been accepted by the Owner for full-time operation.

2.05 TRAINING OF OWNER'S PERSONNEL

A. Equipment Supplier to Schedule and Organize Training:

1. The Equipment Supplier shall notify the Owner 30 working days ahead of the intended workshop/training. Training will occur approximately 1 month prior to initial startup of the overall treatment system. The workshop/training shall be conducted during working hours to cover shift operation. The Equipment Supplier shall provide training of the Owner on a schedule approved by Owner to accommodate the Owner's operating staff. Equipment Supplier's representative(s) who are fully knowledgeable and conversant with the equipment shall conduct the training. The training sessions are intended to complement and cover instructions that are found in the Operations and Maintenance Manual. The Equipment Supplier may include the use of videos or other training aids and, at the end of the training session, shall provide a copy of all training material including the training video to the Owner.
2. The Owner may also videotape the training session and the Equipment Supplier should be made aware of this requirement.
3. Training shall consist of audio/visual classroom displays and a physical walkdown of the equipment/components.

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B. Training on the Operation and Maintenance of Equipment:

1. The Equipment Supplier shall train Owner's operations staff on the proper operation and maintenance of the equipment or system.
2. The training shall be conducted by qualified, experienced (2 years minimum), factory-trained representatives of the various equipment suppliers at the Site of the equipment. Training shall include instructions on the proper operation of the equipment, including instrumentation and controls, and normal preventive maintenance and repairs.
3. Training material shall be submitted 3 weeks prior to the delivery of the training and shall include the following:
    a. Lesson(s) planned for each training session to be conducted by the Equipment Supplier's representatives, including training manuals, handouts, visual aids, and other reference materials.
    b. An outline of the material to be presented along with a description of visual aids to be utilized during the session. Each lesson will contain a time allocation for each subject.
    c. One complete set of the original materials for the training manuals, handouts, visual aids and reference material, bound as specified in the Contract. Owner shall be allowed to make additional copies of all training materials and O&M materials as needed.
    d. Fifteen copies of training manuals, handouts, visual aids and reference materials prior to each training session.
    e. Date, time, and subject of each training session and identity and qualifications of individuals conducting the training.
4. Each training session shall include time spent in the classroom and at the equipment or system location. As a minimum, a training session shall cover the following topics for each equipment item or system:
    a. System/Component Descriptions.
    b. Safety.
    c. Instrumentation and Controls.
    d. Initial startup.
    e. Normal Operation (equipment/system startup, shutdown, and normal operation).
    f. Troubleshooting.
    g. Preventive maintenance.
    h. Corrective maintenance.
    i. Testing procedures.
    j. Emergency Procedures.
    k. Parts.
    l. Local representatives.
    m. Equipment Operation Manuals.
    n. Equipment Maintenance Manuals.

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5. As a minimum, Classroom Equipment Training shall Include:
   a. A discussion of the equipment-specific location in the facility and an operational overview. Use slides and Drawings as necessary.
   b. Description, purpose, and function of the equipment.
   c. A working knowledge of the operating theory of the equipment.
   d. Startup, shutdown, normal operation and emergency operating procedures including a discussion on system integration and electrical interlocks, if any.
   e. Safety items and procedures.
   f. Routine preventive maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
   g. Operator detection, without test instruments, of specific equipment trouble symptoms.
   h. Equipment inspection and trouble shooting procedures including the use of applicable test instruments and the "pass" and "fail" test instrument readings.
   i. Routine and long term calibration procedures.
   j. Required equipment exercise procedures and intervals.
   k. Routine disassembly and assembly of equipment, if applicable, for inspection of equipment.
   l. Normal maintenance such as belt, seal, and bearing replacement and major repair procedures such as replacement of major equipment part(s) with the use of special tools, welding jigs, etc.
   m. Safety procedures.
6. As a minimum, hands-on equipment training shall include the following (Review and use Equipment Supplier's manual in the hands-on training.):
   a. Location of equipment and review the purpose, equipment function, and theory of operation.
   b. Piping and flow options.
   c. Valves and their purpose.
   d. Instrumentation as Follows:
      1) Location of primary element.
      2) Location of instrument readout.
      3) Purpose, basic operation, and information interpretation.
   e. Owner's approved maintenance and repair work practices, including mechanical and electrical adjustments and calibration and trouble shooting equipment problems.
7. Demonstrate and perform standard operating procedures and routine checks including:
   a. Preventive maintenance activities.
   b. Startup and shutdown procedures.
   c. Equipment exercise procedures.
   d. Routine disassembly and assembly of equipment if applicable.
   e. Safety items and procedures, if feasible.

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8. Training Schedule: Concurrent classes will not be permitted under any circumstances.

C. Training Material:

1. The training program material shall be prepared in bound booklets. For each Site furnish fifty bound copies of the training program and provide one electronic copy. Two draft copies and a detailed description of the program shall be submitted for acceptance approximately 6 months prior to initial startup. After acceptance, the remaining copies shall be provided during the training sessions.
2. The training program, materials, and equipment shall become the property of the Owner.
3. Proposed cost for the Equipment Supplier's training program shall be based upon providing training to two groups of persons at each plant site. Each group shall be trained for a minimum of 2 days. Only one group will participate in the training session on a given day.

PART 3 SCHEDULE REQUIREMENTS

3.01 GENERAL

A. The Equipment Supplier shall prepare for the Engineer's review and approval a Critical Path Method (CPM) network schedule demonstrating his plan for fulfilling all Contract requirements for equipment procurement and coordinating with the Contractor. The schedule for each shall be submitted to the Engineer for approval within 10 working days of the Award of Contract.

B. Information in this schedule shall be comprehensive and shall represent all activities including submittals and procurement necessary to complete this Contract. Typical minimum detail on the schedule shall include, but not be limited to, the following:

1. Date Equipment Supplier meets with Engineer to complete design assistance for tendering.
2. Delivery date of Drawings and tender package (draft and final) for inclusion in General Contract.
3. Delivery date of general Shop Drawings to Engineer.
4. Delivery date of final Shop Drawings to Engineer.
5. Date Equipment Supplier places purchase orders with major subcontractors and suppliers.
6. Date of start of assembly of specified equipment.
7. Date of finish of assembly of specified equipment.
8. Date of shipment from Equipment Supplier.
9. Date of arrival on the jobsite.

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C. The following forms, bound at the end of this Section, shall be used to report progress relative to schedule:

1. Notice of Start of Manufacturing.
2. Notice of Shipment of Equipment (enclose bill of lading).
3. Notice of Schedule Impact.

D. The Equipment Supplier shall assist the Engineer in determining the latest available schedule information on the Contract items, including whether the Equipment Supplier is on schedule or delayed. These requirements apply fully to telephone inquiries, personal visits, letters, or other communications.

PART 4 PREPARATION OF EQUIPMENT FOR SHIPMENT

4.01 GENERAL

A. Insofar as is practical, equipment shall be factory assembled. The equipment parts and assemblies that are, of necessity, shipped unassembled shall be furnished with an assembly plan and instructions. The separate parts and assemblies shall be match-marked or tagged in a manner to facilitate field assembly of the equipment.

B. Generally, machined and unpainted parts subject to damage by the elements shall be protected with an application of a strippable protective coating.

C. Equipment shall be packaged or crated in a manner that will protect equipment from damage during shipping, handling, and storage.

D. The outside of the package or crate shall be adequately marked or tagged to indicate its contents by equipment name, Contract number, and equipment number if applicable; approximate weight; special precautions for handling; and recommended requirements for storage prior to installation.

PART 5 PACKAGING AND DELIVERY OF SPARE PARTS AND SPECIAL TOOLS

5.01 GENERAL

A. Spare parts and special tools shall be properly marked to identify the associated equipment by name, equipment, and part number. Parts shall be packaged in a manner for protection against damage from the elements during shipping, handling, and storage. Spare parts and special tools shall be shipped in appropriately sized, hinged-cover, wood or metal boxes. The boxes shall be marked to indicate the contents and use. Delivery of special tools shall be made prior to the time the associated equipment is scheduled for the initial test run. Equipment Supplier shall provide certification that all special tools provided are suitable for job intended, and shall provide complete operating and safety requirements.

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PART 6 EQUIPMENT/COMPONENTS DELIVERY AND STORAGE

6.01 GENERAL

A. The Equipment Supplier will deliver the equipment in two stages. Jet aeration equipment to be installed in Digesters 1 and 3 will be delivered 98 calendar days after receipt of Purchase Order. Jet aeration equipment to be installed in Digesters 2 and 4 will be delivered 152 calendar days after receipt of Purchase Order.

B. Equipment Supplier will be responsible for storing and maintaining any equipment manufactured before delivery.

C. The Equipment Supplier shall coordinate with the Engineer on delivery of the equipment and components to meet operational dates stated in the purchase order. If requested by the Engineer after issuance of purchase order, the Equipment Supplier shall revise the schedule for delivering the equipment and components without additional cost.

D. The Equipment Supplier shall provide a detailed list of special onsite storage requirements prior to installation such as heated, rain-protected, etc.

6.02 INSPECTION PRIOR TO AND AFTER UNLOADING

A. Prior to transfer of the equipment/components to the Engineer, the Equipment Supplier, and the Engineer/Owner shall jointly inspect the conditions of each system component and shall note, in writing, the conditions of the components transferred, noting any defects in the equipment/components.

1. The Contractor will unload and store the equipment/components for the Engineer.
2. The Contractor and Equipment Supplier shall jointly record in writing all System Equipment/Components transferred to the Contractor's care.
3. Damage or loss to the equipment. Equipment/Components shall be immediately reported to the Engineer.

6.03 STORAGE AND PROTECTION

A. Following transfer of equipment/components, and until final acceptance of the completed work, Contractor shall protect and maintain products to prevent damage in accordance with the Equipment Supplier's written instructions.

B. Equipment/Components susceptible to damage by the elements shall be placed in an acceptable temporary storage building provided by the Contractor prior to installation. The Equipment Supplier shall be responsible for establishing criteria for temporary storage building or location.

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PART 7 CORROSION PROTECTION

7.01 GENERAL

A. All ferrous metal surfaces including pumps, tanks, blowers, piping, and valves shall be coated with System No. 4.

1. System No. 4 Exposed Metal—Highly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
SP10, Near-White Blast Cleaning	Inorganic Zinc Primer	1 coat, 2.5 MDFT
	High Build Epoxy	1 coat, 4 MDFT
	Polyurethane Enamel	1 coat, 3 MDFT

B. Equipment Supplier standard coatings and linings may be substituted for the specified coating systems if they are of similar quality to the specified system, subject to Engineer approval.

C. Stainless steel and plastic surfaces shall not be coated unless otherwise specified in the Specification.

D. Provide sufficient coating material for touchup of any surfaces damaged during transport, storage, and installation.

7.02 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Supplement—1, Typical Maintenance Summary Form.
2. Supplement—2, Notice of Start of Manufacturing.
3. Supplement—3, Notice of Shipment of Equipment.
4. Supplement—4, Notice of Schedule Impact.
5. Supplement—5, Certificate of Proper Installation.
6. Supplement—6, General Project Criteria.

END OF SECTION

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TYPICAL MAINTENANCE SUMMARY FORM

1. EQUIPMENT ITEM_____

2. EQUIPMENT SUPPLIER_____

3. EQUIPMENT IDENTIFICATION NUMBER(S)_____

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 LB) _____

5. NAMEPLATE DATA (kW, voltage, speed, etc.)_____

6. EQUIPMENT SUPPLIER'S LOCAL REPRESENTATIVE_____

Name_____
Telephone No._____
Address_____
_____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation	Frequency	Lubricant (If Applicable)	Comments
List briefly each maintenance operation required and refer to specific information in mfr's. std. maintenance manual, if applicable.	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.	

8. LUBRICANT LIST

Reference Symbol	Shell	Std. Oil	Gulf	Arco	Or Equal
List symbols used in Item 7. above.	List equivalent lubricants, as distributed by each equipment supplier for the specific use recommended.				

9. SPARE PARTS. Include your recommendations regarding what spare parts, if any, should be kept on the job.

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NOTICE OF START OF MANUFACTURING

DATE:_____

TO:_____

ATTENTION:_____

Equipment Contract No.:_____

Name of Contract:_____

Type of Equipment:_____

Quantity:_____

Scheduled Completion of Assembly:_____

Scheduled Date of Shipment:_____

NOTE: Delay to the above schedule which will affect shipment date by 5 days or more must be reported on the NOTICE OF SCHEDULE IMPACT form.

By:_____Date:_____

Title:_____

EQUIPMENT SUPPLIER'S AGENT:

Name:_____

Address:_____

City: _____State: _____ Zip Code: ____Telephone: _____

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NOTICE OF SHIPMENT OF EQUIPMENT

DATE:_____

TO:_____

ATTENTION:_____

Equipment Contract No.:_____

Name of Contract:_____

Type of Equipment:_____

_____

QTY, DESCRIPTION (Include Equipment Numbers) SERIAL NUMBER (If Applicable):

_____

_____

_____

_____

_____

ATTACH BILL(S) OF LADING FOR ALL SHIPMENTS TO THIS FORM:

Date of Shipment:_____

By:_____

Title:_____

EQUIPMENT SUPPLIER'S AGENT:

Name:_____

Address:_____

City:_____State: _____Zip Code: _____Telephone: _____

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NOTICE OF SCHEDULE IMPACT

(Send this form to Engineer if delay is over 5 days)

DATE:_____

TO:_____

ATTENTION:_____

Equipment Contract No.:_____

Name of Contract:_____

Type of Equipment Affected:_____

Nature of Delay:_____

New Estimated Date for Final Shop Drawings:_____

New Estimated Date for Start of Manufacture:_____

New Estimated Date for Finish Manufacture:_____

New Estimated Date for Shipment:_____

New Estimated Date for Arrival at Jobsite:_____

By:_____

Title:_____

EQUIPMENT SUPPLIER'S AGENT:

Name:_____

Address:_____

City:_____State: _____ Zip Code: _____ Telephone: _____

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CERTIFICATE OF PROPER INSTALLATION

Owner: _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO:_____ SPEC. SECTION: _____

Authorization by the Equipment Supplier shall not relieve the Contractor of its liability for damages that may at a later date be shown to be the result of improper installation that was not obvious at the time of this certification by the Equipment Supplier.

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

Installed in accordance with Equipment Supplier's recommendations.

Inspected, checked, and adjusted.

Serviced with proper initial lubricants.

Electrical and mechanical connections meet quality/safety standards.

All applicable safety equipment has been properly installed.

System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one equipment supplier)

Comments:

_____

_____

I, the undersigned Equipment Supplier's Representative, hereby certify that I am (i) a duly authorized representative of the Equipment Supplier, (ii) empowered by the Equipment Supplier to inspect, approve, and operate his equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the Equipment Supplier is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Equipment Supplier:

_____

By Equipment Supplier's Authorized Representative: _____
(Authorized Signature)

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General Project Criteria

Site Data

The facility to be modified is the Manatee County South West Water Reclamation Facility (SWWRF) located in Manatee County. The Owner is Manatee County and the Engineer is CH2M HILL. This project will result in conversion of the SWWRF to a Modified Ludzack-Ettinger (MLE) process designed to reduce Total Nitrogen (TN) to less than 10 ppm. This project will also convert the four anaerobic digesters to aerobic sludge holding tanks. This phase of the project (the subject of this IFB) is the conversion of the digesters. Another later project phase will convert the plant to a MLE process. The digesters will be converted to aerobic sludge holding tanks using a jet aeration system. The plant maximum day flow rate is 23 MGD and maximum Month Average Daily Flow is 15.9 MGD. It is expected that 20,200 lbs/day of waste activated sludge (WAS) will be sent to the 4 sludge holding tanks.

Code Requirements

Applicable Codes and Regulations

Work shall comply with the latest addition of applicable sections of the following regulations, standards and codes:

a) American National Standards institute.
b) American Society for Testing and Materials.
c) ASME Boiler and Pressure Vessel Code Section VIII.
d) ASME Welding Standards.
e) ATEX.
f) Conformité Européenne (CE).
g) Building Code of America.
h) Factory Mutual Insurance Company.
i) Hydraulic Institute Standards.
j) Institute of Electrical and Electronic Engineers.
k) International Society of Automation.
l) International Electrotechnical Commission (IEC)
m) National Electrical Code.
n) National Electric Manufacturer's Association Code.
o) National Fire Protection Association (NFPA) Standards.
p) Occupational Safety and health Act.
q) OSHA 29 CFR 1910.120.

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r) USA Standard Institute Code for Process Piping USASI B31.1.

s) Underwriter's Laboratory.

t) State and Local Codes and Regulations.

u) International Building Code 2009

v) International Mechanical Code 2009

w) American Welding Society

Structural

Codes, Standards, and Regulations and References

The codes and standards will conform to the CH2M HILL Structural Design Guide, except as modified in these instructions, and the following codes and references. Use the latest edition of each code unless a specific year is listed here.

Building Code:

- Florida Building Code (FBC) 2010 (effective March 2012), which is the International Building Code 2010 Edition (IBC), as amended by the state of Florida. The building code is supplemented by national material standards/codes as identified below.

Standards:

The following is a list of codes, standards, regulations, and references to be used in this project.

- American Society of Civil Engineers (ASCE):
  ASCE Standard 7-10, Minimum Design Loads for Buildings and Other Structures
- American Concrete Institute (ACI):
  ACI 301, Specifications for Structural Concrete
  ACI 318, Building Code Requirements for Structural Concrete
  ACI 530, Building Code Requirements for Masonry Structures
  ACI 350, Code Requirements for Environmental Engineering Concrete Structures
- American Institute of Steel Construction (AISC):
  AISC 360-05 Specification for Structural Steel Buildings
- Light Gauge Metal Framing:
  AISI Specifications for the Design of Light-gauge, Cold-formed Steel Structural Members
- Aluminum Association Design Manual - Specifications and Guidelines for Aluminum Structures
- National Association of Architectural Metal Manufacturers Metal Grating Manual and Heavy Duty Metal Grating Manual

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Design methods:

- Concrete design and analysis will be ultimate strength design in accordance with ACI 318, Building Code Requirements for Structural Concrete. Hydraulic structures will be designed in accordance with the recommendations of ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
- Structural steel will be designed using the LRFD method.
- Aluminum shall be designed using the LRFD method.
- Masonry shall be designed using the ASD method.

Design Loads

General

- Risk Category:

Dead Loads

The loads resulting from the weight of all fixed construction and all permanent non-removable stationary construction are considered to be dead loads. Numerical values used for these loads may be determined by either actual known weights of the respective items or by documentation presented in the IBC and other publications such as ASCE 7.

Collateral Dead Loads

Collateral dead loads are allowances for suspended utilities such as small piping, ducts, lights, conduit, cable trays, and sprinklers.

- Roof Collateral Dead Load (applied to the underside of roof structure): 10 psf

Live Loads

- Roof 20 psf (minimum)
- Electrical rooms and motor control centers: 300 psf
- Grating, checkered plate and hatch covers: Same as surrounding floor area, 100 psf minimum
- Process areas: 300 psf
- Stairs, landings, platforms, and corridors: 100 psf
- Areas with unrestricted vehicle access: AASHTO H2O wheel loading

Seismic Loads

Not included in the Florida Building Code

Wind Loads

Reference IBC, and ASCE 7:

- Wind speed (3 second gust): 160 mph

Site is in wind borne debris region.

- Exposure Category: C

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Snow Loads

Do not apply.

Liquid and Groundwater Loads

Ground water and flood levels will be defined in the geotechnical report. Wall loads and uplift pressures due to ground water level will be considered based on ground water levels given. Weight of the structure will be used to counteract uplift whenever possible. The factor of safety for buoyancy shall be 1.1 against 100 year flood level. The factor of safety for buoyancy shall be 1.25 against typical high ground water level.

Tanks will be designed for maximum liquid levels at overflow. Where there is no overflow, tanks will be designed for maximum liquid level at top of the walls.

Earth Loads

Lateral design loads due to earth pressure and other geotechnical design parameters defined in the geotechnical report. Surcharge loads as recommended by the geotechnical report to be applied to the design of below grade walls.

Test Loads

All liquid containing tanks shall be tested for water-tightness. Where economically feasible, walls around tanks will be designed assuming elevated floor and roof slabs will not be installed prior to water-tightness testing and backfilling.

Test loads for foundation support elements to be determined from Geotechnical recommendations. Structure shall be designed for test loads for equipment and piping.

Special Loads

Handrail and Guardrail Systems: 200 pound concentrated load or 50 lbs/ft uniform load applied in any direction at top of rail. See IBC, 1607.7.

Load Combinations

Building Structures:

- LRFD IBC, Section 1605.2

Hydraulic Structures:

- Normal operating level with no backfill (water-tightness test condition)
- Empty basin with backfill in place
- Walls around tanks may be designed assuming elevated floor and roof slabs will not be installed prior to backfilling.

Inspection Requirements

Special Inspections: Owner-furnished special inspection is not required in accordance with the FBC.

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Geotechnical Design Parameters

The geotechnical report shall provide pertinent geotechnical design data including the following as appropriate:

- Design frost depth
- Footing bearing depth
- Allowable soil-bearing pressure
- Lateral earth pressures (active, at-rest, passive)
- Subgrade modulus
- Soil unit weight (dry, saturated)
- Structural fill requirements
- Engineered fill requirements
- Maximum design groundwater elevation and 100-year flood elevation
- Over excavation requirements
- Requirements for excavation and excavation support adjacent to existing structures
- Surcharge

Vibration Design Criteria

Equipment manufacturers shall be consulted for vibration related information such as frequencies, unbalanced loads, use of vibration isolators or dampeners and support requirements. All rotating equipment that produces vibrations of sufficient magnitude shall be mounted on concrete foundations or concrete support systems.

The concrete support and surrounding structure shall be designed such that the natural frequency will be less than 0.5 times or 1.5 times the normal operating frequency of the equipment. Special consideration shall be given to variable frequency equipment.

Anchorage to concrete foundations shall be by embedded anchor bolts, not post installed anchors.

Structural System Requirements

New materials that will be used in this project will meet the following:

• Concrete(water containment)	f'c = 4,500 psi at 28 days
• Concrete (all other)	f'c = 4,000 psi at 28 days
• Concrete masonry	f'm = 1,500 psi
• Reinforcing steel (unless otherwise noted)	ASTM A 61S, Grade 60
• Welded reinforcing steel	ASTM A 706, Grade 60. Welding shall conform to AWS D1.4
• Structural steel (unless otherwise noted)	ASTM A 36, Fy = 36 ksi
• Structural steel (w-shapes)	ASTM A 992, Fy = 50 ksi
• Structural steel (pipes)	ASTM A 501 or ASTM A 53, Grade B
• Structural steel (square/rectangular tubing)	ASTM A 500, Grade B

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• Cold formed steel	ASTM A 653, Grade 33
• Anchor Bolts	ASTM F 1554, Grade 36
• Structural bolted connections	ASTM A 325
• Stainless steel	AISI, Type 316
• Aluminum	Alloy 6061-T6 or 6351-T6

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SECTION 26 20 00
LOW-VOLTAGE AC INDUCTION MOTORS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. This section applies only when referenced by a motor-driven equipment specification. Application, horsepower, enclosure type, mounting, shaft type, synchronous speed, and deviations from this section will be listed in the equipment specification. Where such deviations occur, they shall take precedence over this section.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Bearing Manufacturers Association (ABMA):
   a. 9, Load Ratings and Fatigue Life for Ball Bearings.
   b. 11, Load Ratings and Fatigue Life for Roller Bearings.
2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   a. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
   b. 620, Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Machines.
   c. 841, Standard for Petroleum and Chemical Industry—Premium Efficiency Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors—Up to and Including 370 kW (500 hp).
3. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
   b. C50.41, Polyphase Induction Motors for Power Generating Stations.
   c. MG 1, Motors and Generators.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. Underwriters Laboratories (UL):
   a. 83, Standard for Safety for Thermoplastic-Insulated Wire and Cables.
   b. 674, Standard for Safety for Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.
   c. 2111, Standard for Safety for Overheating Protection for Motors.

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1.03 DEFINITIONS

A. CISD-TEFC: Chemical industry, severe-duty enclosure.

B. Motor Nameplate Horsepower: That rating after any derating required to allow for extra heating caused by the harmonic content in the voltage applied to the motor by its controller.

C. ODP: Open drip-proof enclosure.

D. TEFC: Totally enclosed, fan-cooled enclosure.

E. TENV: Totally enclosed, nonventilated enclosure.

F. WPI: Open weather protected enclosure, Type I.

G. WPII: Open weather protected enclosure, Type II.

1.04 SUBMITTALS

A. Action Submittals:

1. Descriptive information.
2. Nameplate data in accordance with NEMA MG 1.
3. Additional Rating Information:
   a. Service factor.
   b. Locked rotor current.
   c. No load current.
   d. Safe stall time for motors.
   e. Guaranteed minimum full load efficiency and power factor.
4. Enclosure type and mounting (such as, horizontal, vertical).
5. Dimensions and total weight.
6. Conduit box dimensions and usable volume as defined in NEMA MG 1 and NFPA 70.
7. Bearing type.
8. Bearing lubrication.
9. Bearing life.
10. Space heater voltage and watts.
11. Description, ratings, and wiring diagram of motor thermal protection.
12. Motor sound power level in accordance with NEMA MG 1.
13. Maximum brake horsepower required by the equipment driven by the motor.

B. Informational Submittals:

1. Operation and Maintenance Data: As specified in Section 01 00 01, General Requirements.

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PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Materials, equipment, and accessories specified in this section shall be products of:

1. General Electric.
2. Reliance Electric.
3. Siemens Energy and Automation, Inc., Motors and Drives Division.
4. Toshiba International Corp., Industrial Division.

2.02 GENERAL

A. For multiple units of the same type of equipment, furnish identical motors and accessories of a single manufacturer.

B. In order to obtain single source responsibility, use a single supplier to provide drive motor, its driven equipment, and specified motor accessories.

C. Meet requirements of NEMA MG 1.

D. Motors shall be specifically designed for the use and conditions intended, with a NEMA design letter classification to fit the application.

E. Lifting lugs on motors weighing 100 pounds or more.

F. Operating Conditions:

1. Maximum ambient temperature not greater than 40 degrees C.
2. Motors shall be suitable for operating conditions without reduction being required in nameplate rated horsepower or exceeding rated temperature rise.
3. Overspeed in either direction in accordance with NEMA MG 1.

2.03 HORSEPOWER RATING

A. As designated in motor-driven equipment specification.

B. Constant Speed Applications: Brake horsepower of driven equipment at any operating condition or at any head capacity point on pump curve not to exceed motor nameplate horsepower rating, excluding service factor.

2.04 SERVICE FACTOR

A. Motors: 1.15 minimum at rated ambient temperature, unless otherwise noted.

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2.05 VOLTAGE AND FREQUENCY RATING

A. System Frequency: 60-Hz.

B. Voltage Rating: 480 volt, 3-phase unless otherwise indicated in motor-driven equipment specification.

C. Suitable for full voltage starting.

D. 50 hp and larger also suitable for reduced voltage starting with 65 percent or 80 percent voltage tap settings on reduced inrush motor starters.

E. Suitable for accelerating the connected load with supply voltage at motor starter supply terminals dipping to 90 percent of motor rated voltage.

2.06 EFFICIENCY AND POWER FACTOR

A. For all motors except single-phase, under 1 hp, multispeed, short-time rated and submersible motors, or motors driving gates, valves, elevators, cranes, trolleys, and hoists:

1. Efficiency:
   a. Tested in accordance with NEMA MG 1, Paragraph 12.59.
   b. Guaranteed minimum at full load in accordance with NEMA MG 1 Table 12-12, Full-load Efficiencies for NEMA Premium Efficiency Electric Motors Rated 600 Volts or Less (Random Wound), or as indicated in motor-driven equipment specification.
2. Power Factor: Guaranteed minimum at full load shall be manufacturer's standard or as indicated in motor-driven equipment specification.

2.07 LOCKED ROTOR RATINGS

A. Locked rotor kVA Code F or lower, if motor horsepower not covered by NEMA MG 1 tables.

B. Safe Stall Time: 12 seconds or greater.

2.08 INSULATION SYSTEMS

A. Motors Rated Over 600 Volts: Sealed windings in accordance with NEMA MG 1.

B. Three-phase and Integral Horsepower Motors: Unless otherwise indicated in motor-driven equipment specification, Class F with Class B rise at nameplate horsepower and designated operating conditions.

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C. Motors With Form-Wound Coils: Locked coil bracing system in accordance with NEMA C50.41.

2.09 ENCLOSURES

A. Enclosures to conform to NEMA MG 1.

B. TEFC and TENV: Furnish with drain hole with porous drain/weather plug.

C. Chemical Industry, Severe-Duty (CISD-TEFC): In accordance with Article Special Motors.

2.10 TERMINAL (CONDUIT) BOXES

A. Oversize main terminal boxes for motors.

B. Diagonally split, rotatable to each of four 90-degree positions. Threaded hubs for conduit attachment.

C. Except ODP, furnish gaskets between box halves and between box and motor frame.

D. Minimum usable volume in percentage of that specified in NEMA MG 1, Section 1, Paragraph 4.19 and NFPA 70, Article 430: 500 percent.

E. Terminal for connection of equipment grounding wire in each terminal box.

F. Coordinate motor terminal box conduit entries versus size and quantity of conduits shown on Drawings.

2.11 BEARINGS AND LUBRICATION

A. Horizontal Motors:

1. Regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.
2. Minimum 100,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.

B. Vertical Motors:

1. Thrust Bearings:
   a. Antifriction bearing.
   b. Manufacturer's standard lubrication.
   c. Minimum 50,000 hours L-10 bearing life.

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2. Guide Bearings:
   a. Manufacturer's standard bearing type.
   b. Manufacturer's standard lubrication.
   c. Minimum 100,000 hours L-10 bearing life.

C. Regreasable Antifriction Bearings:

1. Readily accessible, grease injection fittings.
2. Readily accessible, removable grease relief plugs.

D. Oil Lubrication Systems:

1. Oil reservoirs with sight level gauge.
2. Oil fill and drain openings with opening plugs.
3. Provisions for necessary oil circulation and cooling.

2.12 NOISE

A. Measured in accordance with NEMA MG 1.

2.13 BALANCE AND VIBRATION CONTROL

A. In accordance with NEMA MG 1, Part 7.

2.14 EQUIPMENT FINISH

A. Protect Motor for Service Conditions:

1. Other Enclosures: Outdoor industrial atmospheres, including moisture and direct sunlight exposure.

B. External Finish: Prime and finish coat manufacturer's standard.

C. Internal Finish: Bore and end turns coated with clear polyester or epoxy varnish.

2.15 SPECIAL FEATURES AND ACCESSORIES

A. Screen Over Air Openings: Stainless steel on motors with ODP, WPI, and WPII enclosures meeting requirements for guarded machine in NEMA MG 1, and attached with stainless steel screws.

B. Winding Thermal Protection:

1. Thermostats:
   a. Bi-metal disk or rod type thermostats embedded in stator windings.

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b. Automatic reset contacts rated 120 volts ac, 5 amps minimum, opening on excessive temperature. (Provide manual reset at motor controller.)
c. Leads extending to separate terminal box for motors 100 hp and larger.

C. Space Heaters:

1. Provide winding space heaters with leads wired out to motor terminal box.
2. Provide extra hole or hub on motor terminal box as required.
3. Unless shown otherwise, heater shall be suitable for 120V ac supply, with wattage suitable for motor frame size.

D. Nameplates:

1. Raised or stamped letters on stainless steel or aluminum.
2. Display motor data required by NEMA MG 1, Paragraph 10.39 and Paragraph 10.40 in addition to bearing numbers for both bearings.
3. Premium efficiency motor nameplates to display NEMA nominal efficiency, guaranteed minimum efficiency, full load power factor, and maximum allowable kVAR for power factor correction capacitors.

E. Anchor Bolts: Provide meeting manufacturer's recommendations and of sufficient size and number for specified seismic condition.

2.16 SPECIAL MOTORS

A. Requirements in this article take precedence over conflicting features specified elsewhere in this section.

B. Chemical Industry, Severe-Duty (CISD-TEFC):

1. In accordance with IEEE 841.
2. TEFC in accordance with NEMA MG 1.
3. Suitable for indoor or outdoor installation in severe-duty applications including high humidity, chemical (corrosive), dirty, or salty atmospheres.
4. Motor Frame, End Shields, Terminal Box, and Fan Cover: Cast iron.
5. Ventilating Fan: Corrosion-resistant, nonsparking, external.
6. Drain and Breather Fittings: Stainless steel.
7. Nameplate: Stainless steel.
8. Gaskets between terminal box halves and terminal box and motor frame.
9. Extra slinger on rotor shaft to prevent moisture seepage along shaft into motor.
10. Double shielded bearings.
11. 125,000 hours minimum L-10 bearing life for direct-connected loads.

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12. External Finish: Double-coated epoxy enamel.
13. Coated rotor and stator air gap surfaces.
14. Insulation System, Windings, and Connections:
    a. Class F insulation, Class B rise or better at 1.0 service factor.
    b. Multiple dips and bakes of nonhygroscopic polyester varnish.
15. Service Factor:
    a. At 40 Degrees C Ambient: 1.15.
    b. At 65 Degrees C Ambient: 1.00.
16. Safe Stall Time Without Injurious Heating: 20 seconds minimum.

C. Inclined Motors:

1. Motors suitable for operation only in horizontal position not acceptable.
2. Bearings designed for thrust imposed by driven equipment and by motor rotor when motor is in inclined position.
3. Lubrication system designed to provide adequate bearing lubrication when motor is in inclined position.

2.17 FACTORY TESTING

A. Tests:

1. In accordance with IEEE 112 for polyphase motors.
2. Routine (production) tests in accordance with NEMA MG 1. Test multispeed motors at all speeds.
3. For energy efficient motors, test efficiency and power factor at 50 percent, 75 percent, and 100 percent of rated horsepower:
    a. In accordance with IEEE 112, Test Method B, and NEMA MG 1, Paragraph 12.59. and Paragraph 12.60.
    b. For motors 500 hp and larger where facilities are not available to test by dynamometer (Test Method B), determine efficiency by IEEE 112, Test Method F.
    c. Furnish certified copy of motor efficiency test report on an identical motor.
4. Additional Required Tests: Vibration (balance).
5. Provide certified test reports for all polyphase motors.

B. Test Report Forms:

1. Routine Tests: IEEE 112, Form A-1.
2. Efficiency and power factor by Test Method B, IEEE 112, Form A-2, and NEMA MG 1, Table 12-11 and Table 12-12.
3. Temperature Test: IEEE 112, Form A-2.

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PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's instructions and recommendations.

END OF SECTION

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SECTION 40 99 90
PACKAGE CONTROL SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. The Institute of Electrical and Electronics Engineers, Inc. (IEEE): C62.41, IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
2. International Society of Automation (ISA): S50.1, Compatibility of Analog Signals for Electronic Process Instruments.
3. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
   b. AB 1, Molded Case Circuit Breakers and Molded Case Switches.
   c. ICS 2, Industrial Control Devices, Controllers and Assemblies.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. Underwriters Laboratories Inc. (UL): 508A, Standards for Safety, Industrial Control Panels.

1.02 SYSTEM DESCRIPTION

A. Assemble panels and install instruments, plumbing, and wiring in equipment manufacturer's factories.

B. Test panels and panel assemblies for proper operation prior to shipment from equipment manufacturer's factory.

1.03 SUBMITTALS

A. Action Submittals:

1. Bill of material, catalog information, descriptive literature, wiring diagrams, and Shop Drawings for components of control system.
2. Catalog information on electrical devices furnished with system.
3. Shop Drawings, catalog material, and dimensional layout drawings for control panels and enclosures.
4. Panel elementary diagrams of prewired panels. Include in diagrams control devices and auxiliary devices, for example, relays, alarms, fuses, lights, fans, and heaters.
5. Plumbing diagrams of preplumbed panels and interconnecting plumbing diagrams.

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6. Interconnection wiring diagrams that include numbered terminal designations showing external interfaces.
7. Calculations for heat dissipation and power requirements.

B. Informational Submittals:

1. Programmable Controller Submittals:
   a. Complete set of user manuals.
   b. Fully documented ladder logic listings.
   c. Function listing for function blocks not fully documented by ladder logic listings.
   d. Cross-reference listing.
2. Manufacturer's list of proposed spares, expendables, and test equipment.
3. Manufacturer's Certificate of Proper Installation in accordance with Section 01 00 01, General Requirements for Jet Aeration Equipment.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Prior to shipment, include corrosive-inhibitive vapor capsules in shipping containers and related equipment as recommended by capsule manufacturer.

1.05 EXTRA MATERIALS

A. Spares, Expendables, and Test Equipment:

1. Selector Switch, Pushbutton, and Indicating Light: 20 percent, one minimum, of each type used.
2. Light Bulb: 100 percent, 2 minimum, of each type used.
3. Fuse: 100 percent, 5 minimum, of each type used.
4. Surge Suppressors: 20 percent, one minimum, of each type used.

PART 2 PRODUCTS

2.01 SIGNAL CHARACTERISTICS

A. Analog Signals:

1. 4 to 20 mA dc, in accordance with compatibility requirements of ISA S50.1.
2. Unless otherwise specified or shown, use Type 2, two-wire circuits.
3. Transmitters: Load resistance capability conforming to Class L.
4. Fully isolate input and output signals of transmitters and receivers.

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B. Pulse Frequency Signals: dc pulses whose repetition rate is linearly proportional to process variable over 10:1 range. Generate pulses by contact closures or solid-state switches.

1. Power source: Less than 30V dc.

C. Discrete Signals:

1. Two-state logic signals.
2. Utilize 120V ac sources for control and alarm signals.
3. Alarm signals shall be normally open, close to alarm isolated contacts rated for 5-ampere at 120V ac and 2-ampere at 30V dc.

2.02 CORROSION PROTECTION

A. Corrosion-Inhibiting Vapor Capsule Manufacturers:

1. Northern Instruments; Model Zerust VC.
2. Hoffmann Engineering; Model A-HCI.

2.03 CONTROL PANEL

A. Panel Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), UL 508, state and local codes, and applicable sections of NEMA, ANSI, and ICECA.

B. Conform to NEMA ratings as specified in individual equipment sections.

C. Minimum Metal Thickness: 14-gauge.

D. NEMA 250, Type 4X Panels: Type 316 stainless steel construction unless otherwise specified.

E. Doors:

1. Three-point latching mechanisms in accordance with NEMA 250 Type 1 and 12 panels with doors higher than 18 inches.
2. For other doors, stainless steel quick release clamps.

F. Cutouts shall be cut, punched, or drilled and finished smoothly with rounded edges.

G. Access: Front, suitable for installation with back and sides adjacent to or in contact with other surfaces, unless otherwise specified.

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H. Temperature Control:

1. Design panels to adequately dissipate heat generated by equipment mounted on or in the panel.
2. Furnish cooling fans with air filters or A/C if required to dissipate heat.
3. For panels outdoors or in unheated areas, furnish thermostatically controlled heaters to maintain temperature above 40 degrees F.

I. Push-to-Test Circuitry: For each push-to-test indicating light, provide a fused push-to-test circuit.

J. Lighting: Minimum of one hand switch controlled internal 100-watt light for panels 12 cubic feet and larger.

K. Minimum of one 120-volt GFCI duplex receptacle for panels 12 cubic feet and larger.

L. Finish:

1. Metallic External Surfaces (Excluding Aluminum and Stainless Steel): Manufacturer's standard gray unless otherwise specified.
2. Internal Surfaces: White enamel.

M. Panel Manufacturers:

1. Hoffman.
2. H.F. Cox.

N. Breather and Drains: Furnish with NEMA 250, Type 4 and 4X panels.

1. Manufacturer and Product: Cooper Crouse-Hinds; ECD Type 4X Drain and Breather; Drain Model ECD1-N4D, Breather Model ECD1-N4B.

2.04 CONTROL PANEL ELECTRICAL

A. UL Listing Mark for Enclosures: Mark stating "Listed Enclosed Industrial Control Panel" per UL 508A.

B. I&C and electrical components, terminals, wires, and enclosures UL recognized or UL listed.

C. Control Panels without Motor Starters:

1. Furnish main circuit breaker and a circuit breaker on each individual branch circuit distributed from power panel.
2. Locate to provide clear view of and access to breakers when door is open. Group on single subpanel. Provide typed directory.

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3. Circuit Breakers:
   a. Coordinate for fault in branch circuit trips, branch breaker, and not main breaker.
   b. Branch Circuit Breakers: 15 amps at 250V ac.
   c. Breaker Manufacturers and Products:
      1) Heineman Electric Co.; Series AM.
      2) Airpax/North American Philips Controls Corp.; Series 205.

D. Control Panels with Three-Phase Power Supplies and Motor Starters:

1. Interlock main circuit breaker with panel door.
   a. Mount logic controls, branch circuit breakers, overload reset switches, and other control circuit devices.
   b. Mount operator controls and indications on front access door.
2. Circuit Breakers:
   a. In accordance with NEMA AB 1.
   b. 18,000-ampere RMS symmetrical rating, minimum at 480 volts, unless otherwise specified.
   c. Breakers, except Motor Branch Breakers: Molded case thermal magnetic.
   d. 65,000-ampere RMS symmetrical rating, minimum at 480 volts, unless otherwise specified in package system equipment Specification sections.
   e. Tripping: Indicate with operator handle position.
3. Magnetic Motor Starters:
   a. Full voltage, NEMA ICS 2, Class A, Size O minimum.
   b. Include three-pole bimetallic or eutectic alloy thermal overload relays sized for each motor.
   c. Manual reset type with reset button mounted on panel door.
4. Motor Control: 120V ac (except intrinsically safe circuits where applicable).
   a. Power Control Transformer:
      1) Sufficient capacity to serve connected load, including 200VA for duplex outlet plus 100VA (minimum).
      2) Limit voltage variation to 15 percent during contact pickup.
      3) Fuse one side of secondary winding and ground the other.
      4) Furnish primary winding fuses in ungrounded conductors.
5. Power Monitoring Relay:
   a. Protect three-phase equipment from single phasing, phase imbalance, or phase reversal.
   b. Separate, isolated contact outputs to stop motors and activate alarm light during abnormal conditions.
   c. Transient Voltage Protection: 10,000 volts.
   d. Manufacturer and Product: Furnas; Class 47.
6. Power Distribution Blocks: Furnish to parallel feed tap on branch circuit protective devices. Do not "leap frog" power conductors.

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7. Terminations for Power Conductors: Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

E. Wiring:

1. ac Circuits:
   a. Type: 600-volt, Type MTW stranded copper.
   b. Size: For current to be carried, but not less than 14 AWG.
2. Analog Signal Circuits:
   a. Type: 300-volt, Type 2 stranded copper, twisted shielded pairs.
   b. Size: 18 AWG, minimum.
3. Other dc Circuits.
   a. Type: 600-volt, Type MTW stranded copper.
   b. Size: 18 AWG, minimum.
4. Separate analog and other dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.
5. Enclose wiring in sheet metal raceways or plastic wiring ducts.
6. Wire Identification: Numbered and tagged at each termination.
   a. Wire Tags: Machine printed, heat shrink.
   b. Manufacturers:
      1) Brady PermaSleeve.
      2) Tyco Electronics.

F. Wiring Interface:

1. For analog and discrete signal, terminate at numbered terminal blocks.
2. For special signals, terminate power (240 volts or greater) at manufacturer's standard connectors.
3. For panel, terminate at equipment on/with which it is mounted.

G. Terminal Blocks:

1. Quantity:
   a. For external connections.
   b. Wire spare or unused panel mounted elements to their panels' terminal blocks.
   c. Spare Terminals: 20 percent of connected terminals, but not less than 10.
2. General: Group to keep 120V ac circuits separate from 24V dc circuits.
   a. Connection Type: Screw connection clamp.
   b. Compression Clamp:
      1) Hardened steel clamp with transversal grooves penetrating wire strands providing a vibration-proof connection.
      2) Guides strands of wire into terminal.
   c. Screws: Hardened steel, captive, and self-locking.

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d. Current Bar: Copper or treated brass.
e. Insulation:
   1) Thermoplastic rated for minus 55 to plus 110 degrees C.
   2) Two funnel shaped inputs to facilitate wire entry.
f. Mounting:
   1) Rail.
   2) Terminal block can be extracted from an assembly without displacing adjacent blocks.
   3) End Stops: One at each end of rail, minimum.
g. Wire Preparation: Stripping only.
h. Jumpers: Allow jumper installation without loss of space on terminal or rail.
i. Marking System:
   1) Terminal number shown on both sides of terminal block.
   2) Allow use of preprinted and field marked tags.
   3) Terminal strip numbers shown on end stops.
   4) Mark terminal block and terminal strip numbers as shown.

3. Terminal Block, 120-Volt Power:
   a. Rated Voltage: 600V ac.
   b. Rated Current: 30 amp.
   c. Wire Size: 22 through 10 AWG.
   d. Rated Wire Size: 10 AWG.
   e. Color: Gray body.
   f. Spacing: 0.25 inch, maximum.
   g. Manufacturer and Product: Entrelec; Type M4/6.
4. Terminal Block, Ground:
   a. Wire Size: 22 through 12 AWG.
   b. Rated Wire Size: 12 AWG.
   c. Color: Green and yellow body.
   d. Spacing: 0.25 inch, maximum.
   e. Grounding: Ground terminal blocks electrically grounded to the mounting rail.
   f. Manufacturer and Product: Entrelec; Type M4/6.P.
5. Terminal Block, Blade Disconnect Switch:
   a. Use: Provide one for each discrete input and output field interface wire.
   b. Rated Voltage: 600V ac.
   c. Rated Current: 10 amp.
   d. Wire Size: 22 through 12 AWG.
   e. Rated Wire Size: 12 AWG.
   f. Color: Gray body, orange switch.
   g. Spacing: 0.25 inch, maximum.
   h. Manufacturer and Product: Entrelec; Type M4/6.SN.
6. Terminal Block, Fused, 24V dc:
   a. Rated Voltage: 600V dc.
   b. Rated Current: 6.3 amp.

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c. Wire Size: 22 through 12 AWG.
d. Rated Wire Size: 12 AWG.
e. Color: Gray body.
f. Fuse: 5 by 20 GMA fuses.
g. Fuse Marking: Fuse amperage rating shown on top of terminal block.
h. Indication: LED diode 24V dc.
i. Leakage Current: 5.2 mA, maximum.
j. Spacing: 0.32 inch, maximum.
k. Manufacturer and Product: Entrelec; Type M4/6.SFD.

7. Terminal Block, Fused, 120V ac:
a. Rated Voltage: 600V ac.
b. Rated Current: 6.3 amp.
c. Wire Size: 22 through 12 AWG
d. Rated Wire Size: 12 AWG.
e. Color: Gray body.
f. Fuse: 5 by 20 GMA fuses.
g. Fuse Marking: Fuse amperage rating shown on top of terminal block.
h. Indication: Neon lamp 110V ac.
i. Leakage Current: 1.8 mA, maximum.
j. Spacing: 0.32 inch, maximum
k. Manufacturer and Product: Entrelec; Type M4/6.SFL.

H. Grounding: Internal copper grounding bus for ground connections on panels, consoles, racks, and cabinets.

I. Relays:

1. General:
a. Relay Mounting: Plug-in type socket.
b. Relay Enclosure: Provide dust cover.
c. Socket Type: Screw terminal interface with wiring.
d. Socket Mounting: Rail.
e. Furnish holddown clips.

2. Control Circuit Switching Relay, Nonlatching:
a. Type: Compact general purpose plug-in.
b. Contact Arrangement: 3 Form C contacts.
c. Contact Rating: 10A at 28V dc or 240V ac.
d. Contact Material: Silver cadmium oxide alloy.
e. Coil Voltage: As noted or shown.
f. Coil Power: 1.8 watts (dc), 2.7VA (ac).
g. Expected Mechanical Life: 10,000,000 operations.
h. Expected Electrical Life at Rated Load: 100,000 operations.
i. Indication Type: Neon or LED indicator lamp.

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j. Push-to-test button.
k. Manufacturer and Product: Potter and Brumfield; Series KUP.

3. Control Circuit Switching Relay, Latching:
   a. Type: Dual coil mechanical latching relay.
   b. Contact Arrangement: 2 Form C contacts.
   c. Contact Rating: 10A at 28V dc or 120V ac.
   d. Contact Material: Silver cadmium oxide alloy.
   e. Coil Voltage: As noted or shown.
   f. Coil Power: 2.7 watts (dc), 5.3VA (ac).
   g. Expected Mechanical Life: 500,000 operations.
   h. Expected Electrical Life at Rated Load: 50,000 operations.
   i. Manufacturer and Product: Potter and Brumfield; Series KB/KBP.
4. Control Circuit Switching Relay, Time Delay:
   a. Type: Adjustable time delay relay.
   b. Contact Arrangement: 2 Form C contacts.
   c. Contact Rating: 10A at 240V ac.
   d. Contact Material: Silver cadmium oxide alloy.
   e. Coil Voltage: As specified or shown.
   f. Operating Temperature: Minus 10 to 55 degrees C.
   g. Repeatability: Plus or minus 2 percent.
   h. Delay Time Range: Select range such that time delay setpoint fall between 20 to 80 percent or range.
   i. Time Delay Setpoint: As specified or shown.
   j. Mode of Operation: As specified or shown.
   k. Adjustment Type: Integral potentiometer with knob external to dust cover.
   l. Manufacturer and Products: Potter and Brumfield.
      1) Series CB for 0.1-second to 100-minute delay time ranges.
      2) Series CK for 0.1- to 120-second delay time ranges.

J. Intrinsic Safety Barriers:

1. Intrinsically Safe Relays: Monitor discrete signals that originate in hazardous area and are used in a safe area.
   a. Manufacturer and Product: MTL, Inc.; Series MTL 5000.
2. Intrinsically Safe Barriers: Interface analog signals as they pass from hazardous area to safe area.
   a. Manufacturer and Product: MTL, Inc.; Series MTL 5000.

K. Analog Signal Isolators:

1. Furnish signal isolation for analog signals that are sent from one enclosure to another.
2. Do not wire in series instruments on different panels, cabinets, or enclosures.

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L. Power Supplies:

1. Furnish as required to power instruments requiring external dc power, including two-wire transmitters and dc relays. Provide dual power supplies with diode auctioneered outputs.
2. Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.
3. Provide output over voltage and over current protective devices to:
   a. Protect instruments from damage due to power supply failure.
   b. Protect power supply from damage due to external failure.
4. Enclosures: NEMA 1.
5. Mount such that dissipated heat does not adversely affect other components.

M. Programmable Controllers:

1. Solid state units capable of performing same function as conventional relays, timers, counters, drum sequencers, arithmetic, and other special functions necessary to perform required control functions.
2. Minimum of 64 internal control relays, 16 timer/counters, and four, 16 stop drum sequencers. Furnish minimum of 256 words of nonvolatile memory.
3. Minimum of 12 discrete inputs and 8 discrete outputs, optical isolations rated at 2,500-volt rms. Discrete inputs shall be 120V ac. Discrete outputs shall be rated for 2 amps at 120V ac. Each input and output shall have an LED ON/OFF status indicator.
4. Minimum of 25 percent excess capacity for inputs, outputs, internal coils, registers, and other necessary functions.
5. Capable of operating in a hostile industrial environment (for example, heat, electrical transients, RFI, and vibration) without fans, air conditioning, or electrical filtering. Units operate from 0 to 60 degrees C and up to 95 percent humidity, noncondensing.
6. Furnish with a handheld, CRT, or personal computer programmer that plugs into controller. Program using conventional relay ladder diagram notation and drum sequencer chart notation. Programmer shall provide a force function to set inputs or outputs to a given state regardless of program or input conditions. Programmer shall indicate power flow through internal elements.
7. Manufacturer: Allen-Bradley.

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N. Front-of-Panel Devices in Conjunction with NEMA 250, Type 1 and 12 Panels:

1. Potentiometer Units:
   a. Three-terminal, oiltight construction, resolution of 1 percent and linearity of plus or minus 5 percent.
   b. Single-hole, panel mounting accommodating panel thicknesses between 1/8 and 1/4 inch.
   c. Include legend plates with service markings.
   d. Manufacturers and Products:
      1) Allen-Bradley; Model 800T.
      2) Eaton/Cutler-Hammer; Model 10250T.
2. Indicating Lights:
   a. Heavy-duty, push-to-test type, oiltight, industrial type with integral transformer for 120V ac applications.
   b. Screwed on prismatic glass lenses in colors noted and factory engraved legend plates for service legend.
   c. Manufacturers and Products:
      1) Eaton/Cutler-Hammer; Type 10250T.
      2) General Electric; CR2940U.
3. Pushbutton, Momentary:
   a. Heavy-duty, oiltight, industrial type with full guard and momentary contacts rated for 10 amperes continuous at 120V ac.
   b. Standard size legend plates with black field and white markings for service legend.
   c. Manufacturers and Products:
      1) Square D; Class 9001, Type K.
      2) Eaton/Cutler-Hammer; Type T.
      3) General Electric; Type CR-2940.
4. Selector Switch:
   a. Heavy-duty, oiltight, industrial type with contacts rated for 120V ac service at 10 amperes continuous.
   b. Standard size, black field, legend plates with white markings, for service legend.
   c. Operators: Black knob type.
   d. Single-hole mounting, accommodating panel thicknesses from 1/16 inch to 1/4 inch.
   e. Manufacturers and Products for Units with up to Four Selection Positions:
      1) Eaton/Cutler-Hammer; Type T.
      2) Square D; Type K.
   f. Manufacturers and Products for Units with up to 12 Selection Positions:
      1) Rundel-Idec; Standard Cam Switch.
      2) Electroswitch; 31.

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O. Front-of-Panel Devices Used in Conjunction with NEMA 250, Type 4X Panels:

1. Potentiometer, Watertight:
   a. Three-terminal, heavy-duty NEMA 250, Type 4X watertight construction, resolution of 1 percent and linearity of plus or minus 5 percent.
   b. Single-hole, panel mounting accommodating panel thicknesses between 1/8 and 1/4 inch.
   c. Include engraved legend plates with service markings.
   d. Manufacturer and Product: Allen-Bradley; Bulletin 800H.
2. Indicating Lights, Watertight:
   a. Heavy-duty, push-to-test type, NEMA 250, Type 4X watertight, industrial type with integral transformer for 120V ac applications and corrosion-resistant service.
   b. Screwed on prismatic lenses and factory engraved legend plates for service legend.
   c. Manufacturers and Products:
      1) Square D; Type SK.
      2) Allen-Bradley; Type 800H.
3. Pushbutton, Momentary, Watertight:
   a. Heavy-duty, NEMA 250, Type 4X watertight, industrial type with momentary contacts rated for 120V ac service at 10 amperes continuous and corrosion-resistant service.
   b. Standard size, black field, legend plates with white markings for service legend.
   c. Manufacturers and Products:
      1) Square D; Type SK.
      2) Allen-Bradley; Type 800H.
4. Selector Switch, Watertight:
   a. Heavy-duty, NEMA 250, Type 4X watertight, industrial type with contacts rated for 120V ac service at 10 amperes continuous and corrosion-resistant service.
   b. Standard size, black field, legend plates with white markings, for service legend.
   c. Operators: Black knob type.
   d. Single-hole mounting, accommodating panel thicknesses from 1/16 to 1/4 inch.
   e. Manufacturer and Products:
      1) Square D; Class 9001, Type SK.
      2) Allen-Bradley; Type 800H.

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2.05 INSTRUMENT TAG NUMBERS

A. A shorthand tag notation is used. For example:

XXX-AI-YYY-ZZ [BB]

Notation	Explanation
XXX	Unit process number
AI	ISA designator for Analysis Indicator
YYY	Loop number
ZZ	Unit Number
[BB]	Same notation shown at 2 o'clock position on ISA circle symbol on Process and Instrument Diagram

2.06 NAMEPLATES, NAMETAGS, AND SERVICE LEGENDS

A. Nametags: Permanently mounted bearing entire ISA tag number.

1. Panel Mounted: Plastic, mounted to instrument behind panel face.
2. Field Mounted: Engraved Type 316 stainless steel, 22-gauge minimum thickness, attached with stainless steel.

B. Service Legends (Integrally Mounted with Instrument) and Nameplates:

1. Engraved, rigid, laminated plastic type with adhesive back. Furnish service legends and nameplates to adequately describe functions of panel face mounted instruments.
2. Color: White with black letters.
3. Letter Height: 3/16 inch.
4. For each panel, face mounted laminated nameplate inscribed with the panel name and tag number. Color shall be white with black letters 1/2-inch high.

C. Standard Light Colors and Inscriptions: Unless otherwise specified in individual equipment specifications, use the following color code and inscriptions:

Tag	Inscription(s)	Color
ON	ON	Red
OFF	OFF	Green
OPEN	OPEN	Red

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Tag	Inscription(s)	Color
CLOSED	CLOSED	Green
LOW	LOW	Amber
FAIL	FAIL	Amber
HIGH	HIGH	Amber
AUTO	AUTO	White
MANUAL	MANUAL	Yellow
LOCAL	LOCAL	White
REMOTE	REMOTE	Yellow
FORWARD	FORWARD	Red
REVERSE	REVERSE	Blue

1. Lettering: Black on white and amber lenses; white on red and green lenses.
2. Standard Pushbutton Colors and Inscriptions:
   a. Use following unless otherwise noted in Instrument List:

Tag Function	Inscription(s)	Color
OO	ON OFF	Black Black
OC	OPEN CLOSE	Black Black
OCA	OPEN CLOSE AUTO	Black Black Black
OOA	ON OFF AUTO	Black Black Black
MA	MANUAL AUTO	Black Black
SS	START STOP	Black Black
RESET	RESET	Black
EMERGENCY STOP	EMERGENCY STOP	Red

   b. Lettering Color:
      1) Black on white and yellow buttons.
      2) White on black, red, and green buttons.

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2.07 ELECTRICAL SURGE AND TRANSIENT PROTECTION

A. Equip control panels with surge-arresting devices to protect equipment from damage as a result of electrical transients induced in interconnecting lines from lightning discharges and nearby electrical devices.

B. Suppressor Locations:

1. At point of connection between an equipment item, including ac powered transmitters, and power supply conductor (direct-wired equipment).
2. On analog pairs at each end when the pair travels outside of building.
3. In other locations where equipment sensitivity to surges and transients requires additional protection beyond that inherent to design of equipment.

C. Suppressor Design:

1. Construction: First-stage, high-energy metal oxide varistor and second-stage, bipolar silicon avalanche device separated by series impedance; includes grounding wire, stud, or terminal.
2. Response: 5 nanoseconds maximum.
3. Recovery: Automatic.
4. Temperature Range: Minus 20 degrees C to plus 85 degrees C.
5. Enclosure Mounted: Encapsulated inflame retardant epoxy.

D. Suppressors on 120V ac Power Supply Connections:

1. Occurrences: Tested and rated for a minimum of 50 occurrences of IEEE C62.41 Category B test waveform.
2. First-Stage Clamping Voltage: 350 volts or less.
3. Second-Stage Clamping Voltage: 210 volts or less.
4. Power Supplies for Continuous Operation:
   a. Four-Wire Transmitter or Receiver: Minimum 5 amps at 130V ac.
   b. All Other Applications: Minimum 30 amps at 130V ac.

E. Suppressors on Analog Signal Lines:

1. Test Waveform: Linear 8-microsecond rise in current from 0 amp to a peak current value followed by an exponential decay of current reaching one-half the peak value in 20 microseconds.
2. Surge Rating: Tested and rated for 50 occurrences of 2,000-amp peak test waveform.
   a. dc Clamping Voltage: 20 percent to 40 percent above operating voltage for circuit.
   b. dc Clamping Voltage Tolerance: Plus or minus 10 percent.
   c. Maximum Loop Resistance: 18 ohms per conductor.

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F. Manufacturers and Products:

1. Analog Signals Lines: Emerson Edco PC-642 or SRA-64 series.
2. 120V ac Lines: Emerson Edco HSP-121.
3. 480-Volt, Three-Phase Power Supplies: Square D Model SDSA3650.
4. Field Mounted at Two-Wire Instruments:
   a. Encapsulated in stainless steel pipe nipples.
   b. Emerson Edco SS64 series.
5. Field Mounted at Four-Wire Instruments: With 120V ac outlet, ac circuit breaker, and 10-ohm resistor on signal line, all in enclosure.
   a. Enclosure:
      1) NEMA 4X Type 316 stainless steel with door.
      2) Maximum Size: 12 inches by 12 inches by 8 inches deep.
   b. Emerson Edco; SLAC series.

G. Grounding:

1. Coordinate surge suppressor grounding in field panels and field instrumentation with suppressor manufacturer's requirements.
2. Provide control panels with an integral copper grounding bus for connection of suppressors and other required instrumentation.

PART 3 EXECUTION

3.01 ELECTRICAL POWER AND SIGNAL WIRING

A. Restrain control and signal wiring in control panels by plastic ties or ducts. Secure hinge wiring at each end so bending or twisting will occur around the longitudinal axis of wire. Protect bend area with a sleeve.

B. Arrange wiring neatly, cut to proper length, and remove surplus wire. Install abrasion protection for wire bundles passing through holes or across edges of sheet metal.

C. Use manufacturer's recommended tool with sized anvil for crimp terminations. No more than one wire may be terminated in a single crimp lug. No more than two lugs may be installed on a single screw terminal.

D. Do not splice or tap wiring except at device terminals or terminal blocks.

3.02 PROTECTION

A. Protect enclosures and other equipment containing electrical, instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules.

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B. During Work, periodically replace capsules in accordance with capsule manufacturer's recommendations. Replace capsules at Substantial Completion.

3.03 SUPPLEMENTS

A. The supplement listed below, following "END OF SECTION," is part of this Specification.

1. I&C Components.

END OF SECTION

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SUPPLEMENT: I&C COMPONENTS

A. P4 Pressure Gauge:

1. General:
   a. Function: Local pressure indication.
   b. Type: Bourdon tube element.
2. Performance:
   a. Scale Range: As noted.
   b. Accuracy: Plus or minus 1 percent of full scale.
3. Features:
   a. Dial: 4-1/2-inch diameter.
   b. Pointer Vibration Reduction: Required, unless otherwise noted. Use the following method.
      1) Liquid filled gauge front, unless otherwise noted.
         a) Glycerine fill, unless otherwise noted.
   c. Case Material: Black thermoplastic, unless otherwise noted.
   d. Materials of Wetted Parts (including element, socket/process connection, throttling device (if specified) and secondary components):
      1) Stainless steel, unless otherwise noted.
   e. Pointer: Adjustable by removing ring and window.
   f. Window: Glass or acrylic, unless otherwise noted.
   g. Threaded reinforced polypropylene front ring.
   h. Case Type: Solid front with blow-out back.
4. Process Connection:
   a. Mounting: Lower stem, unless otherwise noted.
   b. Size: 1/2-inch MNPT, unless otherwise noted.
5. Accessories:
   a. Throttling Device: Required, unless otherwise noted.
      1) Type suitable for the intended service.
      2) Install in gauge socket bore.
6. Manufacturers and Products:
   a. Ashcroft; Duragauge Model 1259/Model, 1279/Model, 1279 PLUS!
   b. Ametek U.S. Gauge; Solfrunt Model 19XX/1981Advantatge.
   c. WIKA, Type 2XX.34.

B. P7 Pressure Switch, Adjustable Deadband:

1. General:
   a. Function: Monitor pressure, activate switch at setpoint, and deactivate switch at reset point.

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b. Type:
   1) Piston-actuated.
   2) Both setpoint and deadband (the differential between setpoint and reset point) adjustable.

2. Performance:
   a. Setpoint:
      1) As noted.
      2) Repeatability: Plus or minus 1 percent of range.
   b. Reset Point: As noted.
   c. Range: The noted setpoint shall fall between 20 percent and 80 percent of the range.
   d. Deadband: Adjustable within nominally 25 percent and 85 percent of range.
   e. Overpressure Proof Pressure:
      1) Pressure psi Ranges: At least 400 percent of rated maximum static pressure.
      2) Pressure Inches of Water Ranges: 20 psig.
      3) Compound Range: 250 psig.
      4) Vacuum Range: 250 psig.
   f. Operating Temperature Range:
      1) Dependent on actuator seal materials.
      2) For Buna-N seal, 0 degree F to 150 degrees F.
3. Features:
   a. Actuator Seal: Buna-N, unless otherwise noted.
   b. Adjustable deadband.
   c. Mounting: Surface, unless otherwise noted.
4. Process Connection:
   a. 1/4-inch NPT female connections, unless otherwise noted.
   b. Materials:
      1) Pressure psi Ranges: Type 316 stainless steel, unless otherwise noted.
      2) Pressure Inches of Water Ranges: Epoxy coated carbon steel, unless otherwise noted.
5. Enclosure: NEMA 4X, unless otherwise noted.
6. Signal Interface:
   a. Contact Type:
      1) SPDT.
      2) Rated for 10 amps minimum at 120V ac.
   b. Hermetically Sealed Switch: If noted.
7. Manufacturers and Products:
   a. Ashcroft; L or P Series.
   b. United Electric; J6 Series.
   c. If NEMA 7, explosion-proof enclosure specified; Ashcroft; P Series only.

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C. T5 Temperature Switch:

1. General:
   a. Function: Provide change in contacts as temperature rises or falls through noted setpoint.
   b. Type:
      1) Vapor pressure thermal bulb sensing element.
      2) Fixed differential, unless otherwise noted.
   c. Parts: Switch/element assembly and thermowell.
2. Performance:
   a. Setpoint: As noted.
   b. Range: Such that noted setpoint falls between 30 percent and 70 percent of range.
   c. Repeatability: Plus or minus 1 percent of span.
3. Switch:
   a. Type: Snap action, SPDT, sealed environment proof, unless otherwise noted.
   b. Rating: 125V ac 15A, unless otherwise noted.
   c. Reset: Automatic.
   d. Enclosure:
      1) Type: NEMA 4X, unless otherwise noted.
      2) Mounting:
         a) Direct mount, unless otherwise noted.
         b) If remote mounted, furnish capillary with length either as noted or as required.
4. Element:
   a. Type: Bulb.
   b. Stem mounted to thermowell.
   c. Length: Coordinate with thermowell insertion length.
5. Thermowell:
   a. Process Connection: 1/2-inch NPT(M).
   b. Material: Type 316 stainless steel or Type 304 stainless steel.
   c. Insertion Length: 3-1/2-inch minimum immersion for liquids and 5-1/2-inch minimum immersion for gases, unless otherwise noted.
6. Electrical Connections:
   a. Conduit: 1/2-inch NPT(F).
7. Manufacturers:
   a. Ashcroft; B Series (Type 400 NEMA 4X, Type 700 NEMA 7 and NEMA 9).
   b. Barksdale; ML1H, MT1H.

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D. T14 Thermometer, Bimetallic, Adjustable Angle:

1. General:
   a. Function: Indicate process temperature.
   b. Type: Bi-metallic, circular dial.
   c. Parts: Temperature gauge and thermowell.
2. Performance:
   a. Scale Range: As noted.
   b. Accuracy: 1 percent of full scale.
3. Thermometer Features:
   a. Stem Length: 4 inches, unless otherwise noted.
   b. Stem Type:
      1) Every angle, unless otherwise noted.
         a) Adjustable 90 degrees vertical, 360 degrees horizontal.
   c. Dial:
      1) Heavy-duty glass, unless otherwise noted.
      2) 5-inch circular, unless otherwise noted.
      3) Hermetically sealed.
   d. Construction: All-welded, stainless steel.
4. Thermowell:
   a. Type: 1/2-inch NPT connection, Type 304 stainless steel.
   b. Extension Neck: When noted, with length as noted.
5. Manufacturers and Products:
   a. Ashcroft; Series EI bimetal thermometer.
   b. WIKA; Type S5301 bimetal thermometer.

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SECTION 44 42 56.10
HORIZONTAL END SUCTION CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01 WORK OF THIS SECTION

A. The pumps shall be furnished as part of the Jet Mixing/Aeration System in accordance to Section 44 45 18, Jet Mixing/Aeration Systems for Sludge Holding Tanks.

1.02 REFERENCES

A. The following Specification sections are referenced in this section:

1. Section 01 00 01, General Requirements.
2. Section 26 20 00, Low Voltage AC Induction Motors.
3. Section 40 99 90, Package Control System.
4. Section 44 45 18, Jet Mixing/Aeration Systems for Sludge Holding Tanks.

B. The following is a list of standards which may be referenced in this section:

1. American Bearing Manufacturers' Association (ABMA).
2. Hydraulic Institute Standards.
3. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.
4. Occupational Safety and Health Administration (OSHA).

1.03 DEFINITIONS

A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Make, model, weight, and horsepower of each equipment assembly.
   b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
   c. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over entire operating range of pump from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at guarantee point.

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d. Detailed Structural, Mechanical, and Electrical Drawings showing equipment dimensions, size, and locations of connections and weights of associated equipment.
e. Power and control wiring diagrams, including terminals and numbers.
f. Complete motor nameplate data, as defined by NEMA, motor manufacturer. See Section 26 20 00, Low Voltage AC Induction Motors for additional motor submittal requirements.
g. Factory finish system data sheets.

B. Informational Submittals:

1. Factory Functional Test Reports.
2. Manufacturer's Certification of Compliance that factory finish system is identical to the requirements specified herein.
3. Special shipping, storage and protection, and handling instructions.
4. Manufacturer's printed installation instructions.
5. Suggested spare parts list to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
6. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
7. Operation and Maintenance Data: As specified in Section 01 00 01, General Requirements.
8. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 00 01, General Requirements.

1.05 EXTRA MATERIALS

A. Furnish for this set of pumps:

1. Complete set bearings.
2. Complete set gaskets and O-ring seals.
3. Complete set of shaft sleeves.
4. Complete set keys, dowels, pins, etc.
5. Complete mechanical seal.
6. Impeller.
7. Impeller shaft.
8. Impeller wear ring.
9. Head shaft.
10. One complete set of special tools required to dismantle pump.

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PART 2 PRODUCTS

2.01 GENERAL

A. Coordinate pump requirements with drive manufacturer and be responsible for pump and drive requirements.

B. Where adjustable speed drives are required, furnish a coordinated operating system complete with pump, drive, and speed controller.

2.02 SUPPLEMENTS

A. Some specific requirements are attached to this section as supplements.

2.03 ACCESSORIES

A. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.

B. Lifting Lugs: Equipment weighing over 100 pounds.

C. OSHA-approved coupling guard for direct coupled or belt driven pumps.

D. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, 1/2-inch minimum diameter.

2.04 FACTORY FINISHING

A. Prepare, and prime, and finish coat in accordance with Section 44 45 18, Jet Mixing/Aeration Systems for Sludge Holding Tanks.

2.05 SOURCE QUALITY CONTROL

A. Factory Test Report: Include test data sheets, curve test results, certified correct by a registered professional engineer.

B. Functional Test: Perform manufacturer's standard, test on each equipment. Include vibration test, as follows:

1. Dynamically balance rotating parts of each pump and its driving unit before final assembly.
2. Limits:
   a. Driving Unit Alone: Less than 80 percent of NEMA MG 1 limits.
   b. Complete Rotating Assembly Including Coupling, Drive Unit, and Motor: Less than 90 percent of limits established in the Hydraulic Institute Standards.

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C. Performance Test:

1. In accordance with Hydraulic Institute Standards.
2. Adjust, realign, or modify units and retest in accordance with Hydraulic Institute Standards if necessary.

D. Motor Test: See Section 26 20 00, Low-Voltage AC Induction Motors.

E. Hydrostatic Tests: Pump casing(s) tested at 150 percent of shutoff head. Test pressure maintained for not less than 5 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's printed instructions by others.

3.02 FIELD QUALITY CONTROL

A. Functional Tests: Conduct on each pump by others with the assistance of the manufacturer.

1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
2. Vibration Test:
   a. Test with unit installed and in normal operation, and discharging to the connected piping systems at rates between low discharge head and high discharge head conditions specified, and with actual building structures and foundations provided shall not develop vibration exceeding 80 percent of the limits specified in HIS 9.6.4.
   b. If units exhibit vibration in excess of the limits specified adjust or modify as necessary. Units which cannot be adjusted or modified to conform as specified shall be replaced.
3. Flow Output: Measured by plant instrumentation and storage volumes.

B. Performance Test:

1. Conduct on each pump by others with the assistance of the manufacturer.
2. Perform under simulated operating conditions.
3. Test for a continuous 3-hour period without malfunction.
4. Test Log: Record the following:
   a. Total head.
   b. Capacity.
   c. Horsepower requirements.

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d. Flow measured by factory instrumentation and storage volumes.
e. Average distance from suction well water surface to pump discharge centerline for duration of test.
f. Pump discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.
g. Calculated velocity head at the discharge flange.
h. Field head.
i. Driving motor voltage and amperage measured for each phase.

3.03 MANUFACTURER'S SERVICES

A. Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:

1. 2 person-days for installation assistance and inspection, two trips.
2. 2 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation, two trips.
3. 1 person-day for prestartup classroom or Site training.
4. 2 person-days for facility startup, two trips.

B. See Section 01 00 01, General Requirements.

3.04 SUPPLEMENTS

A. The supplement listed below, following "End of Section," is a part of this Specification.

1. Pump Data Sheet.

END OF SECTION

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HORIZONTAL END SUCTION CENTRIFUGAL PUMP DATA SHEET,
44 42 56.10-1

Tag Numbers: 830-PMP-002-001, 830-PMP-005-001, 830-PMP-008-001, and 830-PMP-011-001

Pump Name: Sludge Holding Tank Liquid Motive Pumps

Manufacturer and Model Number: (1) Fairbanks Morse
(2) Sulzer
(3) Or Engineer Approved Equal

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Waste Activated Sludge

Pumping Temperature (Fahrenheit): Normal: 70 Max: 86 Min: 50

Specific Gravity at 60 Degrees F: 1 Viscosity Range: 1

pH: 5-8

Abrasive (Y/N): N Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L): 18,000

Largest diameter solid pump can pass (inches): 3

Min. NPSH Available (Ft. Absolute): 32

PERFORMANCE REQUIREMENTS AT PRIMARY DESIGN POINT

Capacity (US gpm): Rated: 6,600, or per Jet Mixing/Aeration System For Sludge Holding Tanks Supplier, See Section 44 45 18, Jet Mixing/Aeration Systems For Sludge Holding Tanks

Total Dynamic Head (Ft): Rated: 21, or per Jet Mixing Aeration System Supplier

Min. Hydraulic Efficiency (%): 60

Constant (Y/N): Y Adjustable (Y/N): N

DESIGN AND MATERIALS

ANSI (Y/N): Y Standard (Y/N) _____ Design: Frame-mounted (Y/N): Y
Close-Coupled Casing (Y/N): N Back Pullout (Y/N): N

Discharge Orientation: Up Rotation (view from end coupling): _____

Casing Materials: Cast Iron

Case Wear Ring (Y/N): Y Material: per manufacturer

Impeller: Type: Cast Iron Material: per manufacturer

Impeller Wear Ring (Y/N): Y Material: per manufacturer

Shaft Material: Stainless Steel Shaft Sleeve Material: Stainless Steel

Shaft Seal: _____ Packing (Y/N): N Material: _____

Mechanical (Y/N): Y Type: Chesterton 442 or John Crane 37FS with Tungsten Carbide faces

Lubrication: N/A

ABMA L-10 Bearing Life (Hrs): 100,000 Lubrication: Oil

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Coupling: _____ Falk (Y/N) Y_____ Fast (Y/N) _____
Spring-Grid (Y/N) _____
Gear Type (Y/N) __ Spacer (Y/N) _____ Manufacturer _____
Standard (Y/N) _____
Baseplate: Design: _____ Material: Carbon Steel_____
Drive Type: Direct-Coupled: Y_____ Belt: N_____ Adjustable Speed: N_____
Other: _____

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors)

Horsepower: 50 or less_____Voltage: 460__ Phase: 3 Synchronous Speed (rpm): ____

Service Factor: 1.15_____ Inverter Duty (Y/N): N_____

Motor nameplate horsepower shall not be exceeded at any head-capacity point on the pump curve.
Enclosure: DIP ____ EXP ____ ODP ____ TEFC X CISD-TEFC ____ TENV ____
WPI ____ WPII ____ SUBM ____
Mounting Type: Horizontal_____ Nonreverse Ratchet (Y/N) Y_____

REMARKS: Provide winding thermostat and space heater._____
_____
_____
_____

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SECTION 44 45 18
JET MIXING/AERATION SYSTEMS FOR SLUDGE HOLDING TANKS

PART 1 GENERAL

EQUIPMENT AND COMPONENT NUMBERS

Tag Number	Equipment Name
830-PMP-002-01	Liquid Motive Pump No.1
830-PMP-005-01	Liquid Motive Pump No.2
830-PMP-008-01	Liquid Motive Pump No.3
830-PMP-0011-01	Liquid Motive Pump No.4
830-BLR-003-01	Sludge Holding Blower No.1
830-BLR-004-01	Sludge Holding Blower No.2
830-BLR-007-01	Sludge Holding Blower No.3
830-BLR-0010-01	Sludge Holding Blower No.4

Aerated Sludge Holding Tanks

1.01 WORK OF THIS SECTION

A. This section covers the Work necessary to detail, manufacture, deliver to the jobsite, and to provide field service to assist startup and test the jet mixing/aeration systems associated with the Sludge Holding Tanks, including all equipment and services as specified herein.

B. The manufacturer shall provide four liquid motive pumps, four blower packages, and four aeration headers and associated pipe supports. Others will install the components according to the manufacturer's instructions.

C. Interconnecting pipes and associated pipe supports, valves, concrete slabs, and tank floor penetrations, are not part of the equipment manufacturer's scope of supply.

D. Jet aeration/mixing system components shall be supplied by a single manufacturer to assure single source responsibility for the performance of the system. The manufacturer shall assume complete responsibility for conformance of the jet mixing/aeration system with these Specifications.

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E. The manufacturer shall ensure compliance with the Specifications and compliance with required performance.

1.02 REFERENCES

A. The following Specification sections are referenced in this section:

1. Section 01 00 01, General Requirements.
2. Section 26 20 00, Low Voltage AC Induction Motors.
3. Section 40 99 90, Package Control System.
4. Section 44 42 56.10, Horizontal End Suction Centrifugal Pumps.

B. The following is a list of standards which may be referenced in this section:

1. AGMA, American Gear Manufacturers Association.
2. ASME, American Society of Mechanical Engineers.
3. ASTM, American Society of Testing and Materials.
4. ANSI, American National Standards Institute.
5. IEEE, Institute of Electrical and Electronics Engineers.
6. NEC, National Electrical Code.
7. NEMA, National Electrical Manufacturer's Association.
8. OSHA, Occupational Safety and Health Act.
9. SSPC: Steel Structures Painting Council.
   a. SP10, Near-White Blast Cleaning.

1.03 DEFINITIONS

A. AOR = Actual Oxygen Requirement under field operating conditions.

B. MDFT = Minimum Dry Film Thickness Per Coat, mils.

C. Mil: Thousandth of an inch.

D. SP: Surface Preparation.

E. SOR = Standard oxygen requirement.

F. ICFM = Blower inlet at site conditions of 100 degrees F, 85 percent RH, 14.5 psia.

G. SCFM = Standard blower rate at 14.7 psia, 68 degrees F and 36 percent RH.

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1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Make, model, weight, and horsepower of each equipment assembly.
   b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction. Identify the largest diameter solids that the nozzles can pass.
   c. Complete Drawings, details, and construction drawings for the enclosure for the blowers. The submittal shall also include data documenting that the specified noise attenuation requirements shall be met.
   d. Process calculations documenting the AOR, SOR, SCFM, ICFM blower, liquid motive pump, and aeration header selection for the Sludge Holding Tanks.
   e. Structural calculations documenting the structural wall thickness of the header provides the factors of safety specified in this section.
   f. Detailed Mechanical and Electrical Drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.
   g. Power and control wiring diagrams, including terminals and numbers.
   h. Outside utility requirements for each component including water, drains, and power.
   i. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications. See Section 26 20 00, Low Voltage AC Induction Motors for additional motor submittal requirements.
   j. Factory finish system.
   k. Certification that FRP piping meets the ASTM standards specified.

B. Informational Submittals:

1. Special shipping, storage and protection, and handling instructions.
2. Manufacturer's printed installation instructions.
3. Manufacturer's Certificate of Proper Installation.
4. Suggested spare parts list to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
5. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
6. Operation and Maintenance Data: Operation and Maintenance Manual as specified in Section 01 00 01, General Requirements.

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1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Product delivery, storage, and handling, shall comply with Section 01 00 01, General Requirements.

1.06 SPARE PARTS AND SPECIAL TOOLS

A. Provide spare spares and special tools in accordance with Section 01 00 01, General Requirements, and as follows:

1. Furnish the following for each set of blowers:
   a. One complete set of gaskets and seals.
   b. One set of V-belts.
   c. Four filter elements.
   d. One case of blower oil.
   e. One complete set of any special tools required to dismantle the pumps or blowers.

1.07 SPECIAL COORDINATION

A. The design shown on the Drawings of the Sludge Holding Tanks is based on the one of the named manufacturers and use of a backflush system. The other named manufacturers may provide a backflush with air. The air backflush system will have piping arrangement in and out of the Sludge Holding Tanks different from what's shown on the Drawings.

PART 2 PRODUCTS

2.01 GENERAL

A. Each jet mixing/aeration system shall consist of an aeration header (specified herein), rotary positive displacement blower, and a solids handling end suction pump. Inlet filter, inlet silencer, discharge silencer, inlet and discharge sleeve type expansion joints, check valve, and pressure relief valve shall be provided for each blower.

B. The system shall include all necessary safety devices, such as machinery guards and similar items required by OSHA, and other federal, state, and local health and safety regulations.

C. Motors shall comply with the standards specified in Section 26 20 00, Low-Voltage AC Induction Motors, of these Specifications.

D. The use of manufacturer's model or catalog numbers herein is for the purpose of establishing item quality and configuration desired.

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2.02 MANUFACTURERS

A. Siemens.

B. Mass Transfer Systems.

C. Fluidyne.

2.03 SERVICE CONDITIONS

A. The equipment specified herein shall be suitable for installation outdoors, for exposure to continuous 100 percent relative humidity conditions, for operation in ambient air temperature from minus 4 to 38 degrees C.

B. Site Elevation: 17 feet.

C. Sludge Holding Tanks: Sludge to be mixed/aerated will be waste activated sludge (WAS) from a municipal wastewater treatment plant with the following characteristics:

1. Solids Concentration: 14,000 to 18,000 mg/L.
2. pH: 5.5 to 8.0.
3. WAS Temperature Range: 22 to 30 degrees C.

D. Sludge Holding Tanks: The liquid depth in the Sludge Holding Tanks during normal operation will fluctuate between elevations 22.00 and 42.00. The base slabs of the tanks are sloped between elevations 14.50 and 17.00 as shown on drawing. The design of the system shall take into account the sloped tank bottoms, the depth of submergence of the header and the 4 foot available suction head on the Liquid Motive Pumps.

E. Each system shall be capable of mixing and aerating to a maximum elevation of 42.00.

2.04 SPECIAL DESIGN CRITERIA FOR NOISE REDUCTION

A. The blowers provided for the Aerated Sludge Holding Tanks shall be provided with a special sound attenuating enclosure that will limit the sound to a maximum level of 80 dBA from each blower when measured at a distance of 3 feet.

B. The manufacturer may augment the sound attenuation capability of the enclosures with sound insulating blankets on the blower discharge silencer, or other sound attenuating devices. The manufacturer shall supply all means necessary to ensure that the maximum sound level is not exceeded.

C. The enclosure shall include appropriate ventilation to prevent heat from building up in the enclosure.

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2.05 DESIGN CRITERIA FOR AERATED SLUDGE HOLDING TANKS

A. The jet mixing/aeration system shall be capable of aerating and mixing the WAS within each 75 feet diameter Sludge Holding Tank with the dimensions as shown on the Drawings.

B. The system will normally be operated with the air on. However, the system shall be also capable of completely mixing the tank contents with the air off.

C. The aeration system shall be sized based on the following criteria or manufacturer's actual test data, whichever is more conservative:

Parameter	Basin T-70-1	Basin T-70-2	Basin T-70-3	Basin T-70-4
Minimum SOR (lb./day)	7600	7600	7600	7600

D. The jet aeration/mixing system shall operate continuously or intermittently on demand.

E. The mixing system(s) shall maintain solids in uniform suspension throughout each tank. The mixing system(s) shall completely mix the contents of the tanks so that the variations in WAS concentrations between any two sampling points in the tank do not exceed plus or minus 10 percent of the mean value.

F. Noise suppression devices shall be provided such that the noise level measured at 3 feet from each blower shall not exceed 80 dBA.

2.06 SYSTEM COMPONENTS

A. Major System Components of Aerated Sludge Holding Tank Mixing System:

1. Headers: Four aeration headers with jet aerators, complete, including supports and in-basin piping.
2. Blowers: Four rotary positive displacement blowers. Each rotary positive displacement blower shall include inlet filter, inlet silencer, discharge silencer, discharge sleeve type expansion joints, check valve, pressure relief valve, base plate, V-belt drive and motor, and sound attenuating enclosure.
3. Liquid Motive Pumps: The manufacturer shall provide solids handling end-suction pumps.

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2.07 EQUIPMENT DESCRIPTION

A. Aeration Headers:

1. Aeration headers shall be comprised of a liquid duct, an air duct, and aerator assemblies. Header shall be constructed such that the liquid duct, air duct, and jet aerator assemblies comprise one self-contained unit. Header shall be shipped in sections of length that are sufficient for installation in the Sludge Holding Tanks as shown on the Drawings.
2. The liquid duct shall be a cylindrical member having a plurality of liquid nozzle entry orifices which are longitudinally spaced along its perimeter, and aligned in a common horizontal plane. The inner surface of the liquid duct shall be smooth and free of protrusions which might collect stringy material.
3. The air duct shall also be a cylindrical member which is parallel to and above the liquid duct. The air duct shall be joined to, and supported by, the air manifolds, and additional support points as necessary. The air duct shall have a plurality of air manifold entry orifices longitudinally spaced along its perimeter, in corresponding number to, and in vertical alignment with the liquid nozzle entry orifices of the liquid duct. The provision of a separate air entry manifold with a fixed orifice for each jet assembly shall ensure uniform air distribution.
4. The liquid and air ducts shall be machine filament wound fiberglass reinforced plastic pipe. Liquid and air ducts shall be fabricated in strict conformance with ASTM D2996. Hand filament wound FRP piping, PVC, or other thermoplastics are not acceptable.
5. The aeration header shall be designed for an appropriate internal operating pressure plus a 5 to 1 safety factor. The header shall also be designed for an appropriate external pressure (vacuum) rating for the header flush out service conditions.
6. Each jet aerator assembly shall consist of an inner liquid nozzle, and an outer air/liquid delivery nozzle. The inner and outer nozzles shall be aligned on a common centerline, joined together, and laminated to form a single unit. The jet aerator assembly shall be joined to the liquid duct and the air manifold and laminated for strength to form a single integrated unit. The matting surface of the jet aerator assembly shall match the contour of the liquid duct and be stepped to match the liquid nozzle entry orifices of the liquid duct to ensure proper alignment, and provide a smooth contoured liquid flow path. No portion of the liquid nozzle or aerator assembly shall protrude into the liquid duct.
7. Both inner and outer nozzles shall be of nonclog design, free from all protrusions which might collect stringy material. The nozzles shall be able to pass solids with diameter up to 2.2 inches. Inner and outer nozzles shall be fabricated of isophthalic, corrosion-resistant laminating resin, reinforced with glass fibers, and a surfacing material of a commercial grade chemical-resistant glass having a coupling agent. The interior of each air and liquid nozzle shall contain a "coabrasion" liner

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to specifically achieve optimum abrasion resistance. Each nozzle shall contain a specific liner separate from the structural fiberglass wall of the nozzle. The liner shall be constructed of a glass laminate utilizing a minimum of two layers of 0.010-inch synthetic, apertured "Nexus" or "C glass" veil. The interior liner shall be a resin-rich surface layer containing no more than 20 percent by weight of synthetic veil, and shall be free from cracks and crazing. The liner shall be staged separately from the structural fiberglass laminate, but shall contain the same resin as the substrate structural wall, and be surface prepared to form a singular integrated laminate with the structural wall to prevent delamination of dissimilar materials. All construction shall be in accordance with the American Voluntary Standard PS 15-60.

8. The air manifolds, shall be enclosed conduits which convey the compressed air from the air duct to the jet aerator assembly. The air manifolds shall be fabricated of an isophthalic, corrosion-resistant laminating resin, reinforced with glass fibers, and a surfacing material of commercial grade chemical-resistant glass having a coupling agent. Air manifolds shall be fabricated in accordance with NBS PS 15-69.

B. Backflushing System: A positive flush-out system utilizing a pumped, out-of-basin cross-over pipe configuration and valve arrangement or an air backflushing system shall be provided.

C. Air Piping: By others.

D. Liquid Piping: By others.

E. Supports:

1. All necessary supports for the aeration headers shall be provided as part of the system.
2. Fabricated of Type 316 stainless steel for corrosion resistance.
3. Supports shall consist of a contoured saddle and a supporting base. The base shall be anchored with anchor bolts and grouted in-place, if necessary. The saddle shall be provided with a Buna-N rubber pad to avoid abrasion. A contoured clamp with an accompanying Buna-N rubber pad shall hold the piping to the saddle. Fastening hardware shall be Type 316 stainless steel.

F. Blowers and Accessories:

1. Blowers shall be rotary positive displacement type designed to provide the oxygen transfer requirements for the ambient and water temperature ranges specified, manufactured by Aerzen, Roots, or Kaeser.

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2. Blower Selection: The following design points for the blowers are based on information available during the design period. The manufacturer shall perform process calculations based on the Service Conditions and Design Criteria and confirm these selections.
3. Sludge Holding Tank Blowers: Shall be selected such that each blower shall deliver the rated total air requirement (nominally set at 940 scfm but shall be designed by the manufacturer). Motor shall be 75 horsepower, 1,800 rpm, 460 volts, 3-phase, 60-Hz, TEFC horizontal motor. Provide motors in accordance with Section 26 20 00, Low-Voltage AC Induction Motors. Provide winding thermostat and space heater for the motors. If a different horsepower, air flow rate, or pressure is required to meet the design conditions, the approval of the Engineer must be obtained.
4. Blowers shall be furnished completely packaged with all accessories, tested and ready for operation.
5. Each blower shall have a design rating for continuous service.
6. Lubrication: The timing gears and the bearings shall be splash oil lubricated from oil slingers mounted on the driving shaft and dipping in the oil. Sight glasses for oil level observation shall be provided. Grease lubricated bearings are not acceptable.
7. Expansion Joints: Provide flanged sleeved cylindrical type, three ply bias fiberglass reinforced silicone rubber connectors for blower discharge connections. Furnish units which are suitable for the operating pressure and temperature.
8. Equipment Base: Base shall be built so that the blower and motor are mounted to provide for fully automatic tensioning of the V-belt drive. The base shall be plate steel. All welds are to be continuous and full penetration.
9. Drive: Provide V-belt drive assembly consisting of sheaves, quick detachable bushings, V-belts, and sliding motor base. Provide drive assembly with a 1.4 service factor based on motor nameplate horsepower.
10. Guard: Provide OSHA style belt guard to enclose drive and belts. Design guard for easy removal. Guard shall be constructed to allow visual inspection of the drive system without removing the guard.
11. Inlet Filter: Provide each blower with a suitably sized air filter for the required flow rates.
12. Inlet Silencer: Provide a heavy duty, all welded, noise attenuation unit constructed of carbon steel sheet and plate and featuring an acoustically treated outlet for pulse control. Provide suitable supports for rigidly mounting silencer horizontally to the blower package base.
13. Pressure Relief Valve: Provide spring type relief valve with proper sizing and springs for set point pressure.
14. Check Valves: Blower discharge check valves shall be full-bore swing check type with stainless steel body, disc and shaft.

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G. Liquid Motive Pumps and Accessories:

1. Liquid Motive Pumps: Shall be selected so that each pump can deliver 6,600 gpm at 21 feet total dynamic head with a 50 hp motor. If a different horsepower, flow, or head is required, the approval of the Engineer is required.
   a. Specific criteria for solids handling end suction pump are provided in Section 44 42 56.10, Horizontal End Suction Centrifugal Pumps, and Pump Data Sheet.

2.08 INSTRUMENTATION AND CONTROLS

A. General: See Section 40 99 90, Package Control Systems, for general instrumentation and control requirements. All instrumentation, control, and electrical components provided under this section, including panel fabrication and color coding of lights and switches, shall comply with the requirements of Section 40 99 90, Package Control Systems.

B. Special Requirements:

1. Provide field mounted surge suppression on all analog signals. Refer to Section 40 99 90, Package Control Systems.
2. Provide the following instrumentation as shown on the Drawing. Refer to Section 40 99 90, Package Control Systems for instrument selection requirements.
   a. Temperature Indicators 830-TI-003-01, 830-TI-004-01, 830-TI-007-01, 830-TI-010-01.
      1) Range: 32 – 300 degrees F.
   b. Temperature Switches 830-TSH-003-02, 830-TSH-004-02, 830-TSH-007-02, 830-TSH-010-02.
      1) Setpoint by the manufacturer.
   c. Pressure Gauges 830-PI-003-01, 830-PI-004-01, 830-PI-007-01, 830-PI-010-01.
      1) Range: 0 - 50 psig.
   d. Pressure Switches 830-PSH-003-01, 830-PSH-004-01, 830-PSH-007-01, 830-PSH-010-01.
      1) Single set point, adjustable deadband 5-54 psig. Initial setpoint at 30 psig.

2.09 ACCESSORIES

A. Equipment Identification Plate: Provide in accordance with Section 01 00 01, General Requirements. 16-guage stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.

B. Lifting Lugs: Equipment weighing over 100 pounds.

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C. Anchor bolts of sufficient size and quantity shall be provided for mounting of all manufacturer supplied equipment and piping in the basin. Anchor bolts shall be Type 316 stainless steel, sized by equipment manufacturer, 1/2-inch minimum diameter..

2.10 FACTORY FINISHING

A. Prepare, prime, and finish coat blowers and pumps with the follow system.

1. SP-10, Near-white blast cleaning.
2. 1 coat 2.5 MDFT epoxy primer for ferrous metal: anticorrosive, converted epoxy primer containing rust-inhibitive pigments.
3. 1 coat 4 MDFT high-build epoxy: polyamidoamine epoxy, minimum 69 percent volume solids, capability of 4 to 8 MDFT per coat.
4. 1 coat 3 MDFT polyurethane enamel: two-component, aliphatic or acrylic based polyurethane; high floss finish.

2.11 SOURCE QUALITY CONTROL

A. Factory Tests and Adjustments: Test all equipment for proper alignment, operation and intended function.

B. Function Test: Perform manufacturer's standard motor test on equipment.

PART 3 EXECUTION

3.01 SHIPMENT, HANDLING, AND STORAGE

A. Insofar as is practical, the equipment shall be factory assembled. The parts and assemblies that are of necessity shipped unassembled, shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field. Generally, machined and unpainted ferrous metal parts shall be protected from the elements by the application of a strippable protective coating.

B. Weight, handling instructions, type of storage required, and instructions for protective maintenance during storage shall be included with each shipment to the construction site.

3.02 INSTALLATION

A. Installation will be by others with the manufacturer's assistance.

3.03 FIELD FINISHING

A. Touchup painting will be by others. Manufacturer shall provide touchup paint.

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3.04 FIELD QUALITY CONTROL

A. Functional Test: Conduct on each tank by the installer with the assistance of the manufacturer.

1. Manufacturer's representative shall inspect installation, check for lubrication and minor adjustments, provide certification that the system components have been installed correctly and are ready for operation.

B. Performance Test: Conduct on each tank by the installer with the assistance of the manufacturer.

1. Mixing Test: Demonstrate conformance with requirements listed below.
   a. Sample points will be located at up to two points on top of each tank.
   b. Samples will be collected at three separate depths at each location. The depths will be the same for each sample point.
   c. Owner shall perform residue test on each sample mean value of suspended solids concentrations will be used to demonstrate conformance with requirements.
   d. All testing and sampling shall conform to procedures established in the latest edition of Standard Methods for Examination of Water and Wastewater.
   e. The mixing system(s) shall be required to pass the performance test within the range of solids concentrations stated in Article Service Conditions. The TSS concentration of each of the twelve samples shall be within plus or minus 10 percent of the average.
2. If the mixing system on either tank fails to pass the performance test, the manufacturer and installer shall be responsible for adjusting and/or modifying the mixing system and retesting the equipment until a passing test is achieved.

3.05 MANUFACTURER'S SERVICES

A. Manufacturer's Representative: Present at Project Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:

1. 4 person-days for installation assistance and inspection, two trips minimum.
2. 4 person-days for Function Testing, and Manufacturer's Certificate of Proper Installation, two trips minimum.
3. 1 person-day for Prestartup Classroom and Onsite Training.
4. 8 person-days for Startup and Performance Testing, two trips minimum.

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B. Manufacturer's Representative shall make separate trips to the Project Site to complete the above services. The minimum number of trips required is six.

END OF SECTION

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DRAWINGS

ABBREVIATIONS

A	AMMETER, AMPERES, AWNINGS
AB	ANCHOR BOLT, ABOVE
ABDN	ABANDON
AC	ACOUSTICAL, ACOUSTICAL CEILING
AC	ALTERNATING CURRENT
AC	ASPHALTIC CONCRETE
ACFL	ACCESS FLOORING
ACI	AMERICAN CONCRETE INSTITUTE
ACMU	ACOUSTICAL CONCRETE MASONRY UNIT, ACOUSTICAL CMU
ACP	ACOUSTICAL PANELS
ACST	ACOUSTICAL
ACT	ACOUSTICAL TILE
AD	AREA DRAIN
ADDL	ADDITIONAL
ADJ	ADJACENT
ADW	DRY WEATHER AVERAGE
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AG	ACOUSTICAL, ACOUSTICAL GLASS
AGGR	AGGREGATE
AHR	ANCHOR
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AJ	ADJUSTABLE
AL	ALUMINUM
ALKY	ALKALINITY
ALTN	ALTERNATE
AM	AUTO-MANUAL
AMRD	ACOUSTICAL METAL ROOF DECKING
ANDZ	ANODIZE
APPROX	APPROXIMATE
APVD	APPROVED
ARCH	ARCHITECTURAL
AR	ANALOG RELAY
AS	AS SELECTED
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
AWW	WET WEATHER AVERAGE
@	AT
B	BELL
BAL	BALANCE
BETW	BETWEEN
BF	BLIND FLANGE, BOTTOM FACE
BFV	BUTTERFLY VALVE
BL	BASELINE
BFP	BACKFLOW PREVENTER
BLDG	BUILDING
BLK	BLOCK
BM	BEAM, BENCHMARK
BO	BOTTOM OF
B.O.B.	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BOT	BOTTOM
BRG	BEARING
BRK	BRICK
BRKR	BREAKER
BSP	BLACK STEEL PIPE
BV	BALL VALVE, BLOCK VENT
BVC	BEGINNING OF VERTICAL CURVE
C	CONDUIT, CASEMENT
°C	DEGREE CELSIUS
C TO C	CENTER TO CENTER
CAB	CABINET
CB	CATCH BASIN, CIRCUIT BREAKER
CC	CENTER OF CIRCLE
CC	CONTROL CABLE
CCP	CENTRAL CONTROL PANEL
CCS	CENTRAL CONTROL SYSTEM
CDF	CONTROLLED DENSITY FILL
CE	CONSTRUCTION ENTRANCE
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CHEM	CHEMICAL
CHKD	CHECKERED
CI	CAST IRON
CIP	CAST IRON PIPE, CAST IN PLACE
CIP	CULVERT INLET PROTECTION
CISP	CAST IRON SOIL PIPE
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTERLINE
CLDI	CEMENT LINED DUCTILE IRON
CLSF	CONTROLLED LOW STRENGTH FILL
CLG	CEILING
CLR	CLEAR, CLEARANCE
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CMP	CENTRAL MONITORING PANEL
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNTR	COUNTER
CO	CLEANOUT, CARBON MONOXIDE
COL	COLUMN, COLOR
CONC	CONCRETE
COND	CONDENSATE
CONDTN	CONDITIONED
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUED, CONTINUOUS, CONTINUATION
CONTR	CONTRACTOR
COORD	COORDINATE
COP	COPPER
CP	CENTER PIVOT
CP-X	CONTROL PANEL NO. X
CPLG	COUPLING
CPRSR	COMPRESSOR
CPT	CONTROL POWER TRANFORMER, CARPET
CPVC	CHLORINATED PVC
CR	CONTROL RELAY
CRS	COLD ROLLED STEEL
CRS	CONSTRUCTION ROAD STABILIZATION
CT	CERAMIC TILE
CT	CURRENT TRANSFORMER
CTC	COMPUTER TERMINAL CABINET
CTR	CENTER
CTRD	CENTERED
CTSK	COUNTERSUNK
CU	CUBIC
CU FT	CUBIC FOOT
CU IN	CUBIC INCH
CUH	COPPER TUBING, HARD DRAWN
CV	CHECK VALVE
CWR	CABINET DOOR MOUNTED WASTE RECEPTACLE
CY, CU YD	CUBIC YARD
CWS	CLEAN WATER SERVICES
D	DEEP, DRAIN
d	PENNY NAIL SIZE
DA	DUAL ACTION
DAS	DATA ACQUISITION SYSTEM
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DET	DETAIL
DF	DOUGLAS FIR, DRINKING FOUNTAIN
DDI	DROP INLET
DH	DOUBLE HUNG
DI	DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL
DIP	DUCTILE IRON PIPE
DIR	DIRECTION
DISCH	DISCHARGE
DN	DOWN
DO	DISSOLVED OXYGEN
DOL	DIRECT-ON-LINE
DP, DPNL	DISTRIBUTION PANEL
DR	DOOR
DS	DOWNSPOUT
DWG	DRAWING
DWL	DOWEL
△	DELTA
E	EAST, EMPTY
EA	EACH, EXHAUST AIR
EB, EBCT	EMPTY BED CONTACT TIME
ECC	ECCENTRIC
EE	EMERGENCY EYEWASH
EDF	EGG-SHAPED DIGESTER FACILITY
EF	EACH FACE, EXHAUST FAN
EFF	EFFICIENCY, EFFICIENT
EFL	EFFLUENT
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EL	ELEVATION
ELB	ELBOW
ELC	ELECTRICAL LOAD CENTER
ELEC	ELECTRIC, ELECTRICAL
ENGR	ENGINEER
EOP	EDGE OF PAVEMENT
ESC	EROSION AND SEDIMENT CONTROL
EP	EXPLOSION PROOF, EDGE OF PAVING
EQL	EQUAL
EQL SP	EQUALLY SPACED
EQPT	EQUIPMENT
ESC	EROSION AND SEDIMENT CONTROL
ETM	ELAPSED TIME METER
EVC	END OF VERTICAL CURVE
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXH	EXHAUST
EXP	EXPANSION, EXPOSED
EXP AB	EXPANSION ANCHOR BOLT
EXP JT	EXPANSION JOINT
EXST, EXIST	EXISTING
EXT	EXTERIOR
°F	DEGREE FAHRENHEIT
FB	FLAT BAR
F, FU	FUSE
F, FX	FIXED
FAP	FIRE ALARM PANEL
FC	FLEXIBLE CONDUIT
FCPLG	FLANGED COUPLING ADAPTER
FCL2	FREE CHLORINE RESIDUAL
FCO	FLOOR CLEANOUT
FCTY	FACTORY
FD	FLOOR DRAIN
FDN	FOUNDATION
FDR	FEEDER
FEXT	FIRE EXTINGUISHER
FF	FINISHED FLOOR
FG	FINISH GRADE, FLOAT GLASS
FH	FLAT HEAD
FHY	FIRE HYDRANT
FIG	FIGURE
FL	FLOW LINE
FLG	FLANGE
FL	FLOOR
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FLUOR	FLUORESCENT
FNSH	FINISH
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FP	FIELD PANEL
FPM	FEET PER MINUTE
FR	FORWARD REVERSE
FRP	FIBERGLASS REINFORCED PLASTIC
FSHS	FOLDING SHOWER SEAT
FT	FOOT OR FEET
FTG	FOOTING
FU	FIXTURE UNIT
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD
G, GND	GROUND
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GYPSUM BOARD
GC	GROOVED COUPLING
GCMU	GLAZED CONCRETE MASONRY UNITS
GFA	GROOVED FLANGE ADAPTER
GFI	GROUND FAULT INTERRUPTER
GFR	GROUND FAULT RELAY
GH	GREENHOUSE
GL	GLASS
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPS	GLOBAL POSITION SYSTEM
GRTG	GRATING
GSB	GYPSUM SOFFIT BOARD
GSP	GALVANIZED STEEL PIPE
GV	GATE VALVE
GVL	GRAVEL
GWB	GYPSUM WALLBOARD
GYP	GYPSUM
H	HIGH, HORN OR HOWLER
H2S	HYDROGEN SULFIDE
H.A.S.	HEADED ANCHOR STUD
HC	HOLLOW CORE WOOD
HCL	HYDROCHLORIC ACID
HDNR	HARDENER
HDNS	HARDNESS
HDR	HEADER
HDW	HARDWARE
HGL	HYDRAULIC GRADE LINE
HK	HOOK
HGT	HEIGHT
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HK	HOOK
HM	HOLLOW METAL
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HORIZ	HORIZONTAL
HP	HORSEPOWER
HPT	HIGH POINT
HPU	HYDRAULIC POWER UNIT
HR	HOSE RACK, HANDRAIL
HV	HOSE VALVE
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HWL	HIGH WATER LEVEL
IC	INTERRUPTING CAPACITY
ID	INDUCED DRAFT, INSIDE DIAMETER
IE	INVERT ELEVATION
I.F.	INSIDE FACE
IG	INSULATING, INSULATING GLASS
IN	INCH
INCAND	INCANDESCENT
INFL	INFLUENT
INJS	INJECTIONS
INST	INSTANTANEOUS
INSTM	INSTRUMENT, INSTRUMENTATION
INSUL	INSULATION
INVT	INVERT
IP	INLET PROTECTION, INSTRUMENTATION PANEL
IRRIG	IRRIGATION
ITG	INSULATED TEMPERED GLASS
ITX	ISOLATION TRANSFORMER
IU	INTAKE UNIT
IW	IRRIGATION WELL
J	JALOUSIE
JA	JAL-AWNING
JB	JUNCTION BOX
JAN	JANITOR
JCT	JUNCTION
JT	JOINT
K	KEY GROUP, KEY INTERLOCK
KIP	THOUSAND POUNDS
KIT	KITCHEN
K-PL	KICKPLATE
KSK	KITCHEN SINK
KV	KILOVOLTS
KVA	KILOVOLT AMPERES
KVAR	KILOVOLT AMPERES REACTIVE
KW	KILOWATT
L	ANGLE, LENGTH
LA	LIGHTNING ARRESTER
LAB	LABORATORY
LAM	LAMINATE
LAT	LATITUDE
LB	POUND
LC	LIGHTING CONTACTOR
LD	COMBINATION LOUVER/DAMPER
LDG	LOADING DOCK
LEL	LOWER EXPLOSIVE LIMIT
LF	LINEAR FEET
LG	LONG
LH	LEFT HAND
LHR	LEFT HAND REVERSE
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LNTL	LINTEL
LONG	LONGITUDINAL
LOS	LOCK-OUT STOP PUSHBUTTON
LP	LIGHT POLE, LIGHTING PANEL, LOCAL PANEL
LPT	LOW POINT
LR	LATCHING RELAY
LR	LOCAL-REMOTE
LR	LONG RADIUS
LS	LABORATORY SINK
LT	LEFT
LTG, LTS	LIGHTS OR LIGHTING
LTX	LIGHTING TRANSFORMER
LWL	LOW WATER LEVEL
MA	MANUAL-AUTO
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MC	MASONRY CLEARANCE
MC	MODULATE-CLOSE
MCC	MOTOR CONTROL CENTER
MCJ	MASONRY CONTROL JOINT
MDO	MEDIUM DENSITY OVERLAY
MECH	MECHANICAL
MFD	MANUFACTURED
MFR	MANUFACTURER
MGD	MILLION GALLONS PER DAY
MH	MANHOLE, MOUNTING HEIGHT
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MLO	MAIN LUGS ONLY
MMDW	DRY WEATHER MAXIMUM MONTH
MMP	MECHANICAL MOUNTING PANEL
MMWW	WET WEATHER MAXIMUM MONTH
MO	MANUAL OPERABLE, MASONRY OPENING
MP	METAL PANEL
MPU	MULTIPURPOSE UNIT
MS	MANUFACTURER'S STANDARD
MSC	MANUFACTURER SUPPLIED CABLE
MSR	GROUPED MOTOR CONTROL
MT	MOUNT
MTD	MOUNTED
MTG	MOUNTING
MTS	MANUAL TRANSFER SWITCH
MTS	MILL TYPE STEEL PIPE
MU	MULCHING
MV	MERCURY VAPOR
MWS	MAXIMUM WATER SURFACE
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NA	NON-AUTOMATIC
NC	NORMALLY CLOSED
NEUT	NEUTRAL
NG	NATURAL GAS
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NIC	NOT IN CONTRACT
N.O.	NORMALLY OPEN
NO., #	NUMBER
NOM	NOMINAL
NP	NON-PROTECTED
NPT	NATIONAL PIPE THREADS
NS	NON-SHRINK
NTS	NOT TO SCALE
O2	OXYGEN
O TO O	OUT TO OUT
OA	OVERALL, ODOROUS AIR
OC	ON CENTER
OC	OPEN-CLOSE (O)
OCA	OPEN-CLOSE-AUTO
OCR	OPEN-CLOSE-REMOTE
OD	OUTSIDE DIAMETER, OVERFLOW DRAIN
O.F.	OUTSIDE FACE
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OL	OVERLOAD RELAY
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
OP	OPAQUE PANEL, OUTLET PROTECTION
OPER	OPERATOR
OPNG	OPENING
OPP	OPPOSITE
OSA	OUTSIDE AIR
OSC	OPEN-STOP-CLOSE
OSD	OPEN SITE DRAIN
OWSJ	OPEN WEB STEEL JOIST
OZ	OUNCE
P	PROJECTED
P	PILASTER, PIPE
PAVT	PAVER TILE
PB	PUSHBUTTON SWITCH
PC	POINT OF CURVE, PHOTOCELL
PC	PRECAST CONCRETE PANEL
PCCP	PRECAST CONCRETE CYLINDER PIPE
PCV	PRESSURE CONTROL VALVE
PE	PLAIN END
PED	PEDESTAL, PEDESTRIAN
PEP	POLYETHYLENE PIPE
PEN.	PENETRATION
PFC	POUNDS PER CUBIC FOOT
PH	PENTHOUSE
pH	HYDROGEN ION CONCENTRATION
PH	PHASE
PI	POINT OF INTERSECTION
PIT	PILOT TUBE TEST STATION
PJF	PREMOULDED JOINT FILLER
PL	PLATE (STEEL)
PL	PROPERTY LINE
PLAM	PLASTIC LAMINATE
PLAS	PLASTER, PLASTIC
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLYWD	PLYWOOD
PNL	PANEL
PP	POWER POLE
P-P	PUSH-PULL
PPL	POLYPROPYLENE LINED
PR	PAIR
PRC	POINT OF REVERSE CURVE
PRCST	PRECAST
PREFAB	PREFABRICATION
PRES	PRESSURE
PRI	PRIMARY
PRM	PERMANENT REFERENCED MARKER
PROJ	PROJECTION
PROP	PROPERTY
PS	PLASTIC SHEET, POLYCARBONATE SHEET
PS	PAINT SYSTEM
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH, GAUGE
PT	POINT OF TANGENCY
PT	POTENTIAL TRANSFORMER
PT	PRESSURE TREATED
PTD	PAPER TOWEL DISPENSER
PTN	PARTITION
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENCY
QAA	AVERAGE FLOW
QMM	MAXIMUM 30 DAY FLOW
QPI	PEAK INSTANTANEOUS FLOW
QPP	PEAK PUMPING FLOW
QT	QUARRY TILE
R	RISER
R OR RAD	RADIUS
RA	RETURN AIR
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RCPT	RECEPTACLE
RD	ROAD, ROOF DRAIN
RDCR	REDUCER
RDW	REDWOOD
RECIR	RECIRCULATION
REF	REFER OR REFERENCE
REFR	REFRIGERATE, REFRIGERANT
REINF	REINFORCED, REINFORCING, REINFORCE
REQD	REQUIRED
RESIL	RESILIENT
RFS	ROLL-UP FIRE SHUTTER
RH	RIGHT HAND
RH	RODHOLE
RHR	RIGHT HAND REVERSE
RL	RAIN LEADER
RLS	RUBBER LINED STEEL
RM	ROOM
RO	ROUGH OPENING
ROL	RAISE-OFF-LOWER
RPM	REVOLUTIONS PER MINUTE
RR	RIPRAP

NOTES:

1. CONTACT ENGINEER FOR ABBREVIATIONS USED BUT NOT SHOWN ON THIS DRAWING.

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MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

CH2MHILL.

GENERAL

ABBREVIATIONS

ISSUED FOR BID

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
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FILENAME: 001-G-0101_457133.dgn PLOT DATE: 2/28/2013 PLOT TIME: 5:24:17 PM

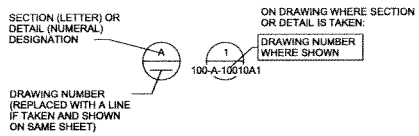
ABBREVIATIONS

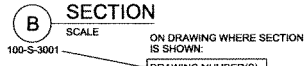
RRUB	RADIAL RUBBER
RS	RIGID STEEL
RST	REINFORCING STEEL
RT	RIGHT
RTN	RETURN
RTO	REGENERATIVE THERMAL OXIDIZER
RUB	RUBBER
RUBC	RUBBER CUSHIONED FLOORING
RUBS	RUBBER ESD CONTROL FLOORING
R/W	RIGHT OF WAY
S	I-BEAM
S	SLOPE, SOUTH, SWITCH
SA	SUPPLY AIR
SATC	SUSPENDED ACCUSTICAL TILE CEILING
SB	SEDIMENT BASIN
SC	SHOWER CURTAIN, SOLID CORE WOOD
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SCC	SOLID CORE
SCFM	STANDARD CUBIC FEED PER MINUTE
SCHED	SCHEDULE
SCU	SPEED CONTROL UNIT
SDP	SUB-DISTRIBUTION PANEL
SDWK	SIDEWALK
SEC	SECONDARY
SECT	SECTION
SED	SEDIMENTATION
SEW	SEWAGE
SG	LAMINATED SAFETY GLASS, SAFETY
SGWB	SUSPENDED GYPSUM WALL BOARD
SH	SHEET
SHA	SURFACE HARDENING AGENT
SHS	SOLIDS HANDLING SYSTEM
SIM	SIMILAR
SK	SINK
SLR	SEALER
SMLS	SEAMLESS EPOXY
SOI	SPRAY- ON INSULATION
SOLN	SOLUTION
SP	SPACE OR SPACES, SPANDREL PANEL, STORMPROOF
SPEC, SPECS	SPECIFICATIONS
SPD	SUMP PUMP DISCHARGE
SPG	SPACING
SPLY	SUPPLY
SQ	SQUARE
SQ FT	SQUARE FOOT, FEET
SQ IN	SQUARE INCH
SR	SHORT RADIUS
SS	START-STOP
SST	STAINLESS STEEL
SSC	SUPERVISORY SET POINT CONTROL
ST	STORM DRAIN
ST	STRAIGHT
STA	STATUS, STATION
STD	STANDARD
STIF	STIFFENER
STIRR	STIRRUP
STL	STEEL
STRL	STRUCTUAL
STRUCT	STRUCTURE
SUBFL	SUBFLOOR
SUSP	SUSPENDED
SV	SOLENOID VALVE
SVIN	SHEET VINYL
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYMM	SYMMETRICAL
T	THERMOSTAT, TREAD
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TA	TRANSFER AIR
TAN	TANGENT
TB	TERMINAL BOARD
TBG	TUBING
TC	TIME TO CLOSE
TC	TURBIDITY CURTAIN
TCAD	TIME CLOSE AFTER DE-ENERGIZATION
TCAE	TIME CLOSE AFTER ENERGIZATION
TDH	TOTAL DYNAMIC HEAD
TDR	TIME DELAY RELAY
TECH	TECHNICAL
TEL	TELEPHONE
TEMP	TEMPORARY, TEMPERATURE
TF	TOP FACE
TFG	TEMPERED FLOAT GLASS
TG	TEMPERED
TH	TOP-HINGED
THD	THREAD
THK	THICKNESS
THRU	THROUGH
TJB	TERMINAL JUNCTION BOX
TL	TEFLON LINED PIPE
T.O.	TIME TO OPEN, TOP OF
TOAE	TIME OPEN AFTER ENERGIZATION
TOC	TOP OF CONCRETE
TOC	TOP OF CURB
TOD	TIME ON DELAY, TOP OF DUCT TOTAL OXYGEN DEMAND
TOF	TOP OF FOOTING
TOG	TOP OF GROUT, TOP OF GRATE
T.O.P.	TOP OF PARAPET
TOS	TOP OF SLAB
TOW	TOP OF WALL
TP	TURNING POINT
TR	TRANSOM, TRUSS
TRANS	TRANSFORMER, TRANSITION
TRANSV	TRANSVERSE
TRD	TREAD
TS	TEMPORARY SEEDING, TUBE STEEL
TSHT	THRESHOLD
TSS	TOTAL SUSPENSION SOLIDS
TST	TOP OF STEEL
TTC	TELEPHONE TERMINAL CABINET
TTD	TOILET TISSUE DISPENSER
TU-X	TREATMENT UNIT NO. X
TURB	TURBIDITY
TWP	TRANSLUCENT WALL PANEL
TX	TRANSFORMER
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTIBLE POWER SUPPLY
USB	UNIT SUBSTATION
UVR	UNDER VOLTAGE RELAY
V	VENT, VALVE
V	VOLTMETER, VOLTS
VB	VAPOR BARRIER (RETARDER)
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VCT	VINYL COMPOSITION TILE
VEL	VELOCITY
VERT	VERTICAL
VHC	VOLATILE HYDROCARBONS
VIB	VIBRATION
VIF	VERIFY IN FIELD
VIN	VINYL
VINT, VT	VINYL TILE
VP	VERTICAL PIVOTED
VPS	VENEER PLASTER SYSTEM
VPC	POINT OF VERTICAL CURVATURE
VPI	POINT OF VERTICAL INTERSECTION
VPT	POINT OF VERTICAL TANGENT
VS	VERTICAL SLIDE
VTR	VENT THRU ROOF
VWC	VINYL WALL COVERING
W	WEST
W/	WITH
WC	WATER COLUMN
WEASTRIP	WEATHERSTRIP
WG	WIRE, WIRE GLASS
WH	WATTHOUR METER
WHD	WATTHOUR DEMAND METER
WP	WATERPROOF, WEATHERPROOF, WORKPOINT
WR	WASTE RECEPTACLE
WRB	WATER RESISTANT GWB
WS	WATER SURFACE, WATERSTOP, WELDED STEEL
WWF	WELDED WIRE FABRIC
WWPH	WET WEATHER PEAK HOUR

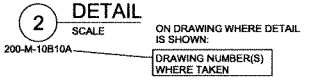
NOTES:

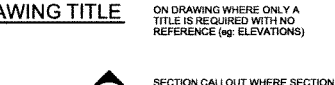
1. CONTACT ENGINEER FOR ABBREVIATIONS USED BUT NOT SHOWN ON THIS DRAWING.

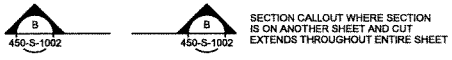
SECTION / DETAIL DESIGNATIONS

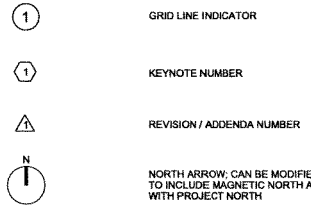












DESIGN DETAIL DESIGNATION

NOTES:

1. ALL DESIGN DETAILS ARE TYPICAL AND MUST BE USED IF DESIGN DETAIL DESIGNATION IS NOT SHOWN
2. THE TERM STANDARD DETAIL, OR A FORM OF IT, IS SYNOMONOUS WITH DESIGN DETAIL. THE DESIGN DETAILS REPRESENT THE CHARACTER AND NATURE OF THE WORK REQUIRED THROUGHOUT THE PROJECT. ALL ASSOCIATED WORK SHALL BE IN ACCORDANCE WITH THE DESIGN DETAILS SHOWN WHETHER THE DETAILS ARE SPECIFICALLY REFERENCED OR NOT.

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SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

GENERAL
ABBREVIATIONS

CH2MHILL.

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

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PIPE AND FITTING SYMBOLS

DOUBLE LINE	SINGLE LINE	
		EXISTING PIPE
		NEW PIPE
		EXISTING PIPE TO BE ABANDONED
		EXISTING PIPE TO BE REMOVED
		WELDED JOINT
		GROOVED END JOINT
		FLANGED JOINT
		MECHANICAL JOINT & PROPRIETARY RESTRAINED JOINT
		BELL & SPIGOT JOINT (LEADED)
		HUB & SPIGOT JOINT (RUBBER GASKET)
		BALL JOINT
		ADAPTER SIDE GROOVED END ADAPTER FLANGE
		FLANGED COUPLING ADAPTER
		FLEXIBLE COUPLING
		METAL BELLOWS EXP JOINT
		ELASTOMER BELLOWS EXP JOINT
		ELBOW UP
		ELBOW OOWN
		TEE UP
		TEE DOWN
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER

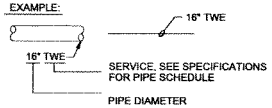
DOUBLE LINE	SINGLE LINE	
		REDUCING BUSHING
		UNION
		CAP
		ANCHOR
		ELBOW, 90 DEGREE
		CROSS
		TEE
		ELBOW, 45 DEGREE
		LATERAL

NOTES:

1. ONLY FLANGED END CONNECTIONS ARE SHOWN HERE FOR DOUBLE LINE FITTINGS. FITTINGS WITH OTHER END PATTERNS ARE SHOWN SIMILARLY ON THE CONSTRUCTION DRAWINGS. ALSO SEE PIPING SPECIFICATIONS.
2. SYMBOLS SHOWN HERE FOR SINGLE LINE FITTINGS ARE GENERIC ONLY. REFER TO PIPING SPECIFICATIONS FOR SPECIFIC END CONNECTIONS FOR SINGLE LINE PIPE AND FITTINGS.
3. EXISTING PIPE AND EQUIPMENT IS SHOWN LIGHT-LINED AND/OR SCREENED AND IS NOTED AS EXISTING. NEW PIPING AND EQUIPMENT IS SHOWN HEAVY-LINED.

PIPING DESIGNATION

EXAMPLE:



MECHANICAL LEGEND AND NOTES

GENERAL PIPING NOTES

1. UNDERGROUND UTILITIES SHOWN ARE TAKEN FROM EXISTING RECORDS AND ARE SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR SHALL CONTACT ALL UTILITY OWNERS AND CONFIRM LOCATIONS OF EXISTING UTILITIES AT LEAST 48 HOURS BEFORE BEGINNING CONSTRUCTION. THE CONTRACTOR SHALL ACCURATELY LOCATE AND UNCOVER ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION. ANY DAMAGE RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. WHERE CROSSING OF EXISTING UTILITIES OCCUR, PROVIDE 12" MINIMUM CLEARANCE.
2. UNLESS OTHERWISE NOTED, LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
3. SIZE OF FITTINGS SHOWN ON PLANS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
4. LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS SHOWN IS ONLY APPROXIMATE. CONTRACTOR SHALL DESIGN AND PROVIDE ALL HANGERS AND SUPPORTS NECESSARY TO COMPLY WITH SPACING AND LOCATON REQUIREMENTS IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 15.
5. ALL JOINTS SHALL BE WATERTIGHT. WALL PIPES SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO BACKFILL.
6. ALL FLEXIBLE CONNECTORS AND FLANGED COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, AND ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE ADEQUATE FOR TEST PRESSURES SPECIFIED IN SPECIFICATION SECTION 40 27 00.
7. SYMBOLS, LEGENDS, AND PIPE USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE PLANS, WHEREVER APPLICABLE. NOT ALL OF THE VARIOUS PIPING COMPONENTS ARE NECESSARILY USED IN THE PROJECT.
8. ALL BURIED PIPING SPECIFIED TO BE PRESSURE TESTED, EXCEPT FLANGED, WELDED, OR SCREWED PIPING, SHALL BE PROVIDED WITH THRUST RESTRAINTS AT ALL DIRECTION CHANGES. SEE THRUST DETAILS AND NOTES ON THIS SHEET AND SPECIFICATION SECTION 40 27 00.
9. NUMBER AND LOCATION OF UNIONS SHOWN ON PLANS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.
10. WHERE A GROOVED END COUPLING IS SHOWN, IT SHALL BE THE RIGID JOINT TYPE, UNLESS OTHERWISE SPECIFIED. WHERE A FLANGED COUPLING ADAPTER IS SHOWN, A STANDARD FLANGE SHALL BE JOINED TO THE COUPLING ADAPTER.
11. UNLESS SHOWN OTHERWISE ON DRAWINGS, THE UNDERGROUND PIPES SHALL HAVE 3-FEET MINIMUM SOIL COVER.

VALVE SYMBOLS

SINGLE LINE	DOUBLE LINE
GATE	
KNIFE GATE	OR
BUTTERFLY	OR
GLOBE	OR
BALL	OR
SEATING PORT ECCENTRIC PLUG	OR
PLUG OR COCK	OR
NEEDLE	OR
DIAPHRAGM	OR
PINCH	OR
SWING CHECK	OR
BALL CHECK	OR

HOSE VALVE (HV- X) OR (V-X)
X = NO. IN SPECS

SAMPLE

MUD

PRESSURE RELIEF

AIR AND/OR VACUUM RELEASE

REGULATED SIDE
PRESSURE CONTROL (INTERNAL PILOT)

REGULATED SIDE
PRESSURE CONTROL (EXTERNAL PILOT)

MULTI-PORT VALVE.
ARROWS INDICATE FLOW PATTERN.
SEATING PORTS ARE IMPLIED BY INDICATED FLOW PATTERN.

TELESCOPING SCUM VALVE

ACTUATOR SYMBOLS

PNEUMATIC DIAPHRAGM

PNEUMATIC CYLINDER

ELECTRIC MOTOR

HYDRAULIC

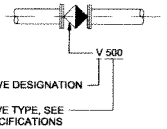
MANUAL

SOLENOID

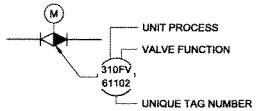
ELECTRO HYDRAULIC

VALVE DESIGNATIONS

MANUAL VALVES AND CHECK VALVES

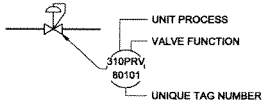


CONTROL VALVES



NOTE:
SEE I&C LEGENDS FOR FURTHER DEFINITIONS AND ACTUATOR TYPES.

SELF-CONTAINED REGULATING VALVES



NOTE:
FLOW STREAM IDENTIFICATIONS ARE SHOWN ON THE INSTRUMENTATION AND CONTROL LEGENDS

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MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

GENERAL
PROCESS MECHANICAL LEGEND

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0 1"

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INSTRUMENT IDENTIFICATION

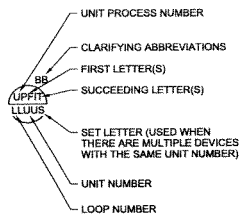
INSTRUMENT IDENTIFICATION LETTERS TABLE

LETTER	FIRST-LETTER		SUCCEEDING-LETTERS		
	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	READOUT OR PASSIVE FUNCTION	READOUT OR PASSIVE FUNCTION
A	ANALYSIS (+)		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE (*)	USER'S CHOICE (*)	USER'S CHOICE (*)
C	USER'S CHOICE (*)			CONTROL	
D	DENSITY (S.G.)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT, SENSOR		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE (*)		GLASS, GAUGE VIEWING DEVICE	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION	MOMENTARY			MIDDLE, INTERMEDIATE
N	TORQUE		USER'S CHOICE (*)	USER'S CHOICE (*)	USER'S CHOICE (*)
O	USER'S CHOICE (*)		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD OR PRINT		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTI VARIABLE		MULTI FUNCTION	MULTI FUNCTION	MULTI FUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED (*)	X AXIS	UNCLASSIFIED (*)	UNCLASSIFIED (*)	UNCLASSIFIED (*)
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION	Z AXIS		DRIVE, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

TABLE BASED ON THE INTERNATIONAL SOCIETY OF AUTOMATION (ISA) STANDARD.

(+) WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL. SEE ABBREVIATIONS AND LETTER SYMBOLS.
(*) WHEN USED, DEFINE THE MEANING HERE FOR THE PROJECT.

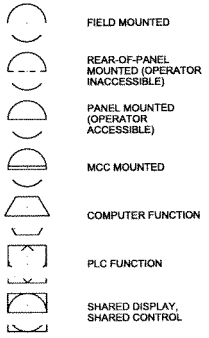
EXAMPLE SYMBOLS



DIGITAL SYSTEM INTERFACES

- ▲ ANALOG INPUT
- ▼ ANALOG OUTPUT
- $\triangle_X$ DISCRETE INPUT
- ∇_X DISCRETE OUTPUT

GENERAL INSTRUMENT OR FUNCTIONAL SYMBOLS



TRANSDUCERS

A	ANALOG	I	CURRENT
D	DIGITAL	P	PNEUMATIC
E	VOLTAGE	PF	PULSE FREQUENCY
F	FREQUENCY	PD	PULSE DURATION
H	HYDRAULIC	R	RESISTANCE

EXAMPLE

CURRENT TO PNEUMATIC TRANSDUCER (BACK OF PANEL, IN A FLOW LOOP)

ACCESSORY DEVICES

A	ALARM
C	CONTROLLER
I	INDICATOR
R	RECORDER
S	SWITCH
T	TRANSMITTER
X	UNCLASSIFIED

EXAMPLE

TRANSMITTER AS AN ACCESSORY TO A FLOW ELEMENT

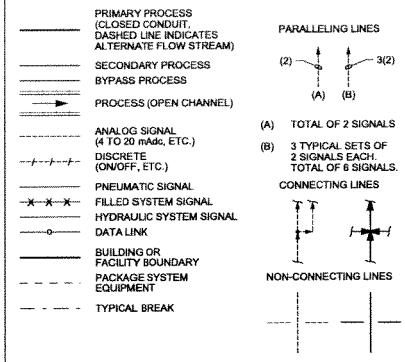
SPECIAL CASES

ON AND OFF EVENT LIGHTS

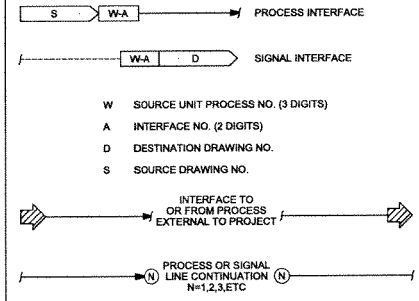
ON-OFF HAND SWITCH, MAINTAINED CONTACT SWITCH (CONTROLLED DEVICE WILL RESTART ON RETURN OF POWER AFTER POWER FAILURE).

STOP-START HAND SWITCH MOMENTARY CONTACT SWITCHES (CONTROLLED DEVICE WILL NOT RESTART ON RETURN OF POWER AFTER POWER FAILURE).

LINE LEGEND



INTERFACE SYMBOLS



SELF CONTAINED VALVE & EQUIPMENT TAG NUMBERS

W-D-X-Y

W		UNIT PROCESS NUMBER
D	ARV	AIR RELEASE VALVE
	AVRV	AIR AND VACUUM RELEASE VALVE
	BLR	BLOWER
	CMP	COMPRESSOR
	E	EJECTOR
	GTE	GATE
	M	MECHANICAL EQUIPMENT
	MIX	MIXER
	NMH	MONORAIL
	PMP	PUMP
	PRV	PRESSURE RELIEF VALVE
	T	TANK
	SCR	SCREEN
X		LOOP NUMBER
Y		UNIT NUMBER

ABBREVIATIONS & LETTER SYMBOLS

AC	ALTERNATING CURRENT
AFD	ADJUSTABLE FREQUENCY DRIVE
AM	AUTO-MANUAL
CAM	COMPUTER-AUTO-MANUAL
CCS	CENTRAL CONTROL SYSTEM
CL_2 etc.	CHLORINE (TYPICAL: USE STANDARD CHEMICAL ELEMENT ABBREVIATIONS)
CM	COMPUTER-MANUAL
COD	CHEMICAL OXYGEN DEMAND
CP-X	CONTROL PANEL NO. X
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DCU	DISTRIBUTED CONTROL UNIT
DO	DISSOLVED OXYGEN
FCL_2	FREE CHLORINE RESIDUAL
FOS	FAST-OFF-SLOW
FOSA	FAST-OFF-SLOW-AUTO
FOSR	FAST-OFF-SLOW-REMOTE
FP-W-X	FIELD PANEL NO. WX (W=UNIT PROCESS NUMBER X=PANEL NUMBER)
FR	FORWARD-REVERSE
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
ISR	INTRINSICALLY SAFE RELAY
LEL	LOWER EXPLOSIVE LIMIT
LOS	LOCKOUT STOP
LR	LOCAL-REMOTE
MA	MANUAL-AUTO
MC	MODULATE-CLOSE
MCC-X	MOTOR CONTROL CENTER NO. X
MSC	MANUFACTURER SUPPLIED CABLE
OC	OPEN-CLOSE(D)
OCA	OPEN-CLOSE-AUTO
OCR	OPEN-CLOSE-REMOTE
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
OIU	OPERATOR INTERFACE UNIT
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE
pH	HYDROGEN ION CONCENTRATION
PLC	PROGRAMMABLE LOGIC CONTROLLER
RIO	REMOTE I/O UNIT
RM-X	REMOTE MULTIPLEXING MODULE NO. X
RTU-X	REMOTE TELEMETRY UNIT NO. X
SF	SLOWER-FASTER
SS	START-STOP
SSC	SUPERVISORY SET POINT CONTROL
TCL_2	TOTAL CHLORINE RESIDUAL
TOC	TOTAL ORGANIC CARBON
TOD	TOTAL OXYGEN DEMAND
TURB	TURBIDITY
VHC	VOLATILE HYDROCARBONS
VIB	VIBRATION
Δ	DIFFERENCE
Σ	SUM
x	MULTIPLY
÷	DIVIDE
$F(x)$	CHARACTERIZED
x^N	RAISED TO THE Nth POWER
$\sqrt{}$	SQUARE ROOT
AVG	AVERAGE
1:1	REPEAT OR BOOST
>	SELECT HIGHEST SIGNAL
<	SELECT LOWEST SIGNAL
}	BIAS
%	GAIN OR ATTENUATE

GENERAL NOTES

1. COMPONENTS AND PANELS SHOWN WITH A SINGLE ASTERISK (*) ARE TO BE PROVIDED AS PART OF A PACKAGE SYSTEM.
2. COMPONENTS AND PANELS SHOWN WITH A DOUBLE ASTERISK (**) ARE TO BE PROVIDED UNDER DIVISION 26, ELECTRICAL.
3. COMPONENTS SHOWN WITH A DIAMOND (◆) ARE PART OF PROCESS INSTRUMENTATION AND CONTROLS.
4. THIS IS A STANDARD LEGEND. THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THE PROJECT.

NO.	DATE	DSGN	REVISION	CHK	BY	APVD
		DR		K RINER		APVD
		C SAHARCHIZ				

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

GENERAL
INSTRUMENTATION AND CONTROLS LEGEND
SHEET 1

CH2MHILL

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

DATE	MARCH 2013
PROJ	457133
DWG	001-G-0401
SHEET	of

ISSUED FOR BID

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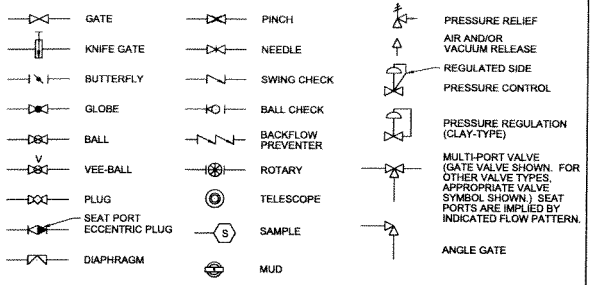
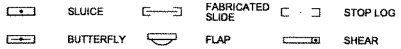
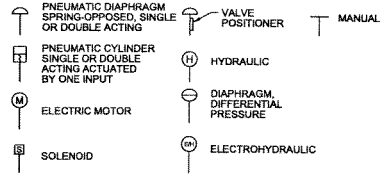
VALVE SYMBOLS



GATE SYMBOLS



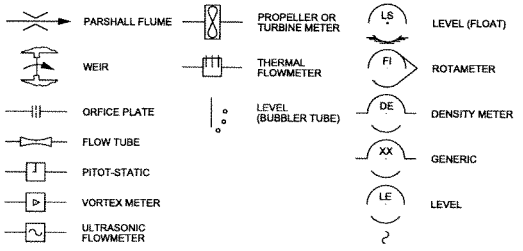
ACTUATOR SYMBOLS



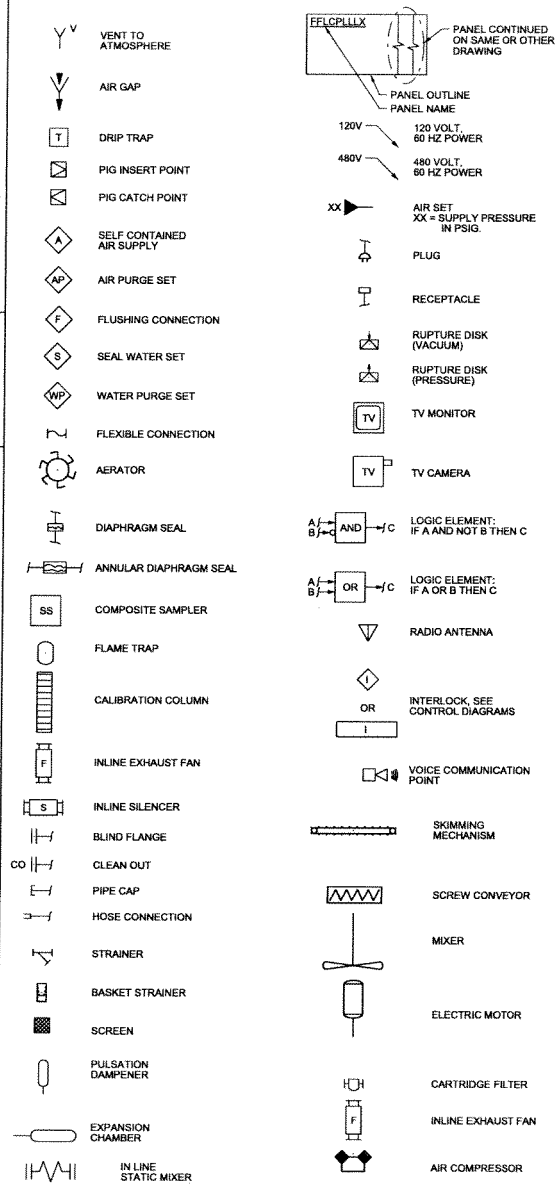
NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL, OR HYDRAULIC)

XX: FO FAIL OPEN
FC FAIL CLOSED
FLP FAIL TO LAST POSITION

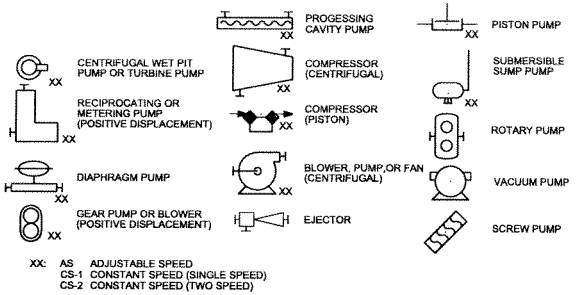
PRIMARY ELEMENT SYMBOLS



MISCELLANEOUS SYMBOLS



PUMP AND COMPRESSOR SYMBOLS



XX: AS ADJUSTABLE SPEED
CS-1 CONSTANT SPEED (SINGLE SPEED)
CS-2 CONSTANT SPEED (TWO SPEED)

LINE SIZE IDENTIFICATION

XX
FLOW STREAM IDENTIFICATION

FLOW STREAM IDENTIFICATION

ALP	AIR LOW PRESSURE	RS	RAW SEWAGE
BWR	BACKWASH RECYCLE	SE	SECONDARY EFFLUENT
DR	PROCESS DRAIN	SH	SODIUM HYPOCHLORITE
DSL	DECANT	SRS	SCREENED RAW SEWAGE
DWS	DEWATERED SLUDGE	WAS	WASTE ACTIVATED SLUDGE
F	FILTRATE	W3	PLANT REUSE WATER.
FE	FILTER EFFLUENT		
ML	MIXED LIQUOR		
NRCY	NITRIFIED RECYCLE		
OFL	OVERFLOW		
POS	POLYMER SOLUTION		
RAS	RETURN ACTIVATED SLUDGE		

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK		
C.SAHARKHIZ		K.RINER		

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

CH2MHILL.

GENERAL
INSTRUMENTATION AND CONTROLS
LEGEND
SHEET 2

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MARCH 2013
PROJ	457133
DWG	001-G-0402
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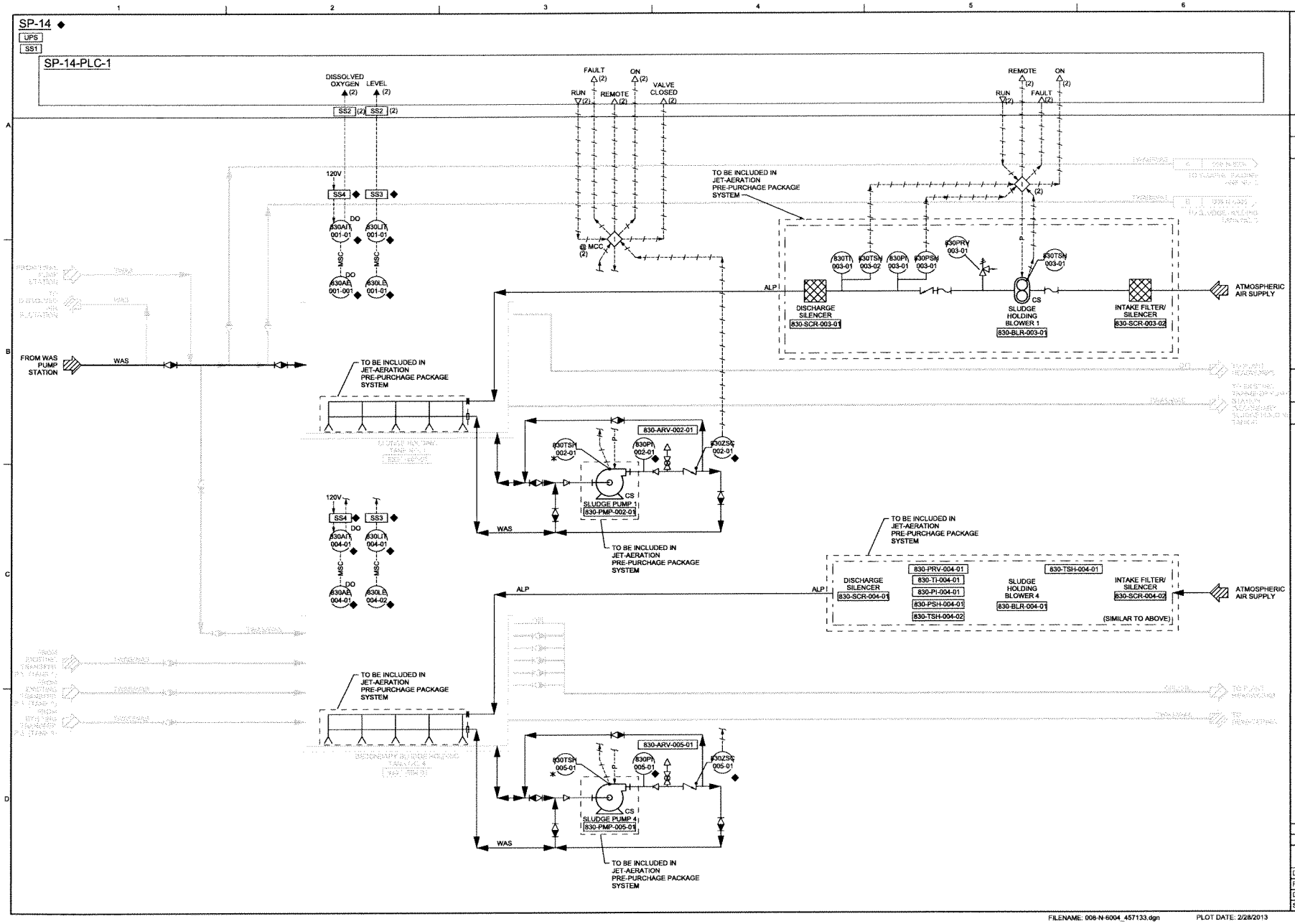

CH2MHILL.

INSTRUMENTATION AND CONTROL

P&ID
SLUDGE HOLDING TANKS AND JET AERATION SYSTEMS

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

NO.	DATE	BY	APVD
DSGN	C. SAHARCHIZ	DR	AL CLOUGH
		REVISION	CHK

NTS
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0 1"

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FILENAME: 008-N-6004_457133.dgn PLOT DATE: 2/28/2013 PLOT TIME: 5:24:44 PM

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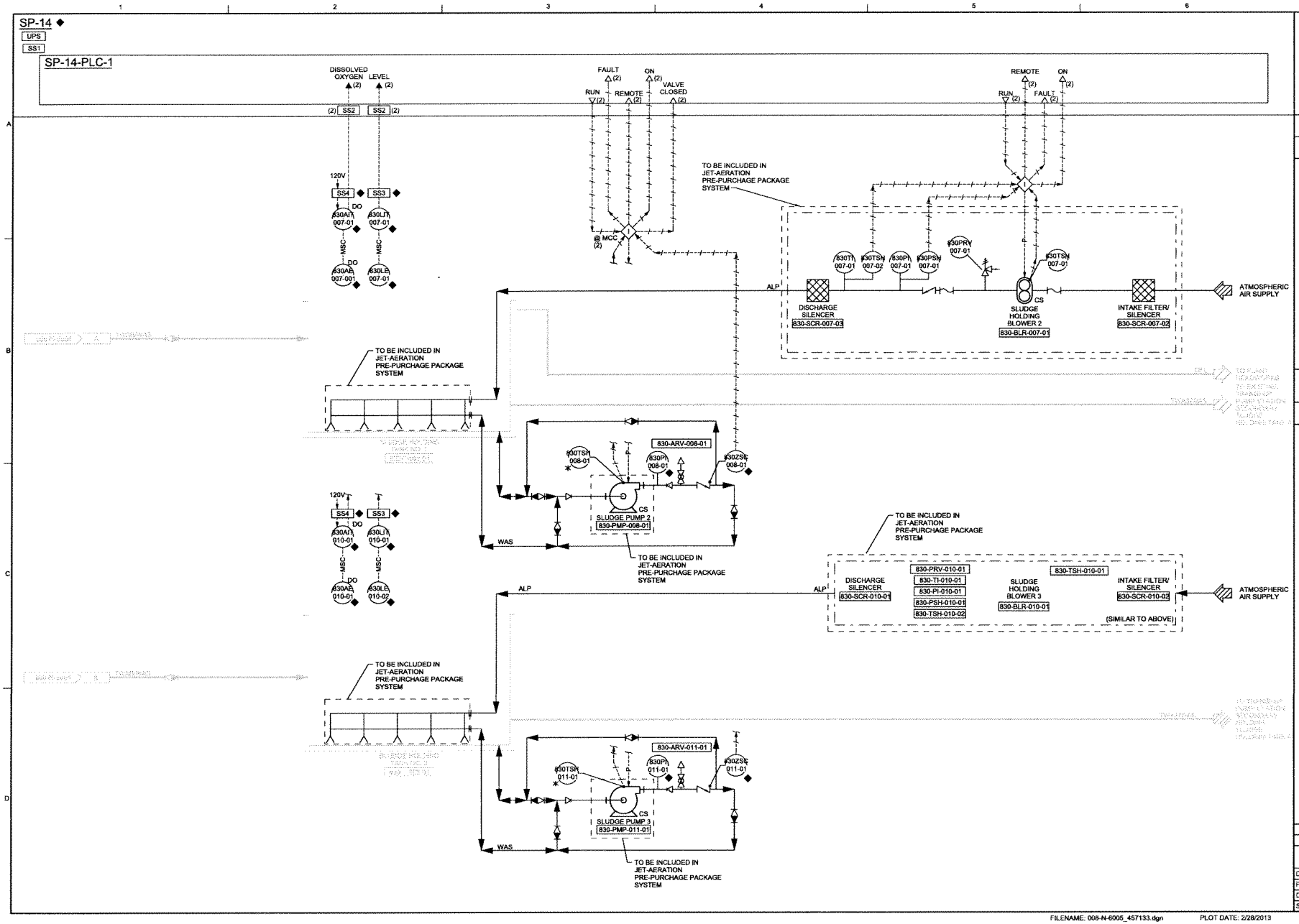

NO.	DATE	BY	APVD
DSGN	C.SAHARCHIZ	DR	AL CLOUGH
	REVISION	CHK	APVD

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SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

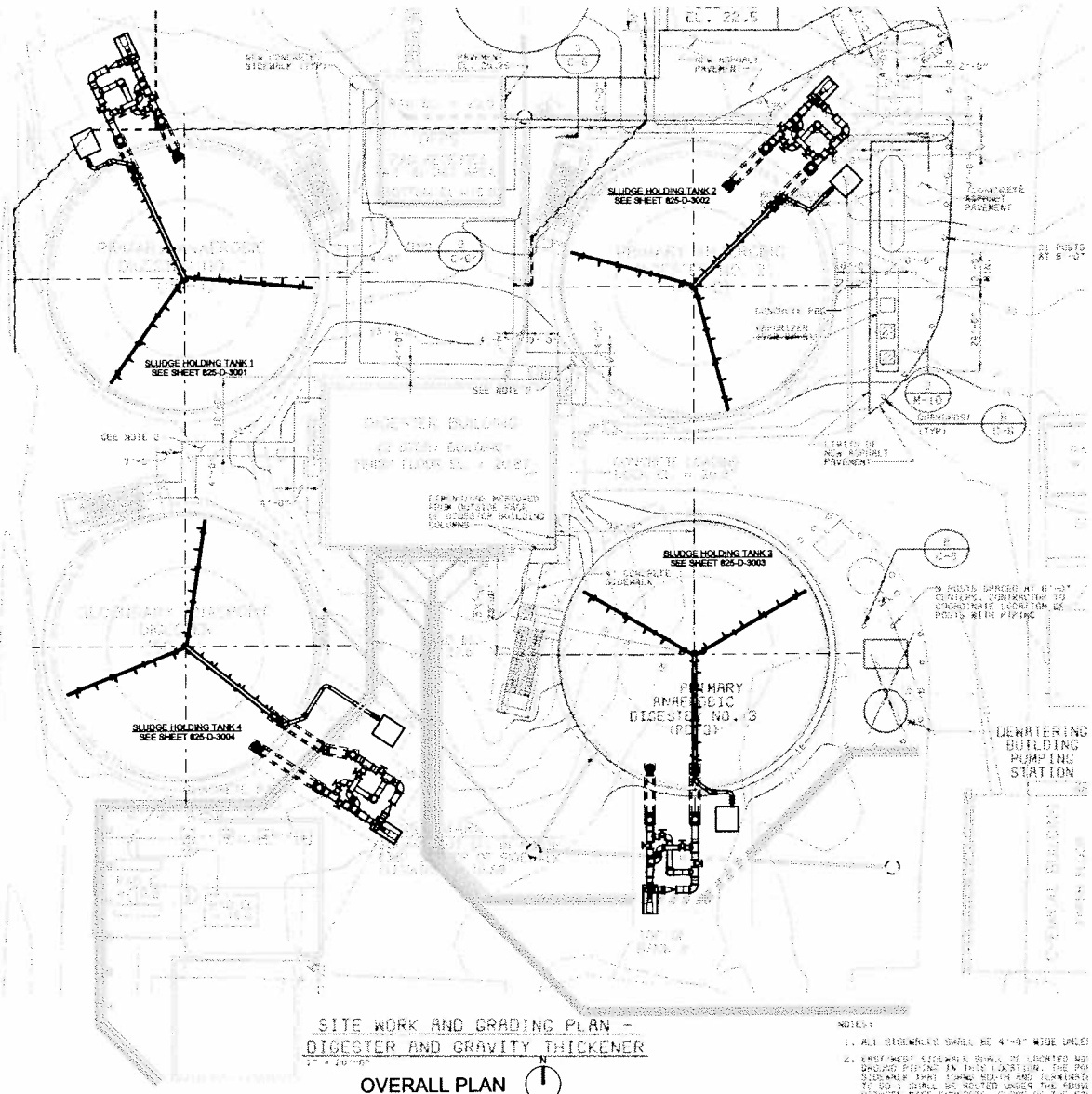
INSTRUMENTATION AND CONTROL
P&ID
SLUDGE HOLDING TANKS AND BLOWERS

ISSUED FOR BID

NTS
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MARCH 2013
PROJ	457133
DWG	008-N-6005
SHEET	of

FILENAME: 008-N-6005_457133.dgn PLOT DATE: 2/28/2013 PLOT TIME: 5:24:49 PM



SITE WORK AND GRADING PLAN - DIGESTER AND GRAVITY THICKENER

1" = 20'-0"

OVERALL PLAN

1/16"=1'-0"

NOTES:

1. ALL SIDEWALKS SHALL BE 4'-0" WIDE UNLESS
2. EAST-WEST SIDEWALK SHALL BE CENTERED NO
BRIDGE PIPING IN THIS LOCATION. THE PRO
SIDEWALK THAT TURNS SOUTH AND TERMINATES
TO GO & SHALL BE ROUTED UNDER THE FROM
BETWEEN PIER SUPPORTS. SLOPE OF THE SI
SHALL NOT EXCEED 8:1.

CH2MHILL.

PROCESS

SLUDGE HOLDING TANKS
OVERALL PLAN

SWWRF NITROGEN REMOVAL
AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

NO.	DATE	REVISION	BY	APVD
DSGN		DR	CHK	APVD

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

DATE	MARCH 2013
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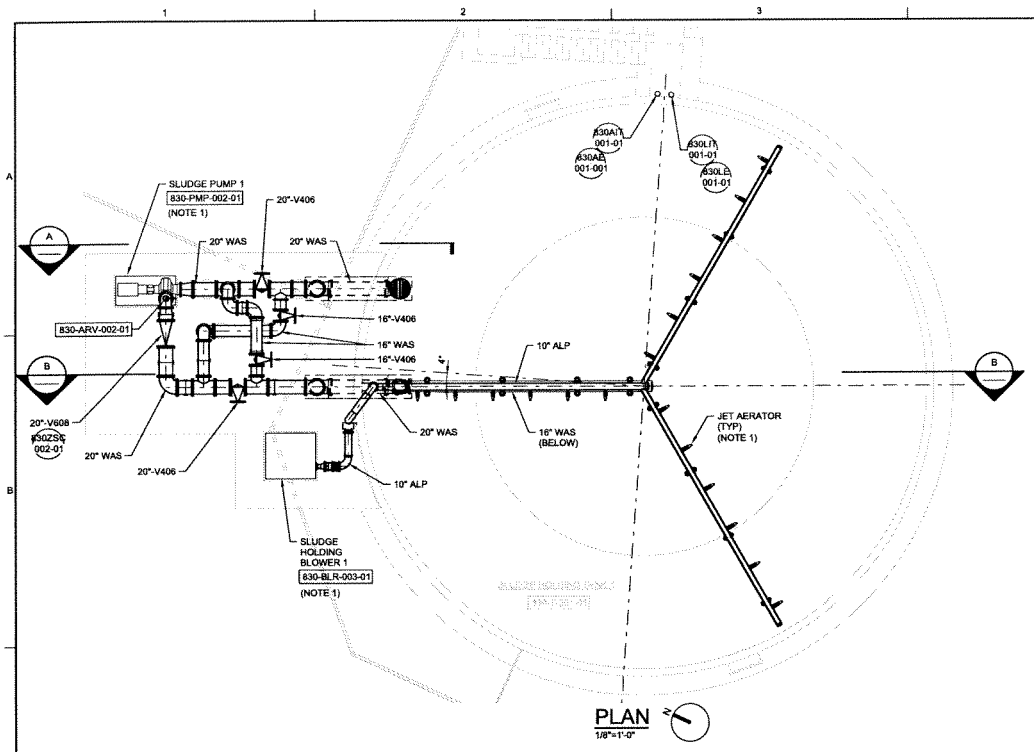
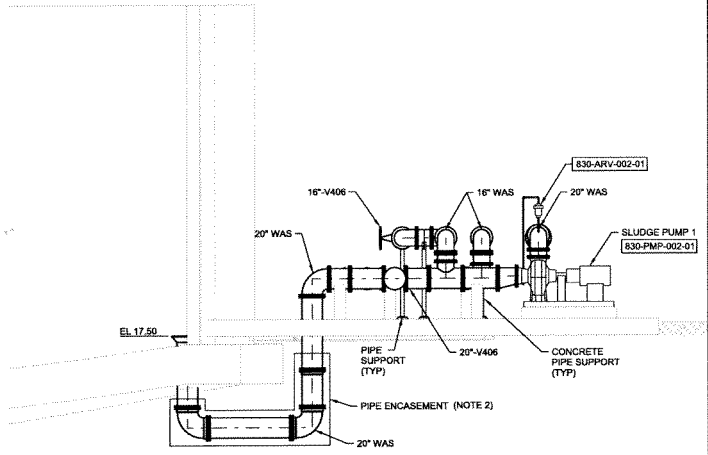
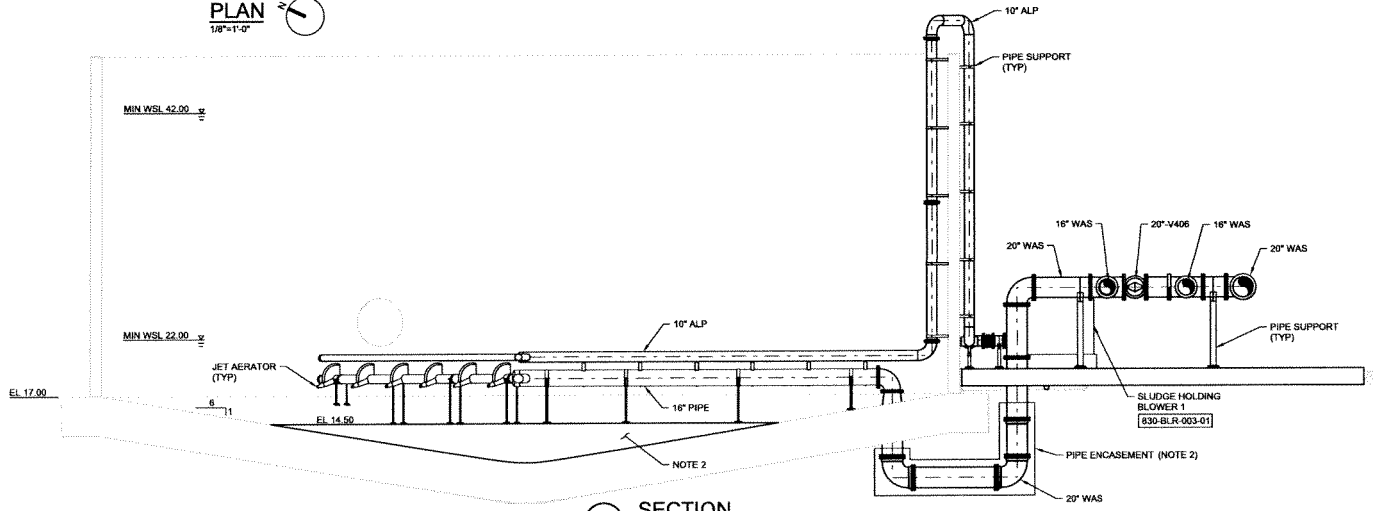


PLAN
1/8"=1'-0"



A SECTION
3/16"=1'-0"



B SECTION
3/16"=1'-0"

NOTES:

1. COORDINATE EQUIPMENT AND PIPING WITH JET AERATION SYSTEM MANUFACTURER. THE EQUIPMENT SHOWN IS BASED ON ONE MANUFACTURER. DIFFERENT MANUFACTURER WILL HAVE DIFFERENT EQUIPMENT AND PIPING LAYOUT.
2. SEE STRUCTURAL DRAWINGS FOR DETAILS OF PIPE ENCASEMENT AND FILL.

NO.	DATE	REVISION	BY	APVD
DSGN	T.FU	DR	CHK	N.PATTERSON

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

CH2MHILL.

PROCESS
SLUDGE HOLDING TANKS
PLAN AND SECTIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

DATE: MARCH 2013
PROJ: 457133
DWG: 825-D-3001
SHEET: of

ISSUED FOR BID

FILENAME:
PLOT DATE: 2/28/2013
PLOT TIME: 5:25:09 PM

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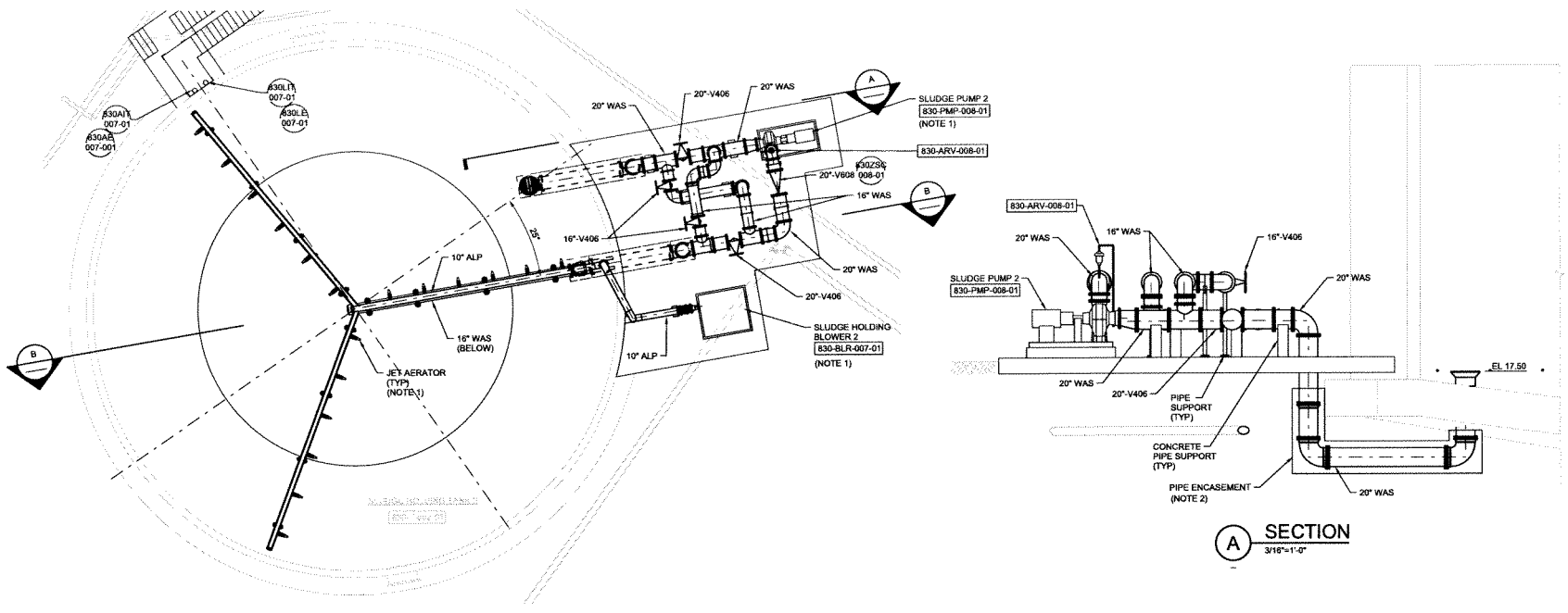

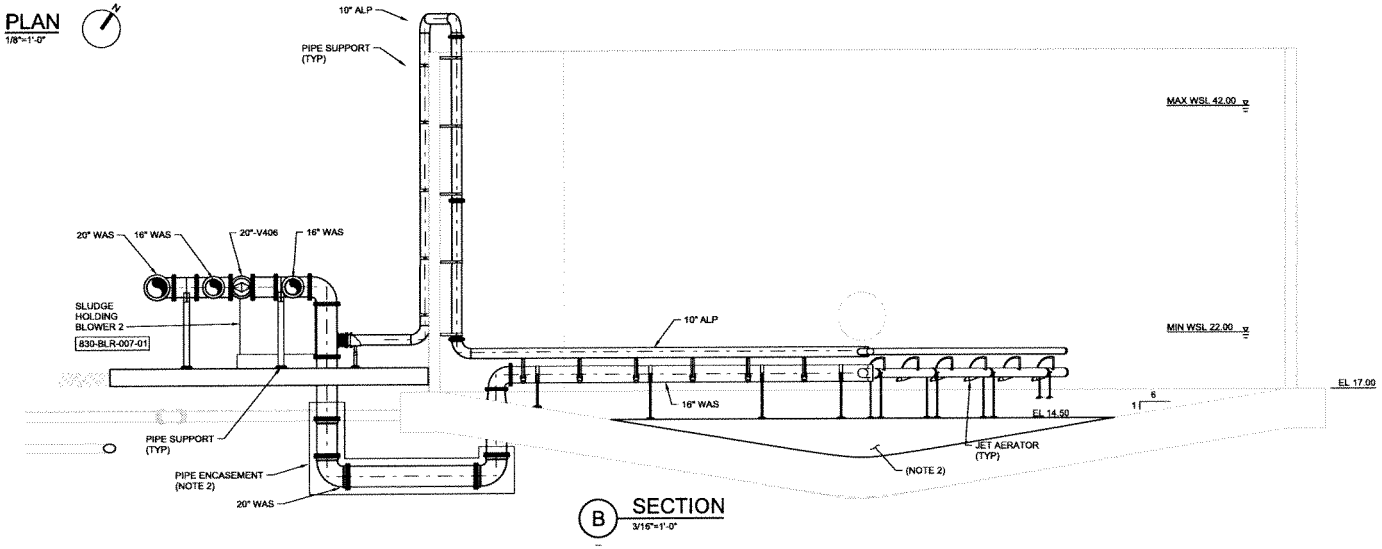

NOTES:

1. COORDINATE EQUIPMENT AND PIPING WITH JET AERATION SYSTEM MANUFACTURER. THE EQUIPMENT SHOWN IS BASED ON ONE MANUFACTURER. DIFFERENT MANUFACTURER WILL HAVE DIFFERENT EQUIPMENT AND PIPING LAYOUT.
2. SEE STRUCTURAL DRAWINGS FOR DETAILS OF PIPE ENCASEMENT AND FILL.

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SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

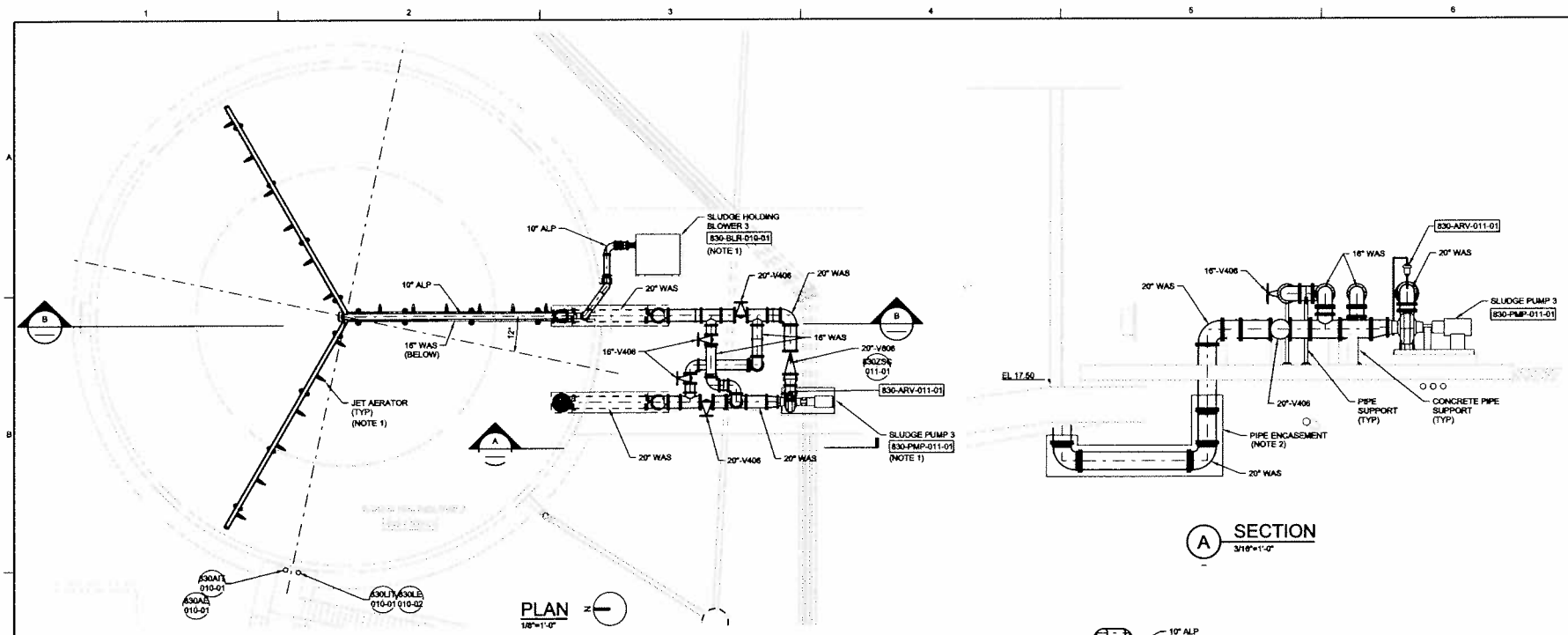
PROCESS
SLUDGE HOLDING TANKS PLAN AND SECTIONS

ISSUED FOR BID

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MARCH 2013
PROJ	457133
DWG	825-D-3002
SHEET	of

FILENAME: 825-D-3002_457133.dgn PLOT DATE: 2/28/2013 PLOT TIME: 5:25:14 PM



NOTES:

1. COORDINATE EQUIPMENT AND PIPING WITH JET AERATION SYSTEM MANUFACTURER. THE EQUIPMENT SHOWN IS BASED ON ONE MANUFACTURER. DIFFERENT MANUFACTURER WILL HAVE DIFFERENT EQUIPMENT AND PIPING LAYOUT.
2. SEE STRUCTURAL DRAWINGS FOR DETAILS OF PIPE ENCASEMENT AND FILL.

NO.	DESCRIPTION	DATE	BY	APVD
	REVISION	DR	CHK	APVD

CH2MHILL.

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

PROCESS
SLUDGE HOLDING TANKS PLAN AND SECTIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

DATE	MARCH 2013
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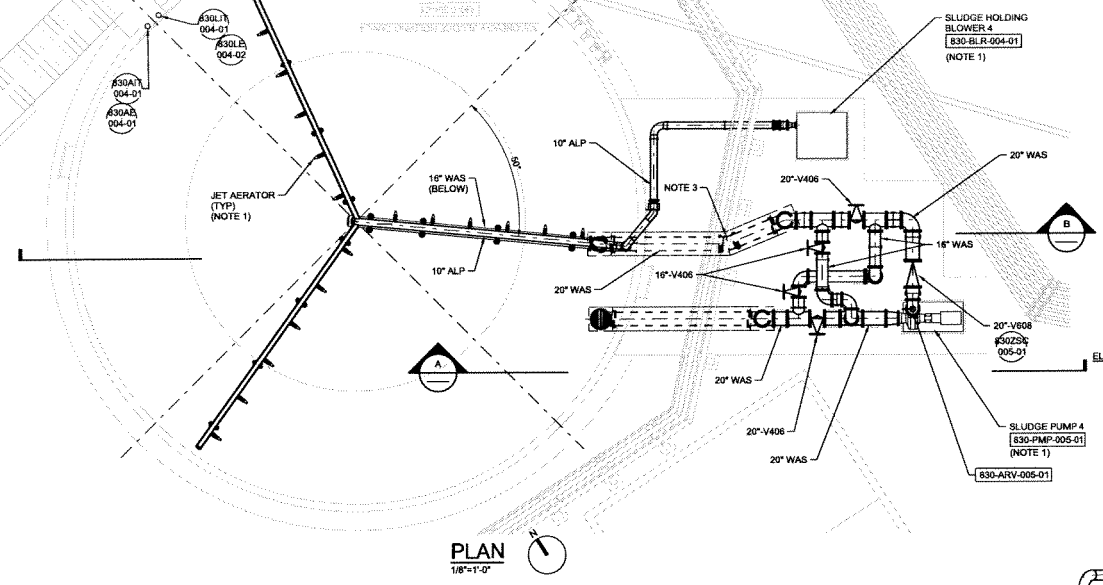
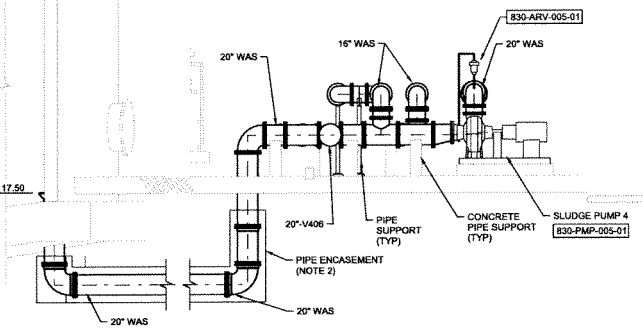
NOTES:

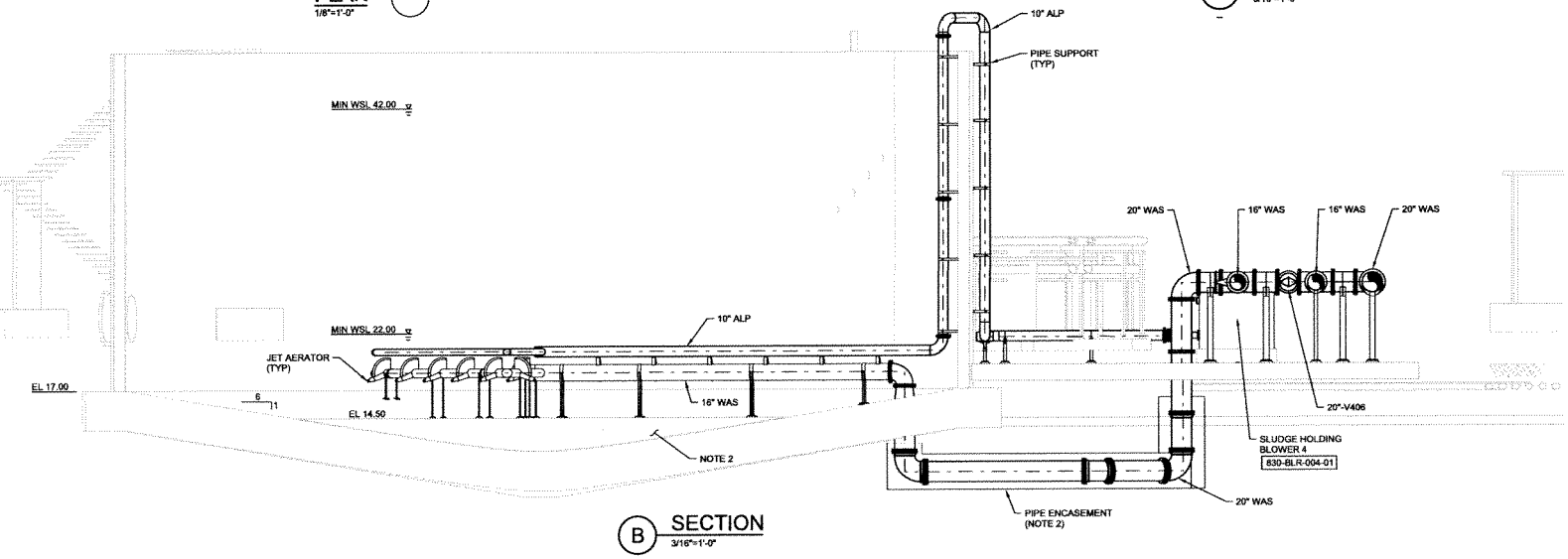
1. COORDINATE EQUIPMENT AND PIPING WITH JET AERATION SYSTEM MANUFACTURER. THE EQUIPMENT SHOWN IS BASED ON ONE MANUFACTURER. DIFFERENT MANUFACTURER WILL HAVE DIFFERENT EQUIPMENT AND PIPING LAYOUT.
2. SEE STRUCTURAL DRAWINGS FOR DETAILS OF PIPE ENCASEMENT AND FILL.
3. FIELD VERIFY LOCATION OF BEND TO AVOID INTERFERENCE WITH EXISTING PIPE SUPPORT.



PLAN
1/8"=1'-0"



A SECTION
3/16"=1'-0"



B SECTION
3/16"=1'-0"

NO.	DATE	REVISION	BY	APVD
DSGN	T FU	DR N PATTERSON	CHK	APVD

CH2MHILL

PROCESS
SLUDGE HOLDING TANKS
PLAN AND SECTIONS

SWWRF NITROGEN REMOVAL AND DIGESTER MODIFICATIONS
MANATEE COUNTY UTILITIES
MANATEE COUNTY, FL

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MARCH 2013
PROJ	457133
DWG	825-D-3004
SHEET	of

ISSUED FOR BID

RELIEF OF DOCUMENTS
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FILENAME: 825-D-3004_457133.dgn PLOT DATE: 2/28/2013 PLOT TIME: 5:25:24 PM

Attachment "A"

STATEMENT OF NO BID

If you do not intend to bid please return this form immediately to:

Manatee County Purchasing
1112 Manatee Avenue West, Suite 803
Bradenton, Florida 34205

We, the undersigned, have declined to bid on Bid No.: 13-1274CD – Purchase of Jet Aeration Equipment for Nitrogen Removal and Digester Modifications at SWWRF, for the following reason(s):

____Specifications too restrictive, i.e., geared toward one brand or manufacturer.
____Insufficient time to respond
____We do not offer this product or service
____Our schedule would not permit us to perform
____Unable to meet specifications
____Unable to meet Bond requirement
____Specifications unclear (explain below)
____Unable to meet insurance requirements
____Remove us from your "Bidders List"
____Other (specify below)

REMARKS:

We understand that if we do not submit a Bid and this Statement of No Bid is not executed and returned, our name may be deleted from your Bidders List for this commodity or service.

Company Name: _____

Company Address: _____

Telephone: _____

Date: _____

Signature: _____

_____
(Print or type name and title of above signer)

Attachment "B"

PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO ARTICLE V,
MANATEE COUNTY PURCHASING CODE

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

This sworn statement is submitted to the Manatee County Board of County Commissioners by _____
[print individual's name and title]

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

whose business address is: _____

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

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

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

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

(3) been convicted of a violation of an environmental law that, in the sole opinion of the County's Purchasing Director, 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 and 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.

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 the County's Purchasing Director. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with the County.

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

_____
[Signature]

STATE OF FLORIDA
COUNTY OF _____

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

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

_____ My commission expires _____
Notary Public Signature

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

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