

REQUEST FOR BIDS

BID NUMBER: 2013 03

THE EMERALD COAST UTILITIES AUTHORITY INVITES YOUR COMPANY TO SUBMIT A BID ON ITEM (S) AS LISTED IN THIS BID REQUEST. IT IS THE INTENT OF THE EMERALD COAST UTILITIES AUTHORITY TO RECEIVE BIDS THAT WILL BE PUBLICLY OPENED AT **2:00 P.M., JANUARY 8, 2013**, FOR THE FOLLOWING:

ITEM A - PERFORATED PLATE SCREENS WITH CONTROLS

ITEM B - GRIT REMOVAL SYSTEM/GRIT DEWATERING SYSTEM WITH CONTROLS

ITEM C - GRIT PUMPS

SEALED BIDS WILL BE RECEIVED UNTIL 2:00 P.M., JANUARY 8, 2013, BY THE PURCHASING AND STORES MANAGER, EMERALD COAST UTILITIES AUTHORITY, 9255 STURDEVANT STREET, ELLYSON INDUSTRIAL PARK, PENSACOLA, FLORIDA 32514. THE BIDS RECEIVED WILL THEN BE PUBLICLY OPENED AND READ. THE EMERALD COAST UTILITIES AUTHORITY RESERVES THE RIGHT TO WAIVE INFORMALITIES IN ANY BID; REJECT ANY OR ALL PROPOSALS, IN WHOLE OR IN PART; RE-BID A PROJECT, IN WHOLE OR IN PART; AND TO ACCEPT A PROPOSAL THAT IN ITS JUDGEMENT IS THE LOWEST AND BEST BID OF A RESPONSIBLE BIDDER. IN ACCEPTING A BID, ECUA MAY AWARD A CONTRACT BASED ONLY ON THE BASE BID, THE BASE BID PLUS ALL ALTERNATES, OR THE BASE BID PLUS ANY ALTERNATES WHICH ECUA SELECTS – WITH ALL DECISIONS BEING MADE BASED UPON WHAT ECUA BELIEVES TO BE THE BEST INTERESTS OF ITS RATEPAYERS, IN THE REASONABLE EXERCISE OF ITS DISCRETION. ECUA FURTHER RESERVES THE RIGHT TO INCREASE OR DECREASE QUANTITIES AS MAY BE REQUIRED TO MEET THE NEEDS OF ECUA, AT THE UNIT PRICE WHICH WAS BID.

LEGAL ADVERTISEMENT

Sealed bids for Bid 2013 03, Bayou Marcus Water Reclamation Facility Headworks Equipment, will be received by the Emerald Coast Utilities Authority Purchasing and Stores Manager, 9255 Sturdevant Street, Ellyson Industrial Park, Pensacola, FL 32514, until 2:00 p.m., local time, January 8, 2013, at which time bids submitted will be publicly opened and read. It is the intent of ECUA to purchase two perforated plate screens with controls, two grit removal systems, two grit dewatering systems with controls and two grit pumps. Specifications, preliminary drawings, and information may be examined and obtained from ECUA, Purchasing and Stores Manager (850-969-3350). Bids received after the closing time will be returned unopened. ECUA reserves the right to reject any or all bids and re-advertise.

Advertised 12/9/12

**Emerald Coast Utilities Authority
Purchasing and Stores Division
9255 Sturdevant Street
Pensacola, Florida 32514-7038
850-969-3350**

STATEMENT OF NO BID

If you **do not** intend to bid on this commodity/service, please return this form to the above address immediately. If this statement is not completed and returned, your company may be deleted from the Emerald Coast Utilities Authority Vendors' list for this commodity/service.

We the undersigned, have declined to bid on requested commodity/service Bid Number 2013 03, Bayou Marcus Water Reclamation Facility Headworks Equipment for the following reasons:

_____ Specifications too "tight," i.e. geared toward one brand or manufacturer only (explain below).

_____ Insufficient time to respond to the Invitation to Bid.

_____ We do not offer this product or service.

_____ Our schedule would not permit us to perform.

_____ Unable to meet bond/insurance requirements.

_____ Specifications are unclear (explain below).

_____ Remove us from your vendors' list for this commodity/service.

_____ Other (specify below).

Remarks:

Company Name: _____

Signature: _____

Telephone: _____ Date: _____

NOTE: Statement of No Bid may be faxed into the Purchasing and Stores Division, (850-969-3384) Attention: Amy Williamson

INSTRUCTIONS TO BIDDERS

ALL THESE TERMS AND CONDITIONS ARE A PART OF THIS BID REQUEST.

1. BID SCHEDULE:

BIDS ARE PRESENTLY SCHEDULED TO BE PUBLICLY OPENED AND READ AT 2:00 P.M., JANUARY 8, 2013 IN THE ECUA PURCHASING SECTION, 2ND FLOOR, CUSTOMER SERVICE BUILDING, 9255 STURDEVANT STREET, ELLYSON INDUSTRIAL PARK. ECUA STAFF WILL REVIEW ALL BIDS AND FORWARD THEIR RECOMMENDATIONS TO THE ECUA BOARD AT THEIR MEETING SCHEDULED FOR 3:00 P.M., JANUARY 24, 2013 IN THE ECUA BOARD ROOM, 9255 STURDEVANT STREET, ELLYSON INDUSTRIAL PARK.

2. BID SUBMISSION:

ONE ORIGINAL AND FOUR (4) COPIES OF THE BIDS TO BE CONSIDERED MUST BE IN THE POSSESSION OF THE EMERALD COAST UTILITIES AUTHORITY PURCHASING AND STORES MANAGER. BIDS MAY BE MAILED OR DELIVERED TO HIS OFFICE AT 9255 STURDEVANT STREET, ELLYSON INDUSTRIAL PARK, PENSACOLA, FLORIDA, 32514, IN A SEALED ENVELOPE CLEARLY MARKED WITH THE TIME AND DATE OF THE OPENING. REGARDLESS OF THE METHOD OF DELIVERY, EACH BIDDER SHALL BE RESPONSIBLE FOR HIS BID(S) BEING DELIVERED ON TIME, AS THE EMERALD COAST UTILITIES AUTHORITY ASSUMES NO RESPONSIBILITY FOR SAME. PROPOSALS OFFERED OR RECEIVED AFTER THE TIME SET FOR THE BID OPENING WILL BE REJECTED AND RETURNED UNOPENED TO THE BIDDER.

3. CONVICTION OF PUBLIC ENTITY CRIME

A PERSON OR AFFILIATE WHO HAS BEEN PLACED ON THE CONVICTED VENDOR LIST FOLLOWING A CONVICTION FOR A PUBLIC ENTITY CRIME MAY NOT SUBMIT A BID ON A CONTRACT TO PROVIDE ANY GOODS OR SERVICES TO A PUBLIC ENTITY, MAY NOT SUBMIT A BID ON A CONTRACT WITH A PUBLIC ENTITY FOR THE CONSTRUCTION OR REPAIR OF A PUBLIC BUILDING OR PUBLIC WORK, MAY NOT SUBMIT BIDS ON LEASES OF REAL PROPERTY TO A PUBLIC ENTITY, MAY NOT BE AWARDED OR PERFORM WORK AS A CONTRACTOR, SUPPLIER, SUBCONTRACTOR, OR CONSULTANT UNDER A CONTRACT WITH ANY PUBLIC ENTITY, AND MAY NOT TRANSACT BUSINESS WITH ANY PUBLIC ENTITY IN EXCESS OF THE THRESHOLD AMOUNT PROVIDED IN SECTION 287.017, FOR CATEGORY TWO (\$35,000) FOR A PERIOD OF 36 MONTHS FROM THE DATE OF BEING PLACED ON THE CONVICTED VENDOR LIST.

4. BID WITHDRAWAL:

NO BID MAY BE WITHDRAWN FOR A PERIOD OF NINETY (90) DAYS FROM THE BID OPENING. PRICES MAY NOT BE MODIFIED DURING THIS PERIOD. PROPOSALS MAY BE WITHDRAWN AT ANY TIME PRIOR TO THE BID OPENING TIME.

5. BID AUTHORIZATION:

ALL BIDS MUST BE SUBMITTED ON THE FORM PROVIDED BY THE EMERALD COAST UTILITIES AUTHORITY AND MUST BE SIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE COMPANY PLACING THE BID. ONE COMPLETE SET OF BID FORMS WILL BE FURNISHED EACH COMPANY INTERESTED IN BIDDING.

6. BID ERRORS:

A BIDDER MAY NOT MODIFY ITS BID AFTER BID OPENING. ERRORS IN THE EXTENSION OF UNIT PRICES STATED IN A BID OR IN MULTIPLICATION, DIVISION, ADDITION, OR SUBTRACTION IN A BID MAY BE CORRECTED BY THE PURCHASING AND STORES MANAGER PRIOR TO AWARD. IN SUCH CASES, UNIT PRICES SHALL NOT BE CHANGED.

7. AWARD OF BID:

ECUA RESERVES THE RIGHT TO ESTABLISH PRIORITIES AND TO AWARD THE CONTRACT TO A SINGLE BIDDER BASED UPON THE TOTAL BID OR TO MULTIPLE VENDORS BASED UPON THE ITEMS INDIVIDUALLY BID. ECUA ALSO RESERVES THE RIGHT TO SELECTIVELY PURCHASE ANY SINGLE OR ANY MULTIPLE ITEMS FROM THIS BID.

8. TAXES:

DO NOT INCLUDE ANY TAX WITH YOUR BID. THE EMERALD COAST UTILITIES AUTHORITY IS EXEMPT FROM FEDERAL, STATE AND LOCAL TAXES. TAX EXEMPT NUMBER 85-8012640152C-4 APPLIES.

9. TERMS:

MINIMUM TERMS WILL BE NET 30 (30 DAYS AFTER RECEIPT OF MATERIAL/SERVICE) UNLESS A DISCOUNT IS INVOLVED. TERMS OFFERING A DISCOUNT FOR PROMPT PAYMENT WILL ONLY BE CONSIDERED IN DETERMINING THE LOW BID IF THE DISCOUNT PERIOD IS 15 DAYS OR GREATER (15 DAYS AFTER RECEIPT OF MATERIAL/SERVICE OR INVOICE, WHICHEVER IS GREATER).

10. BID TABULATIONS:

BID TABULATIONS WILL BE POSTED FOR REVIEW IN THE PURCHASE SECTION, 9255 STURDEVANT STREET, ELLYSON INDUSTRIAL PARK ON OR ABOUT JANUARY 13, 2013, AND WILL REMAIN POSTED FOR 72 HOURS EXCLUDING WEEKENDS AND HOLIDAYS.

11. BID QUESTIONS:

IF ANY BIDDER HAS A QUESTION CONCERNING THE BID SPECIFICATIONS OR BID PROCEDURES, PLEASE FORWARD THE INQUIRY TO THE PURCHASING AND STORES MANAGER BEFORE DECEMBER 31, 2012, FOR CONSIDERATION.

EMERALD COAST UTILITIES AUTHORITY
ATTN: PURCHASING AND STORES MANAGER
9255 STURDEVANT STREET
PENSACOLA, FLORIDA 32514-7038
PHONE: 850-969-3350
FAX: 850-969-3384
EMAIL: (Amy Williamson's email address) amy.williamson@ecua.fl.gov

12. COMPLIANCE WITH SPECIFICATIONS:

IN ORDER TO DETERMINE THAT YOUR BID COMPLIES WITH BID SPECIFICATIONS, PRODUCT LITERATURE AND/OR DATA/INFORMATION SHOULD BE INCLUDED WITH THE BID PROPOSAL. ANY DEVIATIONS FROM THE BID SPECIFICATIONS SHOULD BE IDENTIFIED SEPARATELY.

13. UNIFORM COMMERCIAL CODE:

THE UNIFORM COMMERCIAL CODE (FLORIDA STATUTES, CHAPTER 672) SHALL PREVAIL AS THE BASIS FOR CONTRACTUAL OBLIGATIONS BETWEEN THE AWARDED VENDOR/CONTRACTOR AND EMERALD COAST UTILITIES AUTHORITY FOR ANY TERMS AND CONDITIONS NOT SPECIFICALLY STATED IN THIS INVITATION FOR BID.

14. EXECUTION OF CONTRACT:

ANY ACTION OF ECUA IN AWARDING THE PURCHASE OF ANY MATERIAL OR PERFORMANCE OF A SERVICE IS SUBJECT TO AND CONDITIONED UPON THE EXECUTION OF A WRITTEN PURCHASE CONTRACT AND/OR A PURCHASE ORDER BETWEEN ECUA AND THE VENDOR.

15. CONTRACTUAL AGREEMENT:

THIS INVITATION FOR BID SHALL BE INCLUDED AND INCORPORATED IN THE FINAL CONTRACT OR PURCHASE ORDER. THE ORDER OF CONTRACT PRECEDENCE WILL BE THE CONTRACT (PURCHASE ORDER), BID DOCUMENT AND RESPONSE. ANY AND ALL LEGAL ACTION NECESSARY TO ENFORCE THE CONTRACT WILL BE HELD IN ESCAMBIA COUNTY AND THE CONTRACT WILL BE INTERPRETED ACCORDING TO THE LAWS OF FLORIDA.

16. PROTESTS:

ANY PERSON WHOSE SUBSTANTIAL INTERESTS ARE DIRECTLY AND ADVERSELY AFFECTED BY THE AWARD OR INTENDED AWARD OF A PURCHASE ORDER OR CONTRACT OR BY PLANS OR SPECIFICATIONS CONTAINED IN AN INVITATION TO BID OR REQUEST FOR PROPOSALS MAY FILE A PROTEST IN ACCORDANCE WITH THE FOLLOWING RULES AND SECTION 12 OF THE ECUA ACT (CHAPTER 2001-324, LAWS OF FLORIDA AS AMENDED).

NOTICE OF PROTEST OF PLANS, SPECIFICATIONS OR OTHER REQUIREMENTS CONTAINED IN AN INVITATION TO BID OR IN A REQUEST FOR PROPOSALS SHALL BE FILED NOT LATER THAN 5:00 P.M. OF THE THIRD BUSINESS DAY FOLLOWING RECEIPT OF THE PLANS OR SPECIFICATIONS. NOTICE OF PROTEST OF THE REJECTION OF A BID OR PROPOSAL AS NON-RESPONSIVE SHALL BE FILED NOT LATER THAN 5:00 P.M. OF THE THIRD BUSINESS DAY FOLLOWING NOTICE TO THE BIDDER OF THE REJECTION. NOTICE OF PROTEST OF THE AWARD OR INTENDED AWARD OF A PURCHASE ORDER OR CONTRACT TO THE LOWEST BIDDER SHOWN ON A POSTED BID TABULATION SHALL BE FILED NOT LATER THAN 5:00 P.M. OF THE THIRD BUSINESS DAY FOLLOWING THE POSTING OF THE BID TABULATION. NOTICE OF PROTEST OF THE AWARD OR INTENDED AWARD OF A PURCHASE ORDER OR CONTRACT TO A BIDDER OTHER THAN THE LOWEST BIDDER SHOWN ON A POSTED BID TABULATION SHALL BE FILED NOT LATER THAN 5:00 P.M. OF THE THIRD BUSINESS DAY FOLLOWING NOTICE OF THE AWARD OF A PURCHASE ORDER OR CONTRACT.

A NOTICE OF PROTEST SHALL BE IN WRITING AND SHALL STATE THE SUBJECT MATTER OF THE PROTEST.

A FORMAL WRITTEN PROTEST SHALL BE FILED WITHIN SEVEN (7) BUSINESS DAYS AFTER THE FILING OF NOTICE OF PROTEST. A FORMAL WRITTEN PROTEST SHALL STATE WITH PARTICULARITY THE FACTS AND THE LAW ON WHICH THE PROTEST IS BASED.

NOTICE OF PROTEST AND FORMAL WRITTEN PROTEST OF PLANS OR SPECIFICATIONS FOR OR THE AWARD OR INTENDED AWARD OF A CONTRACT SHALL BE FILED WITH THE EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE.

FAILURE TO FILE A NOTICE OF PROTEST OR FAILURE TO FILE A FORMAL WRITTEN PROTEST WITHIN THE TIMES PERMITTED SHALL CONSTITUTE A WAIVER OF PROCEEDINGS UNDER THESE RULES AND UNDER SECTION 12 OF CHAPTER 2001-324, LAWS OF FLORIDA, AS AMENDED.

UPON RECEIPT OF A NOTICE OF PROTEST WHICH HAS BEEN TIMELY FILED, THE EXECUTIVE DIRECTOR SHALL STOP THE BID SOLICITATION OR PURCHASE ORDER OR CONTRACT AWARD PROCESS UNTIL THE PROTEST HAS BEEN RESOLVED. HOWEVER, THE BID SOLICITATION OR PURCHASE ORDER OR CONTRACT AWARD PROCESS MAY PROCEED WHEN THE EXECUTIVE DIRECTOR DETERMINES THAT DELAY WOULD BE DETRIMENTAL TO THE INTERESTS OF ECUA. ANY AWARD OF A PURCHASE ORDER OR CONTRACT UNDER SUCH CONDITIONS SHALL BE SUBJECT TO THE OUTCOME OF THE PROTEST. AFTER THE AWARD OF A CONTRACT OR PURCHASE ORDER RESULTING FROM A BID IN WHICH A TIMELY PROTEST WAS RECEIVED AND IN WHICH ECUA DID NOT PREVAIL, ECUA MAY TAKE SUCH ACTION AS IT CONSIDERS APPROPRIATE, WHICH MAY INCLUDE, BUT SHALL NOT BE LIMITED TO, AWARD OF THE CONTRACT OR PURCHASE ORDER TO THE PREVAILING PARTY, CANCELLATION OF THE CONTRACT OR PURCHASE ORDER, OR REBIDDING.

THE EXECUTIVE DIRECTOR SHALL PROVIDE REASONABLE OPPORTUNITY TO RESOLVE A PROTEST BY AGREEMENT. IF AGREEMENT IS NOT REACHED WITHIN SUCH TIME AS THE EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE CONSIDERS REASONABLE UNDER THE CIRCUMSTANCES, THE EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE SHALL REVIEW THE FACTS AND THE LAW ON WHICH THE PROTEST IS BASED, AND SHALL RENDER A DECISION WHICH SHALL BE IN WRITING AND SHALL BE PROMPTLY TRANSMITTED TO THE PROTESTOR.

IF THE PROTESTOR WISHES TO CONTINUE THE PROTEST BEYOND THE DECISION OF THE EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE, THE PROTESTOR SHALL BE REQUIRED TO FILE A PETITION FOR REVIEW BY THE ECUA BOARD. THIS PETITION SHALL BE MADE IN WRITING AND PRESENTED TO THE EXECUTIVE DIRECTOR WITHIN TEN (10) DAYS AFTER NOTICE OF THE DECISION OF THE EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE; OTHERWISE, THE DECISION OF THE EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE SHALL BE FINAL AND BINDING. SUCH PETITION SHALL STATE THE PARTICULAR GROUNDS ON WHICH IT IS BASED AND MAY INCLUDE PERTINENT DOCUMENTS AND EVIDENCE RELATING THERETO. ANY GROUNDS NOT STATED SHALL BE DEEMED TO HAVE BEEN WAIVED BY THE PROTESTOR. THIS PETITION MUST ALSO BE ACCOMPANIED BY A PROTEST BOND OF AN AMOUNT EQUAL TO 1.0 PERCENT (1%) OF THE VALUE OF THE SOLICITATION, BUT IN NO CASE LESS THAN \$1,000 NOR GREATER THAN \$10,000.00. THIS BOND SHALL BE IN THE FORM OF A MONEY ORDER, CERTIFIED CASHIER'S CHECK, OR CERTIFIED BANK CHECK MADE PAYABLE TO THE EMERALD COAST UTILITIES AUTHORITY. FAILURE TO POST SUCH BOND WITHIN TEN (10) BUSINESS DAYS AFTER THE DECISION OF THE

EXECUTIVE DIRECTOR OR HIS OR HER DESIGNEE SHALL RESULT IN THE PROTEST BEING DISMISSED BY THE EXECUTIVE DIRECTOR.

THE BOND REQUIRED BY THE ABOVE PARAGRAPH SHALL BE CONDITIONED UPON THE PAYMENT OF ALL COSTS AND CHARGES WHICH MAY BE ADJUDGED AGAINST THE PERSON FILING THE PETITION FOR REVIEW. IF THE PROTESTOR PREVAILS, THE BOND SHALL BE RETURNED TO THE PROTESTOR. IF HOWEVER, ECUA PREVAILS, THE BOND SHALL BE FORFEITED, AND ECUA SHALL BE ENTITLED TO RECOVER THE COSTS AND CHARGES, EXCLUDING ATTORNEY'S FEES, OF SUCH HEARING. THE ENTIRE AMOUNT OF THE BOND ALSO SHALL BE FORFEITED IF IT IS DETERMINED THAT A PROTEST WAS FILED FOR A FRIVOLOUS OR IMPROPER PURPOSE, INCLUDING, BUT NOT LIMITED TO, THE PURPOSE OF HARASSING, CAUSING UNNECESSARY DELAY, OR CAUSING NEEDLESS COST FOR ECUA OR ANOTHER INTERESTED PARTY/PARTIES.

ANY NOTICE REQUIRED OR PERMITTED UNDER THIS BID PROTEST PROCEDURE SHALL BE EFFECTIVE WHEN DELIVERED PERSONALLY OR BY FACSIMILE, OR WHEN DEPOSITED IN THE U.S. MAIL. IF NOTICE IS GIVEN ONLY BY MAIL, THREE (3) DAYS SHALL BE ADDED TO THE TIME WITHIN WHICH A PROTESTOR MAY FILE A NOTICE OF PROTEST OR PETITION FOR REVIEW.

TABLE OF CONTENTS

DIVISION 11 – EQUIPMENT

11330	PERFORATED PLATE SCREEN.....	14
11400	GRIT REMOVAL SYSTEM.....	10
11401	GRIT DEWATERING SYSTEM.....	6
11402	GRIT PUMP	6

DIVISION 16 – ELECTRICAL

16010	BASIC ELECTRICAL REQUIREMENTS.....	6
16050	BASIC ELECTRICAL MATERIALS AND METHODS	4
16075	ELECTRICAL IDENTIFICATION.....	8
16140	WIRING DEVICES	8
16150	ELECTRIC MOTORS	8
16269	VARIABLE FREQUENCY CONTROLLERS	12
16289	SURGE SUPPRESSION	6
16491	FUSES.....	4
16900	SYSTEMS INTEGRATION.....	12
16910	CONTROL PANEL CONSTRUCTION	10
16950	FIELD INSTRUMENTS	6

DRAWINGS (FOR EQUIPMENT LAYOUT REFERENCE)

M-200	SCREEN PLAN & SECTION
M-203	SCREEN SECTION
M-205	WASH PRESS DETAILS
M-250	GRIT REMOVAL SYSTEM PLAN
M-251	GRIT REMOVAL SYSTEM SECTIONS
E-001	ELECTRICAL LEGEND & ABBREVIATIONS
E-002	ELECTRICAL GENERAL NOTES
E-011	ELECTRICAL SINGLE-LINE DIAGRAM NEW WORK
E-050	ELECTRICAL PLC BLOCK DIAGRAM
E-051	ELECTRICAL DETAILS
E-902	ELECTRICAL DETAILS

SECTION 11330 – PERFORATED PLATE SCREEN

PART 1 - GENERAL

1.1 DEFINITIONS

- A. CONTRACTOR –The person, partnership, corporation, association, or affiliation as specifically defined in the contract general conditions paraphrased to be the entity with whom the OWNER shall execute an agreement for the installation of the system supplied by the SUPPLIER.
- B. ENGINEER – The person, partnership, corporation, association, or affiliation as specifically defined in the contract general conditions paraphrased to be the engineering firm contracted by the OWNER to design the project.
- C. OWNER – As specifically defined in the contract general conditions, the OWNER refers to the entity contracting the work being completed.
- D. SUPPLIER/MANUFACTURER – The person, partnership, corporation, association, or affiliation with whom the OWNER executes an agreement for supplying the SYSTEM equipment under this contract.
- E. SYSTEM – The complete Perforated Plate Screen System(s), which shall include all equipment, controls, instrumentation, and all appurtenances as necessary to screen the influent raw sewage as herein specified.

1.2 SCOPE

- A. SUPPLIER is to provide two (2) complete Screening Systems as shown on the drawings and as specified herein. Each Screening System shall discharge to a Screen Washing Compactor as supplied by the OWNER. The controls for each Screening System shall incorporate the operating of the Screen Washing Compactor so as to operate in conjunction with the screen. Controls for each screen and paired screening washer shall be incorporated in a single duplex control panel for a total of two (2) panels for the complete System.
- B. The Screen Washing Compactor supplied by the OWNER is a Huber ROTAMAT Screenings Wash Press model WAP2 with a capacity of 70 cu-ft/hr. The compactor dimensions are as detailed in the contract drawings.
- C. This specification and the project drawings are based upon the use of a Huber EscaMax Perforated Band Screen configuration. Alternate Suppliers or systems may be accepted by the OWNER only as herein specified.

- D. The manufacturer shall have an authorized factory representative within 300 miles of the installation site. The representative may be a sales representative that the supplier has provided sufficient training for the representative to provide some technical assistance. A sales representative that falls into this category is expected to consult with the factory on issues that are more complicated in nature.

1.3 RELATED SECTIONS

- A. DIVISION 16 SPECIFICATIONS

1.4 REFERENCE STANDARDS

- A. The properties of all materials, design, fabrication and performance of the equipment to be furnished under this section shall be in accordance with the latest issue of applicable standard specifications. The governing authorities of these standards are listed below.
- B. American Society for Testing and Materials (ASTM) Publications:
 - 1. Section A322: Carbon and Alloy Steel Bar Specifications.
 - 2. Section A507-10: Standard Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold Rolled
- C. Anti-Friction Bearing Manufacturers Association (AFBMA):
 - 1. Standard 9-90 Load Ratings and Fatigue Life for Ball Bearings.
 - 2. Standard 11-90 Load Ratings and Fatigue Life for Roller Bearings.

1.5 SUBMITTALS

- A. Describe the minimum information to be submitted with the bid to determine general acceptance of the proposed equipment. Provide preliminary drawings indicating the general layout of the equipment, including the appropriate cross sections and details.
- B. Within the timeframe provided in the bid after receipt of the purchase order, the SUPPLIER shall furnish five (5) sets of bound submittals in addition to one (1) electronic version on CD. Submittals shall be provided to the OWNER to establish compliance with this specification and shall include the following information:
 - 1. Descriptive product literature
 - 2. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
 - 3. Schematic electrical wiring diagram and electrical controls information.
 - 4. Control panel layout information
 - 5. Complete motor and drive data.
 - 6. Parts list including a list of recommended spare parts for the first five years of operation.
 - 7. Detailed installation instructions
 - 8. The total weight of the equipment and lifting points

9. Recommendations for short and long term unconditioned, exterior storage
 10. A complete bill of materials of all equipment
 11. A copy of the manufacturer's warranty
 12. A copy of document proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.
- C. Operation and maintenance manuals shall be provided within the timeframe provided in the bid after receipt of the approved shop drawings, which must be no later than 15 calendar days after delivery of the equipment. The SUPPLIER shall furnish five (5) sets of bound manuals in 3-ring binders in addition to one (1) electronic version on CD. All material shall be marked with project identification, and inapplicable information shall be marked out or deleted. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions, performance curve, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment. All manuals shall contain only original pamphlets, brochures and equipment cut sheets. The manuals shall include the following data:
1. Alignment, adjustment, and repair instructions.
 2. MANUFACTURER'S installation instructions.
 3. Assembly diagrams.
 4. Troubleshooting guide.
 5. Lubrication instructions.
 6. Recommended spare parts lists and predicted life of parts subjected to wear.
 7. Schematic electrical wiring diagram and electrical controls information.
 8. Control panel layout information.

1.6 QUALITY ASSURANCE

- A. To ensure quality, conformance, and reliability with regard to the manufacturing and production of the equipment, the manufacturer shall meet all requirements listed hereafter:
- B. MANUFACTURER shall have a minimum of twenty (20) years experience producing equipment substantially similar to that required and shall be able to submit documentation of at least fifteen (15) independent installations within the United States and its territories using the same size or larger equipment as detailed in the below. Each installation must have been in satisfactory operation for at least five (5) years.
- C. The Contract Documents represent the minimum acceptable standards for the screening equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. The entire unit shall be Manufacturer's standard product, but shall be modified, redesigned, furnished with special features or accessories, made of materials or provided

with finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.

- D. The entire unit shall be manufactured from AISI 316L stainless steel shapes. All components made of stainless steel shall be passivated by full submergence in a pickling bath for perfect surface finishing. No stainless steel components may be fabricated or assembled in a factory where carbon steel products are also fabricated, in order to prevent contamination by rust.
- E. Electric motors, gear reducers, and other self-contained or enclosed components shall have an acrylic enamel finish.
- F. All stainless steel parts of the unit shall be fully submerged into a pickling bath for at least 8 hours to remove welding spots and to protect the stainless steel against corrosion. Glass bead blast or chemically treated stainless steel shall not be allowed.
- G. Fabrication shall be done in compliance with all applicable ASTM standards or equivalent international standards.
- E. All welding in the factory shall use shielded arc, inert gas, MIG or TIG method. Filler wire shall be added to all welds to provide for a cross section equal to or greater than the parent metal. Butt welds shall fully penetrate to the interior surface and gas shielding to interior and exterior of the joint shall be provided.
- F. Bolts, nuts and washers shall be selected from AISI 304L or 316L stainless steel such that they are anti-seizing.
- G. MANUFACTURER shall have established an ISO 9001 certified quality management system. Equipment suppliers not utilizing ISO 9001 facilities shall not be considered or approved for this project. Equipment supplier shall provide evidence of certification before being named as an acceptable manufacturer.
- H. MANUFACTURER shall have established an ISO 14001 certified environmental protection management system designed to monitor and help minimize the harmful effects on the environment caused by its manufacturing processes. Equipment suppliers not utilizing ISO 14001 facilities shall not be considered or approved for this project. Equipment supplier shall provide evidence of certification before being named as an acceptable manufacturer.
- I. All welding is performed in accordance with American Welding Society (AWS) D1.1 Structural Welding Code, or equivalent.
- J. SUPPLIER shall provide screen, motors, gear reducers, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system. The SUPPLIER shall test-run the fully

assembled machine in his factory before shipment. A certified report of the testing shall be provided no later than the delivery of the screens.

- K. MANUFACTURER shall provide services by a factory-trained Service Engineer, specifically trained on the type of equipment specified (see paragraph 3.2). The Service Engineer requirements include, but are not limited to the following:
1. The Service Engineer shall inspect and verify location of anchor bolts, placement, leveling, alignment and field erection of equipment, as well as control panel operation and electrical connections.
 2. The Service Engineer shall be present during initial energizing of equipment to determine directional testing as described in Section 3.2 (Installation and Testing).
 3. The Service Engineer shall provide classroom and/or field training on the Operation and Maintenance of the equipment to operator personnel. These instructions may include the use of slides, videos, literature, and/or oral presentations.
 4. MANUFACTURER shall state field service rates for a Service Engineer to OWNER and Contractor. In the event that the field service time required by this section should not be sufficient to properly place the equipment into operation, and the requirement for additional time is beyond the manufacturer's and the OWNER'S responsibility, additional time shall be purchased by Contractor to correct deficiencies in installation, equipment, or material without additional cost to OWNER.

1.7 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT

- A. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
- B. Contractor shall be responsible for unloading of the machinery and shall have equipment on-site available at the time of delivery permitting proper hoisting of the equipment.
- C. Contractor shall provide anchor bolts. Supplier shall provide template to contractor for use in securing the anchor bolts.
- D. Spare parts shall be packed in containers bearing packing lists clearly designating contents and pieces of equipment for which they are intended. Packaging shall provide adequate protection of the components in long term unconditioned storage.
- E. Supplier shall furnish one set of any special tools required for maintenance of the screens.
- F. Supplier shall provide to the contractor a minimum seven calendar day notice of proposed delivery date.

1.8 ENGINEER'S APPROVAL OF ALTERNATE EQUIPMENT

- A. MANUFACTURERS of alternate equipment shall submit a pre-approval package to ENGINEER at least fourteen (14) calendar days prior to bid date. Alternative manufacturers shall submit the following information and supporting documentation:
1. Standard equipment drawings showing the equipment meeting the specifications in this section. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted and explanation provided for the deviation. All deviations shall be listed on a single document.
 2. Detailed installation drawings illustrating how the proposed screen fits in the channel. The drawings shall include plan, elevation, and sectional views of the installation. Drawings shall include details of the discharge chute, details of the seal between screen and side walls of the channel, and details of anchor bolt locations.
 3. Hydraulic calculations and flow curves for the proposed screen verifying that the screen is capable of processing the peak flow at various degrees of blinding.
 4. Motor characteristics and performance information.
 5. Reference list of all installations of same and similar equipment including contact names and phone numbers.
 6. Complete bill of materials for all equipment.
 7. Certification by the manufacturer that all stainless steel equipment will be manufactured in a stainless steel only factory.
 8. Certification that the entire equipment will be passivated by submersion in an acid bath as specified in Section 2.3.
 9. Documentation of required maintenance for all equipment including an approved list of lubricants and the required quantities.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The equipment shall be the EscaMax 8000x1152x3 as provided by Huber Technology, Inc. or pre-approved equal. Other than the named supplier, all manufacturers proposing equipment described herein, will provide a detailed submittal package, which will describe the proposed equipment and indicate where it differs (if any) from this specification section. All pre-qualification submittals will be submitted to the ENGINEER at least fourteen (14) calendar days prior to the bid date.
- B. If submitted equipment requires arrangement differing from that specified or provided in the drawings, provide drawings showing equipment differences and construction considerations for that equipment.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Screen design criteria for the processing of municipal wastewater is as follows:
 - 1. Number of Screens: 2
 - 2. Perforation Size: 0.236" (6 mm)
 - 3. Design Capacity (each): 24 MGD
 - 4. Effective screen area (free open-area): 51%
 - 5. Percent blockage at design capacity: 40%
 - 6. Max head loss through screen at design capacity & percent blockage: 2.1 ft.
 - 7. Depth from top of structure to channel invert: 16.75 ft
 - 8. Width of overall channel: 4'-4"
 - 9. Nominal width of screen 4'
 - 10. Approximate Downstream Water Level in Screen Channel: 3.4 ft.
 - 11. Screen inclination: 70-degrees
 - 12. Minimum Height of screening discharge: 4'-6"
(above operating floor of screen)
- B. The travel speed of the screen shall be 14 - 15 feet per minute (7 - 8 cm/s) with a single speed motor.
- C. All parts shall be designed and manufactured to handle the forces that may be exerted on the screen during fabrication, shipping, erection, and proper operation according to the O&M manual.
- D. All components shall be so balanced that jamming at any point will not result in structural failure, but will cause the drive motor to stall. All components, including the gear reducer, shall be designed to withstand, without damage or permanent distortion, the full stalling torque of the drive motor and/or the maximum differential head at any channel water depth.

2.3 SCREEN - MATERIALS

- A. Screen shall be manufactured from AISI 316L stainless steel shapes (rods, angles, and channels), pipes, and sheets unless otherwise noted. In particular, frames and guides,

screen elements, covers, shafting, discharge chute, fasteners and anchor bolts shall be made of this material.

- B. Screen shall be manufactured in a stainless steel only factory to prevent contamination of the stainless steel with foreign debris.
- C. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid (pickling bath) to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel.
- D. Lateral seal plates of the screen elements shall be made of glass fiber reinforced Polypropylene.
- E. Channel reducing plates (2 per screen) shall be of stainless steel and provided by the supplier for installation by the contractor. These plates shall extend from the screen channel bottom to the operating floor level. The contractor shall field drill attachment holes and will supply the anchors and attachment hardware. The holes shall be spaced per the supplier's requirements.
- F. All brushes shall be made of Polypropylene 6.6.
- G. The bottom seal flap and seals between the frame and the channel reducing plates shall be made of 4 mm thick neoprene.
- H. The bearings for the drive shaft shall be ball bearings in a paint coated cast iron casing. The lower sprocket bearings shall be slide bearings in a stainless steel casing with shafts made of white cast iron and slide bushing made of silicium carbide. All ball or roller bearings shall be double-sealed and provided with Nilos seal rings.

2.4 SCREEN - CONSTRUCTION

- A. The perforated band screen shall retain debris (screenings) from the incoming wastewater by means of traveling screen elements. The screenings shall be positively lifted and prevented from rolling back by means of lifting rakes with tines. Such lifting rakes shall be attached to every fourth screen element at distances not exceeding 20" (0.5 m). The screen elements shall be cleaned at the downstream side (back) of the screen by means of a rotating brush and a spray bar. Removed screenings shall be dropped through a discharge chute.
- B. Routine service, repair or replacement of screen elements, drive chain segments, drive mechanism and rotating brush shall be possible from the operating floor with the screen remaining in the channel.

- C. MANUFACTURER shall deliver the screen factory assembled (with the exception of motors and gears, discharge chute and support frames) and shall be tested for a minimum of eight hours prior to shipment. It shall be made such that the contractor can install the screen with minimal field assembly.
- D. The screen shall be provided with perforated screen elements. Each screen element shall be made of a single piece of 1/8" (3 mm) thick perforated plate that is convexly curved with a radius of minimum 6-1/2" (170 mm) to provide for sufficient structural stability. The height of each screen element shall be 9" (224 mm). The screening elements shall be designed as such that the gaps between the screen elements shall never exceed 0.04" (1 mm) throughout their entire lengths and traveling way. Each screen element shall be bolted with two bolts on each side to a link of the drive chain. Lateral plastic seal plates, made of 1/4" (6 mm) thick glass fiber reinforced polypropylene, shall be attached to both ends of each screen element. The seal plates provide slip sealing between the moving screen elements and the frame of the screen. Each screening element shall be removable from the operating floor.
- E. Every fourth screen element shall be provided with a lifting rake with tines that are specifically designed to be able to lift rocks, cans, bottles, rags, etc from the bottom of the channel. The distance between subsequent lifting rakes shall not exceed 1'-8" (0.5m). The tines shall be a minimum of 13/64" (5 mm) thick, 2-1/8" (55 mm) long, and 3/8" (10 mm) wide. The gaps between the tines shall not exceed 3/4" (20 mm). Screen elements with ledges instead of lifting rakes are not acceptable.
- F. The side frames of the screen shall be fabricated from 13/64" (5 mm) thick stainless steel plates and shall have a minimum of four 90 degree edges. The side frames shall be a minimum of 22-1/2" (570 mm) wide and 3-1/2" (93 mm) deep. The top plate shall also be fabricated from a 13/64" (5 mm) thick stainless steel plate. The side frames shall also be connected with each other through lateral tubing having a diameter of minimum 6-1/2" (168 mm) and a wall thickness of minimum 13/64" (5 mm). Contractor shall securely anchor the support frames onto the operating floor. 10/64" thick neoprene strips shall be fastened to the side frames to seal the lateral gaps between the side frames and the channel reducing plates. The entire unit shall be designed and constructed to withstand maximum possible static hydraulic forces exerted by the liquid on the screen. All structural and functional parts shall be sized to prevent deflection or vibration which may impair the operation of the units.
- G. A chute shall be provided that fully encloses the discharge section of the screen. An access hatch with hinges and handle shall be provided in the chute permitting easy access to the rotating brush and spray bar.
- H. A lateral bottom seal element shall be attached to and between the side frames. The element shall include a minimum 10/64" (4 mm) thick and 7" wide (179 mm) neoprene flap for sealing the gap between the element and the channel floor. The element shall also include a twin row of brushes made of polypropylene 6.6, each row having a height of 4-3/4" (120 mm) and a width of 3/8" (10 mm) and a bristle diameter of 1/24" (1

mm). The brushes shall be secured with a holder made of stainless steel 304 that permits easy replacement of the brushes. The brushes seal the gap between the element and the screen elements preventing passage of debris while permitting passage of the tines of the lifting rakes.

- I. The screen shall be provided with easily removable covers made of 3/64" (1.5 mm) thick stainless steel plates with edges on all sides. The covers shall be provided with turn locks and handles.
- J. The side frames shall be provided with roller tracks. The roller tracks shall be bolted to the side frames and shall be made of corner profiles that are a minimum of 13/64" (5 mm) thick and have a cross section of minimum 3 1/8" x 1 3/4" (80 x 45 mm).
- K. Two endless drive chains shall be provided to move the screen elements. The drive chains shall have links made of 316 stainless steel, with connecting bushing and pins made of Duplex stainless steel. The chains shall have a minimum strength of 107,000N (24,000lb.f) and a pitch of 8" (200 mm). Chain rollers shall be made of polyamide and shall have a minimum diameter of 2 3/8" (60 mm) and a width of 1 1/4" (32 mm).
- L. A pair of lower and upper Sprockets (four total) shall be provided. The sprockets shall be made of 316 stainless steel. The sprockets shall be a minimum of 1 1/8" (28.5 mm) thick and shall have a reference diameter of 13 3/8" (340 mm).
- M. The lower sprocket bearings shall be slide bearings with a slide bushing made of silicium carbide and with a shaft of white cast iron. The slide bushing shall have an interior diameter of 2 3/8" (59 mm) and a length of 2" (50 mm). Ball or roller bearings, or slide bushings made of metal or plastic material shall not be accepted as lower sprocket bearings.
- N. The upper drive shaft bearings shall be ball bearing type provided with nipples for grease lubrication. Their interior diameter shall be a minimum of 2 3/8" (60 mm). Their casing shall be made of paint coated cast iron.
- O. The drive shaft shall be made of a stainless steel tube with a minimum diameter of 3 1/2" (89 mm) and a wall thickness of 13/64" (5 mm). The drive shaft shall be driven by a 3.0HP gear motor with a minimum speed of 5.6 rpm.
- P. A rotating brush shall be provided for the cleaning of the screen elements. The distance between the axis of the brush and the screen elements shall be adjustable to allow for wear of the brush. The brush shall be made of polypropylene 6.6 and shall have a diameter of 13 3/8" (340 mm) and a bristle diameter of 1/24" (1 mm). The brush shall be driven by a 2 Hp motor with a speed of 58 rpm.
- Q. A spray pipe shall be provided for washing of the screen elements. The spray pipe shall have a diameter of minimum 1 1/4" and shall have stainless steel nozzles at distances not exceeding 4" (100 mm). The wash water flow per nozzle shall be a minimum of 1.7 gpm (0.1 l/s) at a minimum water pressure of 72.5 psi (5 bar). The water flow shall be

controlled with a minimum 1 ¼” diameter solenoid valve. Solenoid valves shall be Class I/Division 2, 120 V, 60 Hz single phase, brass body, ASCO Series 8221. Screens that do not include the specified spray pipe shall not be acceptable.

- R. Gear reducers shall comply with AGMA or comparable standards and shall have ball or roller bearings throughout with all moving parts immersed in oil. Gear reducers which require periodic disassembly of the unit and manual re-greasing of bearings are not acceptable.
- S. Motors shall be UL rated for operation in Class 1 Division 1 environment. Motors shall be inverter duty rated and equipped with thermostats. Motors shall be 460 Volts, 60 Hz, 3-phase, with a service factor of 1.0 for VFD powered motors and a service factor of 1.15 on sine wave power. Motors shall be rated for operation in a 104 degree F (40 degree C) environment.
- T. Refer to Division 16 for additional motor and electrical requirements.

2.5 CONTROLS AND INSTRUMENTATION

A. GENERAL

- 1. The control system shall be provided by the screen supplier.

B. WATER LEVEL SENSORS AND FLOAT SWITCH

- 1. Screen manufacturer shall provide four (4) separate level transmitters for continuously monitoring of the upstream and downstream wastewater levels for control of screen operation. See Specification 16950 Field Instruments for additional requirements. The contractor shall install the transmitters and provide wiring to the control panel.
- 2. Screen manufacturer shall provide a float switch with intrinsically safe relays and submersible cable for emergency high flow and backup situations and alarm. Contractor shall install the float switch and provide wiring to the control panel.

C. CONTROL PANEL

- 1. MANUFACTURER shall provide control panels as indicated in Division 16 specifications and drawings. Contractor shall install the control panel and provide wiring.
- 2. Controls panels shall be made by a U.L. listed company and shall bear a U.L. label.
- 3. Control panels wiring shall be color coded, neatly cabled and supported in non-flammable wiring tracks. Wiring shall be minimum 14 gauge MTW stranded wire.
- 4. Control panels shall contain all power and control devices necessary for the proper function of the screen and screen washing compactor and shall include the following:
 - a. 600-Volt rated main circuit breaker disconnect with lockable handle
 - b. 480 – 120 Volt control power transformer

- c. VFD and MCP type circuit breaker for main screen drive motor
 - d. VFD and MCP type circuit breaker for screen cleaning brush motor
 - e. Control Panel ON-OFF selector switch
 - f. HAND-OFF-AUTO selector switch for the operation of the screen drive
 - g. HAND-OFF-AUTO selector switch for the operation of the screen washing compactor
 - h. 3-pole reversing contactors with screw clamp terminals, motor protection relays and all other necessary equipment for screen motor and brush motor protection
 - i. Red pilot L.E.D for "Screen Drive On" indication
 - j. Red pilot L.E.D for "Brush Drive On" Indication
 - k. Red pilot L.E.D for "Wash Water On" Indication
 - l. Red pilot L.E.D for "Screen Washing Compactor On" indication
 - m. Yellow pilot L.E.D for "Screen Motor Fault" indication
 - n. Yellow pilot L.E.D for "High Water Level" indication
 - o. Yellow pilot L.E.D for "Screen Washing Compactor Fault" indication
 - p. White pilot L.E.D for "Control Power" indication
 - q. Alarm silence and reset push buttons
 - r. Spare contact for remote indication of "Screen Motor Fault" alarm
 - s. Spare contact for remote indication of "High Water Level" alarm
 - t. Spare contact for remote indication of "Screen Washing Compactor Motor Fault" alarm
 - u. Spare contact for remote indication of "Control Power Failure" alarm
 - v. Control relays, wiring and circuitry required to implement the control logic
 - w. Programmable controller (PLC) shall be an Allen Bradley Micrologix 1400
 - x. Operator interface shall be an Allen Bradley Panelview Plus 1000 High Bright
 - y. Push-to-Stop/Pull-to Run emergency stop maintained push button with lockout
 - z. Ethernet-to-multimode fiber converter
5. 120V control power will be provided by electrical contractor supplied power source. Provide control power terminal strips for connection from power source.
 6. Refer to Division 16 for additional control panel requirements.

D. SEQUENCE OF OPERATION - SCREEN

1. In AUTO position shall be controlled by the water level sensors. Screen operation shall be started when the water level sensors monitor a certain water level difference, when the float switch senses high water level, or when a certain time has passed since the last operation of the screen. Screen operation shall be stopped when the water difference is below a certain value and when the float switch does not indicate high water alarm, or when a certain run time has expired (if operation was started by timer).
2. Operation of the screen starts the screen and brush motors and opens the solenoid valve for spray water.

3. In the event of high water level indication, the indicator light is on and an alarm is rendered.
4. In the event that fault of the screen motor is detected by the VFD, the screen shall immediately be stopped and the indicator light shall be illuminated and an alarm shall be rendered.
5. In the event that fault of the screen washing compactor is detected, the screen shall immediately be stopped.
6. Setting the switch into HAND position shall set the screen into operation. The screen and brush motors will run and the solenoid valve for spray water will be open.
7. Reset is manually performed after correction of any cause for a trip-out.

E. SEQUENCE OF OPERATION – SCREEN WASHING COMPACTOR

1. In AUTO position a certain amount of screenings starts the washing and compacting screw, which transports the screenings into the rising pipe. At the same time, a washing cycle starts. Screen washing compactor operation shall stop after the washing cycle in completed.
2. In the event that fault of the screen washing compactor is detected, the screen washing compactor shall immediately be stopped and the indicator light shall be illuminated and an alarm shall be rendered.
3. Setting the switch into HAND position shall start the washing and compacting screw and a wash cycle shall be initiated.

2.6 SPARE PARTS

- A. The following Spare Parts shall be included and supplied together with the equipment (total):
1. Two (2) screen elements
 2. One (1) rotating brush
 3. Two (2) neoprene strips for bottom seal element
 4. Two (2) sets of twin brushes for bottom seal element
 5. Six (6) lateral plastic seal plates including fasteners
 6. Two (2) lower bearings
 7. Two (2) upper bearings
 8. Two (2) complete chains with pins and rollers
 9. One (1) solenoid valve rebuild kit (for ASCO Series 8221)
- B. Spare parts shall be packaged for long term unconditioned exterior storage with labels indicating the contents of each package, and shall be delivered to owner as directed.

PART 3 - EXECUTION

A. WARRANTY

- B. The MANUFACTURER of the equipment supplied under this specification shall provide a non-prorated warranty for a period of twenty-four (24) months commencing on satisfactory start-up and acceptance by the OWNER, or thirty (30) months from date of delivery, whichever occurs last. The MANUFACTURER shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the MANUFACTURER shall, at his option, promptly repair, modify or replace the defective equipment, or OWNER'S payment for the products shall be refunded.

C. INSTALLATION AND TESTING

- D. Supplier shall furnish the services of a factory-trained service engineer for two (2) trips including a total of four (4) days for eight-hours per day minimum, not including travel, to inspect the installation, observe start up, and provide operator and maintenance training.
- E. During installation, Supplier shall supply technical services via telephone as needed.
- F. Equipment shall not be energized, or "bumped" to check the electrical connection for motor rotation without the service engineer present.
- G. The service engineer shall make all necessary adjustments and settings to the controls.
- H. The service engineer shall demonstrate proper and sequential operation of the screen. The screen shall operate automatically based on the water level differential.

3.2 MANUFACTURER'S CERTIFICATE(S)

- A. Provide MANUFACTURER'S certificate of installation and commissioning following functional testing and startup.

END OF SECTION 11330

SECTION 11400 - GRIT REMOVAL SYSTEM

PART 1 - GENERAL

1.1 DEFINITIONS

- A. CONTRACTOR –The person, partnership, corporation, association, or affiliation as specifically defined in the contract general conditions paraphrased to be the entity with whom the OWNER shall execute an agreement for the installation of the system supplied by the SUPPLIER.
- B. ENGINEER – The person, partnership, corporation, association, or affiliation as specifically defined in the contract general conditions paraphrased to be the engineering firm contracted by the OWNER to design the project.
- C. OWNER – As specifically defined in the contract general conditions, the OWNER refers to the entity contracting the work being completed.
- D. SUPPLIER/MANUFACTURER – The person, partnership, corporation, association, or affiliation with whom the OWNER executes an agreement for supplying the SYSTEM equipment under this contract.
- E. SYSTEM – The complete Grit Removal System(s), which shall include all equipment, controls, and instrumentation as necessary to remove grit from the screened raw sewage as herein specified.

1.2 SCOPE

- A. Two (2) complete Grit Removal Systems as shown on the drawings and as specified herein shall be installed. The equipment for each Grit Removal System shall consist of a Grit Separator and a Grit Cyclone/Classifier (see Specification 11401). The controls for each Grit Removal System shall be incorporated in a single control panel for a total of two (2) panels for the System. The control panels shall operate the Grit Separator, Grit Cyclone/Classifier, and the Grit Pump (see Specification 11402).
- B. The grit dewatering system shall be provided by the grit removal system supplier. The supplier shall have overall system responsibility for the grit removal system and the grit dewatering system, not including the grit pumps.
- C. This specification and the project drawings are based upon the use of a Grit King for grit separation configuration. Alternate MANUFACTURER may be accepted by the OWNER only as herein specified.

1.3 RELATED SECTIONS

- A. Division 16 Specifications
- B. 11401 – Grit Classifier

C. 11402 – Grit Pump

1.4 DESIGN REQUIREMENTS

A. The Grit Removal System shall:

B. Remove 90-95% of all grit particles with specific gravity of 2.65 greater than or equal to 106 micron with less than 20% (wt) volatile solids and greater than 60% total solids at a total peak design flow of 24.0 MGD.

C. Remove 90-95% of all grit particles with specific gravity of 2.65 greater than or equal to 106 micron with less than 20% (wt) volatile solids and greater than 60% total solids at the average design flow of 20.0 MGD.

D. The Grit Separator shall be a free standing vessel and receive the incoming screened flow. The Grit Separator shall remove the specified grit particles from the specified peak flow and collect them in a sump at the bottom of the unit. The de-gritted effluent from the Grit Separator shall be discharged via an overflow channel as shown on the drawings.

E. The Grit Separator shall be all-hydraulic, self-activating and shall not require instrumentation, internal moving parts or external power.

F. The Grit Separator shall be self cleaning and consist of corrosion resistant components.

G. The system to be furnished hereunder shall be made by a manufacturer regularly engaged in such work and who has furnished similar installations and had them in successful and continuous operation for a minimum period of ten years.

H. Data on performance testing, service history and operation of existing installations using the submitted equipment shall be made available to the ENGINEER, upon request, for use in determining that the Grit Removal System offered meets the intent of the contract, performance requirements and criteria stated in these specifications.

I. The Grit Separator technology shall be designed utilizing Computational Fluid Dynamics (CFD) and field data to verify its flow regime, headloss and grit removal characteristics. Upon request, data on the computation methods used and generic simulation results shall be made available to the engineer.

J. Units without an internal dip plate with annulus baffle plate to modify the flow pattern shall not be accepted.

K. Equipment using paddles or air to supplement or induce a vortex shall not be accepted.

1.5 SUBMITTALS AND OPERATION AND MAINTENANCE MANUALS

- A. Within the timeframe provided in the bid after receipt of the purchase order, the SUPPLIER shall furnish five (5) sets of bound submittals in addition to one (1) electronic version on CD. Submittals shall be provided to the OWNER to establish compliance with this specification and shall include the following information:
1. Descriptive product literature
 2. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
 3. Schematic electrical wiring diagram and electrical controls information.
 4. Control panel layout information
 5. Complete motor and drive data.
 6. Parts list including a list of recommended spare parts for the first five years of operation.
 7. Detailed installation instructions
 8. The total weight of the equipment and lifting points
 9. Recommendations for short and long term unconditioned, exterior storage
 10. A complete bill of materials of all equipment
 11. A copy of the manufacturer's warranty
- B. Operation and maintenance manuals shall be provided within the timeframe provided in the bid after receipt of approved shop drawings, which must be no later than 15 calendar days after delivery of equipment. The SUPPLIER shall furnish five (5) sets of bound manuals in 3-ring binders in addition to one (1) electronic version on CD. All material shall be marked with project identification, and inapplicable information shall be marked out or deleted. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions, performance curve, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment. All manuals shall contain only original pamphlets, brochures and equipment cut sheets. The manuals shall include the following data:
1. Alignment, adjustment, and repair instructions.
 2. MANUFACTURER'S installation instructions.
 3. Assembly diagrams.
 4. Troubleshooting guide.
 5. Lubrication instructions.
 6. Recommended spare parts lists and predicted life of parts subjected to wear.
 7. Schematic electrical wiring diagram and electrical controls information
 8. Control panel layout information

1.6 QUALITY ASSURANCE

- A. Certificate of Compliance
- B. The MANUFACTURER shall warrant that the Grit Removal System to be supplied shall be manufactured in strict compliance with the Contract Specifications.

- C. The system shall be furnished by a MANUFACTURER who is ISO 9001:2008 Certified.
- D. MANUFACTURER shall be successful in the experience of manufacture, operation, and servicing of Grit Removal Systems of type, size, quality, performance, and reliability equal to that specified for a period of not less than ten (10) years. The MANUFACTURER shall submit evidence of experience having supplied a minimum of ten (10) installations within the United States and its territories of similar size to the proposed system.
- E. In the absence of verifiable experience, the MANUFACTURER shall be required to provide an extended warranty and subsequent Performance Bond for the same number of years that the MANUFACTURER was found lacking in experience from the specified ten (10) year period with a minimum period of four (4) years. The performance bond shall commence with acceptance of the equipment and time described herein and beyond the standard warranty period.
- F. If equipment other than that shown on the Drawings is submitted to the ENGINEER for consideration as an equal, it shall be the responsibility of the MANUFACTURER requesting approval to submit with the request a revised design and layout of the mechanical equipment acceptable to the ENGINEER. Revised drawings shall show the proposed location of the alternate unit, and area required for withdrawal space of replacement or serviceable components. This drawing shall also show clearances of adjacent equipment and service area required by that equipment.
- G. Changes in architectural, structural, electrical, mechanical and plumbing requirements for the alternate shall be the responsibility of the MANUFACTURER requesting approval. This shall include the cost of redesign by affected designers. Any additional cost incurred by affected subcontractors shall be the responsibility of the MANUFACTURER and not the OWNER.
- H. Approved equal MANUFACTURERS shall furnish performance test results documenting that the SYSTEM has achieved the specified performance requirement. Performance test reports must clearly show the performance of the entire grit removal system, including grit washing and/or dewatering units.

1.7 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT

- A. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
- B. Contractor shall be responsible for unloading of the machinery and shall have equipment on-site available at the time of delivery permitting proper hoisting of the equipment.

- C. Contractor shall provide anchor bolts. SUPPLIER shall provide template to contractor for use in securing the anchor bolts.
- D. Spare parts shall be packed in containers bearing packing lists clearly designating contents and pieces of equipment for which they are intended. Packaging shall provide adequate protection of components in long term unconditioned storage.
- E. SUPPLIER shall furnish one set of any special tools required for maintenance of the screens.
- F. SUPPLIER shall provide to the contractor a minimum seven calendar day notice of proposed delivery date.

1.8 ENGINEER'S APPROVAL OF ALTERNATE EQUIPMENT

- A. MANUFACTURERS of alternate equipment shall submit a pre-approval package to ENGINEER at least fourteen (14) calendar days prior to bid date. Alternative manufacturers shall submit the following information and supporting documentation:
 1. Standard equipment drawings showing the equipment meeting the specifications in this section. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted and explanation provided for the deviation. All deviations shall be listed on a single document.
 2. Detailed installation drawings illustrating how the equipment fits in the designated area. The drawings shall include plan, elevation, and sectional views of the installation.
 3. Hydraulic calculations for the proposed equipment.
 4. Motor characteristics and performance information.
 5. Reference list of all installations of same and similar equipment including contact names and phone numbers.
 6. Complete bill of materials for all equipment.
 7. Documentation of required maintenance for all equipment including an approved list of lubricants and the required quantities.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The grit separator equipment shall be Grit King units as provided by Hydro International, Hillsboro, OR. or pre-approved equal. Other than the named MANUFACTURER, all MANUFACTURERS proposing equipment described herein, will provide a detailed submittal package, which will describe the proposed equipment and indicate where it differs (if any) from this specification section. All pre-qualification submittals will be submitted to the ENGINEER at least fourteen (14) calendar days prior to the bid date.

- B. If submitted equipment requires arrangement differing from that specified, prepare and submit for review complete structural, mechanical, and electrical drawings and equipment lists showing all necessary changes and embodying all special features of equipment proposed. Any changes are at no additional compensation and the MANUFACTURER will be responsible for all engineering costs of redesign by the ENGINEER, if necessary.

2.2 GRIT SEPARATOR

A. Design Data

- | | |
|--------------------------------|--|
| 1. Number of Units: | 2 |
| 2. Size: | 14' diameter |
| 3. Configuration: | Free Standing |
| 4. Performance: | 95% removal of all grit (specific gravity 2.65)
≥ 106 microns at average flow |
| 5. Performance: | 95% removal of all grit (specific gravity 2.65)
≥ 106 microns at peak flow |
| 6. Average Flow/Unit: | 10.0 MGD with no more than 4" headloss |
| 7. Peak Flow/Unit: | 14.0 MGD with 6" headloss |
| 8. Depth of Flow Peak/Average: | 12" / 10" |
| 9. Recommended Underflow Rate: | 200 gpm |
| 10. Influent Connection: | 30" flanged pipe |
| 11. Effluent Connection: | 60" wide channel |
| 12. Underflow Connection: | 4" |
| 13. Underflow Layout: | Pumped |
| 14. Underflow Control: | Electric actuated plug valve |
| 15. NPW Connection: | 1" NPT |
| 16. Materials of Construction: | 316L SS |
| 17. Operating Pressure: | Atmospheric |

B. Operation

1. The Grit Separator shall be designed to separate grit and sand from screened raw wastewater using Hydro-dynamic separation and boundary layer effects to aid gravitational forces.
2. All flow passages shall be self-cleaning and free of sharp projections or fittings that may snag stringy or fibrous materials.
3. The Grit Separator shall be characterized by a predetermined flow path caused by the vessel geometry and flow modifying components to maximize the concentration and removal of settleable solids.
4. The Grit Separator shall include a fluidizing system to prevent the collected grit from compacting in the collection area, release entrapped organics, and aid in transporting the accumulated grit to the Grit Dewatering System.
5. The design of the structure shall incorporate all gravity equipment and process liquid loads, and shall be internally braced to the point of gravity support for

lateral/vertical wind loads for an 164 mph, 3 second wind gust in accordance with ASCE 7-10 (Ultimate Wind Loads), Exposure "C" and Risk Category IV (essential facility-public utility). Calculations shall be signed and sealed by a Florida licensed Professional Engineer.

C. Construction

1. The Grit Separator shall consist of a free standing vessel with a sloping base fabricated from stainless steel. The vessel walls shall be 3/16 inch thick minimum.
2. A center shaft and cone shall be mounted so that its edge is clear of the sloping base of the vessel. It shall be removable from the top of the unit.
3. A collection pot for the separated grit shall be located under the cone.
4. All flanges shall conform to ANSI B16.1 bolt patterns.

D. Valves and Accessories

1. The Grit Separator shall be supplied with the following valves:
 - a. One (1) 4" cast iron plug valve with electric actuator as manufactured by Beck, 120 V, 60 Hz, 1PH, NEMA 4X, to control the underflow.
 - b. One (1) 1" NEMA 4X brass solenoid valve to automate the fluidizing water supply, shall be ASCO Series 8221.
 - c. One (1) 1" brass pressure regulator to adjust the fluidizing water pressure.
 - d. Two (2) 1" bronze ball valves to shut off the fluidizing water and isolate the solenoid valve.
2. The following pressure gauges shall be provided for the grit removal system:
 - a. One (1) 0-100 psig pressure gauge to monitor the fluidizing water delivery pressure.

2.3 CONTROLS AND INSTRUMENTATION

A. Control Panel

1. One (1) control panel shall be furnished, completely pre-wired and tested.
2. The control panel shall adhere to the following specifications:

a. Enclosure Rating:	NEMA 12
b. Material:	Mild Steel
c. Voltage:	480 Volt
d. Phase:	3 Phase
e. Frequency:	60 Hz
f. Load:	15 Amp
g. Logic:	Relay
3. The Control panel shall contain all timers, switches, indicator lights, and other components necessary to operate the following equipment:
 - a. Two (2) current Grit Separators and one (1) future
 - b. Two (2) current Grit Pumps and one (1) future
 - c. Two (2) current Grit Classifiers and one (1) future
4. The control panel shall be supplied with applicable control relays and time delay

relays with a minimum one extra normally closed and one extra normally opened contact is provided for each relay.

5. Where remote monitoring is required, the panel shall be provided with all dry contacts necessary.
6. The panel door layout shall include the following items:
 - a. 600-V rated main circuit breaker disconnect with lockable handle.
 - b. Back lit Power Maintained 2-way switch
 - c. System three position HOA switch
 - d. System Emergency Stop push button
 - e. System Alarm Reset push button
 - f. Grit Removal Cycle Start push button
 - g. Grit Separator fluidizing water valve Open/Close switch
 - h. Grit Separator fluidizing water valve OPEN indicating LED
 - i. Grit Separator underflow plug valve three position Open/Close switch
 - j. Grit Separator underflow plug valve OPEN/CLOSE indicating LED
 - k. Grit Pump running LED (red)
 - l. Grit Pump three position HOA switch
 - m. Grit Pump fail indicating LED (yellow)
 - n. Grit Pump manual START push button (red)
 - o. Grit Pump manual STOP push button (green)
 - p. Grit Classifier running LED (red)
 - q. Grit Classifier fail indicating LED (yellow)
 - r. Grit Classifier three position HOA switch
 - s. Grit Classifier manual START push button (red)
 - t. Grit Classifier manual STOP push button (green)
 - u. 120V control power will be provided by electrical contractor supplied power source. Provide control power terminal strips for connection from power source.
 - v. Control power indicator LED (white)
 - w. Programmable controller (PLC)
 - x. Operator interface
 - y. Push-to-Stop/Pull-to-Run emergency stop maintained push button with lockout.
7. Control panel shall also include an Ethernet-to-fiber optic converter.
8. Refer to Division 16 specifications for additional Control Panel and electrical requirements.

2.4 SEQUENCE OF OPERATION

- A. The system shall be controlled to provide automatic or manual operation, manual starting and stopping and system shut down when a fault is detected.
- B. Reuse plant water shall be supplied to the Grit Separator.

- C. Grit Separator
 - 1. Screened raw wastewater shall be pumped into the Grit Separator continuously.
 - 2. A time clock (TC) shall initiate when grit discharge cycles occur. The time clock shall be adjustable to initiate cycles up to every 20 minutes.
 - 3. When the time clock initiates a cycle, the panel shall start the grit dewatering unit.
 - 4. Concurrently, the control panel shall send a signal to open the solenoid valve located on the fluidizing line for an adjustable time period (typically 60 seconds).
 - 5. After the fluidizing time runs out and the solenoid valve closes, the electrically actuated plug valve shall open, and the grit pump shall be activated for an adjustable time period (typically 120 seconds).

2.5 UTILITY REQUIREMENTS

- A. Water
 - 1. The Grit Separator shall require an intermittent supply of minimum 50 gpm clarified non-potable water at 50 psig supplied to the grit fluidizing pipe via a NPT connection.
- B. Electrical
 - 1. The system shall require one (1) 480 VAC, three phase electrical service connection and one (1) 120 VAC, single phase control power connection to operate, explosion proof as required.

2.6 MATERIALS AND FINISHES

- A. Materials
 - 1. All stainless steel used for the fabrication of the equipment shall conform to the following standards:
 - a. Plate and Sheet
 - 1) ASTM A 167
 - 2) ASTM A 240
 - b. Bar
 - 1) ASTM A 276
 - 2) ASTM A 479
 - c. Tube
 - 1) ASTM A 312
- B. Exterior Surface Finishes
 - 1. All surfaces shall be free of sharp edges, weld spatter and residue. All welds shall be ground smooth.
 - 2. All stainless steel surfaces shall be acid washed.

PART 3 - EXECUTION

3.1 WARRANTY

- A. The MANUFACTURER of the equipment supplied under this specification shall provide a non-prorated warranty for a period of twenty-four (24) months commencing on satisfactory start-up and acceptance by the OWNER, or thirty (30) months from date of delivery, whichever occurs last. The MANUFACTURER shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the MANUFACTURER shall, at his option, promptly repair, modify or replace the defective equipment, or OWNER'S payment for the products shall be refunded.

3.2 START-UP, TRAINING AND MANUFACTURER'S SERVICES

- A. A factory trained representative for the equipment specified herein shall be present at the jobsite and/or classroom designated by the OWNER for four (4) 8-hour man-days (in two visits) for installation inspection, plant startup, functional testing, and operator instructions; travel time excluded. A minimum of 15 calendar days notice will be provided to schedule manufacturer's services. Any services with less than 15 calendar days notice may be billed for service time and actual travel costs.

3.3 FUNCTIONAL TESTING

- A. Prior to plant startup, all equipment shall be inspected for proper alignment, operation, connection, and satisfactory operation by means of a functional test. It is the General Contractor's responsibility to duly notify the MANUFACTURER of any inabilities to perform functional testing prior to operator training.

3.4 MANUFACTURER'S CERTIFICATE(S)

- A. Provide MANUFACTURER'S certificate of installation and commissioning following functional testing and startup.

END OF SECTION 11400

SECTION 11401 – GRIT DEWATERING SYSTEM

PART 1 - GENERAL

1.1 DEFINITIONS

- A. CONTRACTOR –The person, partnership, corporation, association, or affiliation as specifically defined in the contract general conditions paraphrased to be the entity with whom the OWNER shall execute an agreement for the installation of the system supplied by the SUPPLIER.
- B. ENGINEER – The person, partnership, corporation, association, or affiliation as specifically defined in the contract general conditions paraphrased to be the engineering firm contracted by the OWNER to design the project.
- C. OWNER – As specifically defined in the contract general conditions, the OWNER refers to the entity contracting the work being completed.
- D. SUPPLIER/MANUFACTURER – The person, partnership, corporation, association, or affiliation with whom the OWNER executes an agreement for supplying the SYSTEM equipment under this contract.
- E. SYSTEM – The complete Grit Dewatering System(s), which shall include all equipment, controls, and instrumentation as necessary to transfer and dewater the grit collected from the Grit Separator.

1.2 SCOPE

- A. The SUPPLIER shall furnish two (2) Grit Dewatering Systems as shown on the drawings and as specified herein. The equipment for each Grit Dewatering System shall consist of a grit dewatering classifier with a grit cyclone. The grit classifier with cyclone which shall consist of a 12” minimum diameter screw type dewatering classifier and a 10” minimum diameter grit cyclone. Power and controls shall be incorporated into the control panel provided with the Grit Removal System (specification 11400).
- B. This specification and the project drawings are based upon the use of grit classifier with cyclone by Wemco, a Division of Weir Pump. Alternate MANUFACTURERS may be accepted by the OWNER only as herein specified.

1.3 RELATED SECTIONS

- A. Division 16
- B. 11400 – Grit Removal System

1.4 SUBMITTALS AND OPERATION AND MAINTENANCE MANUALS

- A. Within the timeframe provided in the bid after receipt of the purchase order, the SUPPLIER shall furnish five (5) sets of bound submittals in addition to one (1) electronic version on CD. Submittals shall provided to the OWNER to establish compliance with this specification and shall includes the following information:
1. Descriptive product literature
 2. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
 3. Schematic electrical wiring diagram and electrical controls information.
 4. Complete motor and drive data.
 5. Parts list including a list of recommended spare parts for the first five years of operation.
 6. Detailed installation instructions
 7. The total weight of the equipment and lifting points
 8. Recommendations for short and long term unconditioned, exterior storage
 9. A complete bill of materials of all equipment
 10. A copy of the manufacturer's warranty
- B. Operation and maintenance manuals shall be provided within the timeframe provided in the bid after receipt of approved shop drawings, which must be no later than 15 calendar days after delivery of equipment. The SUPPLIER shall furnish five (5) sets of bound manuals in 3-ring binders in addition to one (1) electronic version on CD. All material shall be marked with project identification, and inapplicable information shall be marked out or deleted. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions, performance curve, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment. All manuals shall contain only original pamphlets, brochures and equipment cut sheets. The manuals shall include the following data:
1. Alignment, adjustment, and repair instructions.
 2. MANUFACTURER'S installation instructions.
 3. Assembly diagrams.
 4. Troubleshooting guide.
 5. Lubrication instructions.
 6. Recommended spare parts lists and predicted life of parts subjected to wear.
 7. Schematic electrical wiring diagram and electrical controls information.

1.5 QUALITY ASSURANCE

- A. The classifier equipment furnished under this Section shall be of a design and manufacture that has been used in similar applications and it shall be demonstrated to the satisfaction of the OWNER that the quality is equal to equipment made by that manufacturer specifically named herein.
- B. The system shall be furnished by a MANUFACTURER who is ISO 9001 Certified.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- C. The grit classifier with cyclone shall be provided by WEMCO, a Division of Weir Pump, or pre-approved equal. Other than the named MANUFACTURER, all MANUFACTURER'S proposing equipment described herein, will provide a detailed submittal package, which will describe the proposed equipment and indicate where it differs (if any) from this specification section. All pre-qualification submittals will be submitted to the ENGINEER at least fourteen (14) calendar days prior to the bid date.
- D. If submitted equipment requires arrangement differing from that specified, prepare and submit for review complete structural, mechanical, and electrical drawings and equipment lists showing all necessary changes and embodying all special features of equipment proposed. Any changes are at no additional compensation and the MANUFACTURER will be responsible for all engineering costs of redesign by the ENGINEER, if necessary.

2.2 CYCLONE

- A. Each cyclone shall be 316L SS. Each section of the cyclone shall be completely lined and protected from the high velocity grit by a replaceable liner. The cyclone shall be so constructed so any section liner can be replaced independently. The 4" inlet and 6" overflow connections shall be of 125 lb., 316L SS flanges.
- B. The cyclone vortex liner shall be made of an abrasion-resistant alloy with an approximate hardness of 500 Brinell. A hinge and quick disconnect clamp shall be provided between the apex assembly and lower cone section to allow removal of material which may clog the apex, without disconnecting any piping on the cyclone itself. Each cyclone inlet shall be tapped for a 1" NPT gauge connection and a diaphragm protected pressure gauge with shut-off valve shall be provided.
- C. The cyclone underflow shall feed into the classifier for washing and dewatering, and be sized so that the proper hydraulic loading is provided to the classifier.
- D. The cyclone overflow will feed to piping furnished by the contractor which must be adequately vented to prevent siphoning.
- E. The unit shall have a hydraulic capacity of 200 – 250 gallons per minute. The flow shall be supplied to the cyclone at 7 psi.

2.3 CLASSIFIER

- A. Each classifier shall consist of a full flare fabricated 316L stainless steel grit settling tank with a 316L stainless steel screw type grit conveyor. The classifier shall have a minimum pool area at maximum water level of 8.3 square feet, a minimum weir length of 2.0 feet, and a screw speed of 12 RPM maximum. The grit settling tank shall be

constructed of 1/4" 316L stainless steel plate, suitably reinforced and mounted on 316L stainless steel supports at a slope of not more than 3-1/2" per foot. The tank shall be designed to provide a settling compartment where grit separation takes place, with a minimum full water depth of 150% of the screw diameter. The weir overflow shall discharge into a launder box equipped with a screwed pipe nozzle or flanged fitting for connection to drain.

- B. The grit shall be removed from the bottom of the settling compartment and discharged by means of a 50% pitch, 12" diameter screw-type conveyor. The screw shall be made from pre-formed heavy steel flight sections welded or bolted to the shaft and fitted with replaceable wearing shoes. The pipe shaft of the conveyor shall be designed with a maximum stress of 3,000 psi, and fatigue life, at 98% reliability, of 20 years minimum. Calculations, signed by a Florida registered Professional Engineer, showing compliance with these requirements shall be submitted for approval.
- C. Wearing shoes shall be abrasion-resistant and mounted on the flights by means of bolts and nuts. There shall be sufficient clearance between the screw and tank so that a buildup of sand or grit will provide a bed for the screw, eliminating tank wear.
- D. The upper end of the screw conveyor shall be connected to a cycloidal motion speed reducer by a rigid coupling. The cycloidal speed reducer shall be designed so that all torque is transmitted by rollers, and shall be capable of withstanding shock loads of 500% of rated loading. The cyclodrive shall take radial and all thrust loads from the shaft, and at maximum load provide a minimum B-10 bearing life of 50,000 hours. Gear type speed reducers are not acceptable. The cyclodrive shall be connected to a 3/4 HP, totally enclosed motor.
- E. See Specification 16150 for additional motor requirements and Division 16 for additional electrical requirements.
- F. A valve cock with NPT nipple shall be furnished for the spiral washwater. Also, an 115V-single phase solenoid valve, which is compatible with the motor enclosure, shall be included for the washwater line and connected by the electrical contractor to open when the Hydrogritter motor is activated. Solenoid valve shall be brass body, ASCO Series 8221.
- G. The entire motor and reducer assembly shall be provided at the shaft center line so that the screw assembly can be raised. The lower end of the screw shall be supported by a bearing housed in a water tight enclosure suitable for completely submerged operation in grit service. The bearing shall utilize a sealed bronze, sleeve-type bearing, running completely submerged in oil, and shall require only yearly inspection and oil change. Internal parts of the bearing assembly shall be sealed from outside contamination by the use of floating satellite seals. Lower bearing designs incorporating conventional packing or requiring external flushing will not be acceptable.

- H. The entire motor-cyclo-drive assembly shall pivot at the shaft centerline, and the screw assembly shall be provided with a manually operated lifting device attached to the lower bearings, so that the spiral and lower bearing can be raised for inspection and maintenance above the maximum water level without the use of any special tools, or any dismantling of components. Designs which require dismantling of any components to inspect the lower bearing are not acceptable.
- I. A 316L SS protective guard shall be provided over the full length of the rotating screw to protect operating personnel. The belt guard shall be constructed of the same corrosion resistant material as the rotating screw guard.
- J. The classifier and cyclone operating parameters, i.e., cyclone feed rate, pressure and underflow and classifier pool area, weir length, screw speed, submergence, and slope, have been selected to avoid build-up of fine grit in the classifier tank, which will cause grit of the desired size to be lost. Changes in any of these parameters will not be acceptable unless a detailed submittal showing calculations and operating data provides evidence that any such change will not affect the ability of the system to perform as specified. The classifier and cyclone shall be furnished and manufactured by the same manufacturer to ensure compatibility of design and operation of each component.

PART 3 - EXECUTION

3.1 WARRANTY

- A. The MANUFACTURER of the equipment supplied under this specification shall provide a non-prorated warranty for a period of twenty-four (24) months commencing on satisfactory start-up and acceptance by the OWNER, or thirty (30) months from date of delivery, whichever occurs last. The MANUFACTURER shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the MANUFACTURER shall, at his option, promptly repair, modify or replace the defective equipment, or OWNER'S payment for the products shall be refunded.

3.2 STARTUP SERVICE

- A. The manufacturer shall include four (4) days (at 8-hour per day minimum excluding travel time) / two (2) trips of startup service to place the Hydrogritter in service.

3.3 MANUFACTURER'S CERTIFICATE(S)

- A. Provide MANUFACTURER'S certificate of installation and commissioning following functional testing and startup.

END OF SECTION 11401

SECTION 11402 – GRIT PUMP

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

- A. Operating Conditions - Design: 293 GPM @ 11.2 FT TDH
Secondary: 200 GPM @ 17 FT TDH
- B. Minimum Shutoff head: 26 FT
- C. Maximum Motor HP: 7.5 HP
- D. Minimum Hydraulic Efficiency (at design): 40.3%
- E. Maximum Motor RPM: 1160 RPM

1.2 QUALITY ASSURANCE - REFERENCED STANDARDS:

- A. American Iron & Steel Institute (AISI)
- B. American Society for Testing and Materials (ASTM)
- C. Hydraulic Institute Standards for Centrifugal, Rotary, and Recip Pumps (HI)
- D. National Fire Protection Agency (NFPA)
- E. National Electric Code(NEC)
- F. National Electrical Manufacturers Association(NEMA)
- G. Anti-Friction Bearing Manufacturers Association(AFBMA)
- H. International Standards Organization(ISO) - ISO9001

1.3 WARRANTY

- A. The pump manufacturer shall warrant the pump and motor to the Owner against defects in workmanship and materials for a period of seven (7) years under normal use and service. Pump manufacturer warranties shall be in published form, and shall apply to all similar units. A copy of the warranty shall be provided to the Owner with the bid proposal.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following are acceptable:
 - 1. KSB
 - 2. No Others Acceptable
- B. All products, whether named as "acceptable" or proposed as "equal" must fully comply with these specifications. Standard product must be modified, if required, for compliance. Alternate equipment must include a clear statement of each point of difference between the proposed alternate product and these specifications. The Owner and Engineer reserve the right to reject any bid not based on KSB product.

2.2 MATERIALS

A. SUBMERSIBLE SEWAGE PUMPS

1. Pump Case: Chilled cast iron EN-JN 3029 (A 532 II C15% CRMO-Hc)
2. Motor Housing: Chilled cast iron EN-JN 3029 (A 532 II C15% CRMO-Hc)
3. Impeller: Chilled cast iron EN-JN 3029 (A 532 II C15% CRMO-Hc)
4. Intermediate Housing (Backplate): Chilled cast iron EN-JN 3029 (A 532 II C15% CRMO-Hc)
5. Suction Stand Elbow: Cast Iron, ASTM A48, Class 35B
6. Pump/Motor Shaft: Stainless steel, ASTM A276 Type 420
7. O-Rings: Nitrile Rubber (NBR)
8. Fasteners: Stainless Steel, ASTM A276 Type 316Ti.
9. Lower Seal Faces: Silicon Carbide/Silicon Carbide
10. Upper Seal Faces: Silicon Carbide stationary/Carbon rotating
11. Oil-all uses (seal lubrication, etc): Ecologically safe, paraffin base
12. Power/Control Cable Jacket: Chloroprene with non-wicking fillers

2.3 ACCESSORIES

- A. **POWER CABLE** - Provide fifty (50) ft of power/control cable with each pump, suitable for submersible wastewater application, sized in accordance with NEC requirements. Provide cable terminal box on side of motor housing, with cable entry sealed to insure that no entry of moisture is possible into the high-voltage motor/ terminal area even if the cable is damaged or severed below water level. Cable seal shall include a compressed rubber grommet to seal the cable exterior and epoxy fill to seal the interior passages. Also a monolithic dam formed by either soldering on bare stripped cable leads or by inserting cooper bushing over each individual cable lead shall be provided. A strain relief device, in direct contact with both the cable and the cast iron entry housing, shall be provided. The cable entry shall be rated by Factory Mutual (or UL) for submerged operating depths to 100 feet. Cable entries providing only simple grommet seals (external cable jacket) shall not be accepted. If a triple sealed cable entry is not utilized in the pump's design, a separate moisture detector sensor shall be mounted in the terminal area to shut the pump down should moisture wick into the cable entry.
- B. **TEMPERATURE PROTECTION** - Furnish temperature monitoring devices in motor windings for use in conjunction with and supplemental to external motor overload protection. Arrange controls to shut down the pump should any of the sensors detect high temperature and automatically reset once motor temperature returns to normal. Set temperature monitors at levels recommended by pump manufacturer.
- C. **SEAL LEAK DETECTION** - Provide a humidity sensitive sensor in the motor's stator cavity which allows a control panel mounted relay to indicate leakage into the motor. Electronic probes which depend on sensing resistance value changes in seal oil will not be acceptable as seal leak indicators.

- D. "PumpSafe" MOTOR SENSOR MONITORING RELAY - The pump supplier shall furnish all relays required for monitoring all motor sensors. The relays shall be installed by others in the motor control panel and properly wired in accordance with pump manufacturer's instructions. Relays shall mount in standard 12-pin socket bases (provided) and shall operate on available control voltage of 24-240 VAC. If relays require an input voltage that is not available in the motor control panel an adequate transformer (with fused input) shall be provided by the pump supplier. Relays shall have a power consumption of no more than 2.8 watt, and shall be UL approved. Relays shall be modular in design, with each relay monitoring no more than two motor sensor functions.
- E. Each relay module shall include a dual color (red/green) LED to indicate the status of each monitored sensor. Green will indicate "status OK"; red will indicate a failure or alarm condition. A self-corrected fault will allow the relay output contacts to reset, and cause the LED to change from a steady alarm indication to a flashing signal. The LED shall continue to flash until locally cleared, providing the operator an indication of a potential intermittent fault. Each relay shall also include a power-on LED and both "test" and "reset" pushbuttons.
- F. An independent fail-safe (switch on power loss) form-C output contact shall be included for each monitored sensor to provide a normally-open / normally-closed dry contact to initiate a remote alarm device or shut down the motor. Contacts shall be rated for 5 amps at 120 volt.

2.4 FABRICATION

- A. GENERAL - Provide pumps capable of handling raw unscreened wastewater. Pumps and motors shall be designed for continuous operation in a normally dry condition, but suitable for submerged operation. Provide combination vertical stand /suction elbow with covered, gasketed handhole cleanout cover. Provide pumps of "dry-shaft, back pull-out" design permitting removal of the complete rotating assembly without disconnection of suction or discharge connections.
- B. MAJOR COMPONENTS - Furnish major components (pump case, impeller, intermediate housing, and motor housing) of cast material as specified with smooth surfaces devoid of blow holes and other irregularities.
- C. CASING - Provide a volute casing with centerline discharge. It should be made of suitable thickness to allow for long pump life and to safely withstand the pressure at shut off pressure. The discharge nozzle shall be provided with integrally cast flange according to ASME/ANSI B 16.1 Class 125. Critical mating surfaces where watertight sealing is required shall be machined and fitted with o-rings. Fittings will be the result of controlled compression of rubber o-rings in two planes and o-ring contact of four sides without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical o-rings, grease or other devices shall be used.

- D. IMPELLER AND WEAR RINGS - Provide non-clog type impeller, capable of passing at minimum a 3" spherical solid. Statically and dynamically balance the impeller.
- E. SHAFT - Provide common pump/motor shaft of sufficient size to transmit full driver output with a maximum deflection of 0.002 inches measured at the lower mechanical seal. Machine the shaft of ASTM A276 Type 420 stainless steel
- F. SHAFT SEAL - Provide two totally independent mechanical shaft seals, installed in tandem, each with its own independent single spring system acting in a common direction. Install the upper seal in an oil-filled chamber with drain and inspection plug (with positive anti-leak seal) for easy access from external to the pump. Provide seals requiring neither routine maintenance nor adjustment, but capable of being easily inspected and replaced. Provide seals which are non-proprietary in design, with replacements available from a source other than the pump manufacturer or its distributors. Do not provide seals with the following characteristics: conventional double mechanical seals with single or multiple springs acting in opposed direction; cartridge-type mechanical seals; seals which incorporate a coolant circulating impeller; seals with face materials other than those specified; seals using the impeller hub as a mounting surface.
- G. BEARINGS - Furnish upper and lower bearings, single row (preferred) or double row as needed to provide a B10 life of, at minimum, 40,000 hours at anticipated axial and radial loadings. Provide sealed/shielded (permanently lubricated) bearings.
- H. MOTOR - Provide an IE2, high efficiency submersible motor which is squirrel cage, induction in design, housed in a completely watertight and air filled chamber, with a min 1.15 service factor suitable for dry mode operation as well as for fully submerged continuous operation without damage. Insulate the motor stator with, at minimum, Class F insulation rated for 311 Degrees F. Provide temperature protection and seal leak detection. Motors with any kind of liquid based cooling jackets, motors containing dielectric oils used for motor cooling and/or bearing lubrication or motors requiring the pump media and/or externally provided fresh water to be circulated through a cooling jacket shall not be acceptable. Do not provide motors which contain in excess of two (2) gallons of oil (combined total for cooling and seals), or which contain other than ecologically safe paraffin base or mineral base oil.
- I. SUCTION ELBOW WITH STAND - To provide easy maintenance access to the impeller suction area, a suction elbow with stand for installation shall be supplied. All interior surfaces shall be coated with Belzona 1321 ceramic-s metal, or engineer approved equal. The elbow and its incorporated stand shall be designed to bear safely all forces and moments which could ever occur during normal pump operation. The suction flange of the elbow should be according to ASME/ANSI B 16.1 class 125. The elbow shall include a covered clean-out port with appropriate diameter.

- J. PROTECTIVE COATING - All exterior metal surfaces of the pump and installation parts except name plates, bright parts and stainless steel parts shall be cleaned and sand blasted. Primer when using zinc dust or zinc phosphate base shall have a dry film thickness of not less than 35 microns. As the final coating, an abrasion and shock resistant, non porous, 2 component epoxy resin base painting shall be used. It shall be resistant against many diluted acids and brines as well grease, oil, solvents and seawater and specially suited for use in hydrous media. The solids content shall not be less than 82%. The shop applied top coating shall have a dry film thickness of not less than 150 microns. The color should be preferably Ultramarine Blue (RAL 5002).

2.5 SOURCE QUALITY CONTROL

- A. EQUIPMENT TESTS (Optional) - Tests shall be performed in accordance with the Test Code for Centrifugal Pumps per the Standards of the Hydraulic Institute. Tests shall be performed on the actual assembled pumps to be supplied or on duplicate previously constructed models. Tests shall cover a range from shut-off to at minimum 20% beyond specified design capacity. Conduct test per above specification on all supplied pumps, generating a curve showing actual flow, head, BHP and hydraulic efficiency.
- B. VERIFICATION OF PERFORMANCE - Field tests all pumps after installation to demonstrate satisfactory operation without excessive noise, vibration, cavitation or over-heating. Any pump which fails to meet any of the contract specifications will be modified, repaired or replaced by the contractor at no additional cost to the owner.

END OF SECTION 11402

THIS PAGE LEFT BLANK INTENTIONALLY

16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.2 SCOPE

- A. This scope covers the furnishing, installation, testing, adjusting and placing in operation all electrical equipment, devices, facilities, materials, and auxiliary items necessary for the complete and successful operation of all electrical equipment as herein described, shown on the plans, or deemed necessary for the completion of the electrical portion of the project. It is the intent of DIVISION 16 to outline the electrical requirements of the contract in order to provide the information necessary for the construction of a fully operational system as shown on the plans and as herein described. A comprehensive electrical scope of work is as follows:
 1. Power/Electrical System
 2. Lighting System
 3. Control System
 4. Instrumentation
 5. Connection of Electrically Powered Mechanical Equipment
 6. Temporary Power
 7. All Incidentals Necessary for a Complete and Fully Operational Electrical System.

1.3 WORKING CLEARANCES

- A. Working clearances around equipment requiring electrical services shall be verified by Contractor to comply with Code requirements. Should there be apparent violations of clearances; the Contractor shall notify the Engineer before proceeding with connection or placing of equipment.
- B. In the case of panelboards, safety switches and other equipment requiring wire and cable terminations, the Contractor shall ascertain that lug sizes and wiring gutters or space allowed for proper accommodation and termination of the wires and cables are adequate.

1.4 WORKMANSHIP

- A. Workmanship under this Division shall be accomplished by persons skilled in the performance of the required task. All work shall be done in keeping with conventions of the trade. Work of this Division shall be closely coordinated with work of other trades to avoid conflict and interference.

1.5 PROTECTION OF ELECTRICAL EQUIPMENT

- A. Electrical equipment shall be protected by the weather, especially from water dripping or splashing upon it, at all times during shipment, storage and after installation. Should any apparatus be subjected to possible injury by water, it shall be thoroughly dried out and put through a dielectric test, at the expense of the contractor, to ascertain the suitability of this apparatus. The results of the test shall be submitted to the Engineer and if the apparatus is found to be unsuitable, the contractor shall replace it without additional cost to the Owner.

1.6 GUARANTEE

- A. Contractor shall guarantee all light bulbs. Fluorescent and HID lamps, starters, and ballasts shall be guaranteed for a period of one (1) year after the building is occupied. Incandescent bulbs shall be guaranteed for a period of 30 days after acceptance. LED and drivers shall be guaranteed for a period of (5) years after acceptance. Guarantee shall include material and labor for re-lamping.
- B. The Contractor shall guarantee all other electrical systems, materials and workmanship to be free from defects for a period of two (2) years from the date of final acceptance. He shall correct all defects arising within this period upon notification by the Owner or Engineer, without additional compensation.
- C. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

1.7 TEMPORARY DURING CONSTRUCTION

- A. It shall be the responsibility of the Contractor to provide and maintain adequate temporary lighting at all times during construction, so that the various other trades can accomplish their work in a flawless manner. Particular attention will be given to lighting for masonry, drywall, painting, tile work and any other finish work.

B. It shall be the responsibility of the Contractor to provide and maintain adequate temporary power for on-site construction trailers. All utility installation costs and monthly bills shall be included as part of the responsibility.

1.8 MATERIAL STANDARDS Material shall be new and comply with standards of Underwriters' Laboratories, Inc., where standards have been established for the particular product and the various NEMA, ANSI, ASTM, IEEE, AEIC, IPCEA or other publications referenced.

1.9 TEST EQUIPMENT

A. The contractor shall provide all test equipment and supplies deemed necessary by the Engineer at no extra cost to the Owner. These supplies shall include but not be limited to the following: volt meters, amp meters, light meters, fuel, generator load banks, watt meters, harmonic distortion test equipment, thermal image camera, high pot test equipment, power quality analyzers, and oscilloscopes.

1.10 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.
- B. ANSIC2 – National Electrical Safety Code.
- C. NEMA – National Electrical Manufacturer's Assoc.
- D. UL – Underwriters Laboratories
- E. NFPA – National Fire Protection Assoc.
- F. IEEE – The Institute of Electrical and Electronics Engineers
- G. IESNA – The Illuminating Engineering Society of North America
- H. NETA – International Electrical Testing Association
- I. Recommended Standards for Water Works and Wastewater Facilities as published by Great Lakes – Upper Mississippi River Board of State Public Health and Environmental Managers.

1.11 SUBMITTAL

A. Submit under provisions of the General Provisions.

1. The Contractor installing all Electrical work shall review and approve all electrical shop drawings prior to submittal to the Engineer for review. As part of the review, the installer shall certify the following:
 - a. I hereby certify that the (equipment (material) (article) shown and marked in this submittal is in compliance with the contract drawing and specifications, can be installed in the allocated space, will be stored in accordance with the manufacturers recommendation, will be installed per NEC, and is submitted for approval.

Certified by: _____ Date: _____

B. Submit shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal. No electrical work may be performed until shop drawings are approved. Submit Shop Drawings on the Following Systems as Grouped Below:

1. Power/Electrical System
 - b. Conduit and Conduit Fittings
 - c. Wire
 - d. Pull Boxes
 - e. Panelboards
 - f. Panelboard Layouts
 - g. Control Panels
 - h. Control Panel Layouts
 - i. Circuit Breakers
 - j. Disconnects
 - k. Fuses
 - l. Conduit Support Systems
 - m. Wiring Devices
 - n. Transformers
 - o. Surge Protection Equipment
 - p. Breaker Coordination Study
2. Lighting System
 - a. All Light Fixtures
 - 1) Computer Printout of Lighting Layout
 - 2) Sample Fixture (as directed by Engineer)
 - 3) IES Photometric Files
 - b. Site Poles & Foundations
3. Control System
 - a. PLC
 - b. Software
 - c. I/O Racks
 - d. Field Instruments
 - e. HMI Software

- f. Control Point-to-Point Drawings
 - g. Fiber Cable
 - h. Fiber Optic Equipment
 - 4. Miscellaneous Electrical Equipment
 - a. Miscellaneous Electrical Parts
 - 5. Drawings
 - a. Conduit layout drawings
 - b. Duct drawings
- C. Mark dimensions and values in units to match those specified.

1.12 REGULATORY REQUIREMENTS

- 1. Conform to applicable sections of the Building Code and all local rules, regulations and ordinances.
- 2. Electrical: Conform to National Electrical Code & National Electric Safety Code
- 3. Obtain permits, and request inspections from authority having jurisdiction.
- 4. References listed in Paragraph 1.11, this section.

1.13 FINAL INSPECTION AND TESTING

- A. After the electrical installation is complete, the Contractor shall deliver to the Engineer the following information with his request for final inspection.
 - 1. One set of contract drawings marked to show all significant changes in equipment ratings and locations, alterations in locations of conduit runs, or of any data differing from the contract drawings. This shall include revised or changed panelboard and switchgear schedules.
 - 2. Certificates of final inspection from local authority.
 - 3. A tabulation of all motors listing their respective manufacturer, horsepower, nameplate voltage and current, actual running current after installation and overload heater rating.
- B. The electrical work shall be thoroughly tested to demonstrate that the entire system is in proper working order and in accordance with the plans and specifications. Each motor with its control shall be run as nearly as possible under operating conditions for a sufficient length of time to demonstrate correct alignment, wiring capacity, speed and satisfactory operation. All main switches and circuit breakers shall be operated, but not necessarily at full load. Contractor may be required during final inspection, at the request of the Engineer to furnish test instruments for use during the testing.
- C. All wiring shall be given a megger test using a 1000 Volt megger. This test shall be performed after conductors are pulled, but before final connections are made. The Owner and Engineer shall be given two (2) days' written notice of the anticipated test date so that they may witness the test if so desired. In any event, the Contractor shall record the circuit designation and the megger reading on each phase. This written

record shall be submitted to the Engineer. The cost of this test or any retest caused by insufficient megger readings shall be the responsibility of the Contractor (All tests shall be done in accordance with NETA Standards).

1.14 STAFFING

- A. The electrical contractor shall provide a “Master Electrician” who has been deemed a “Master Electrician” by exam through the State of Florida, or any other Florida County Permitting Authority as the Electrical Superintendent for the project. The Electrical Superintendent shall be on the project site any time any electrical work is performed by the contractor.
- B. In addition, the contractor shall provide one Journeyman electrician for every four electrical helpers used on the project site.

1.15 PROCESS EQUIPMENT

- A. The electrical contractor is required and expected to read all other equipment specifications contained in these documents and provide all required power and control conductors required by said equipment to allow them to function as described.
- B. All equipment for which power is not specifically indicated on the plans shall be provided with power per the NEC to the nearest panelboard, MCC, or switchboard with adequate capacity to serve said equipment as calculated by the NEC.

1.16 AS-BUILT DRAWINGS

- A. The contractor shall provide detailed as-built drawings for the project indicating all power wiring. (All Drawings shall be delivered to the Owner in an AutoCAD 2007 Format.)
- B. The As-Built drawings shall include detailed drawings of all duct banks, underground conduit, above ground conduit, motor control centers, PLC control panels, control drawings. These drawings shall indicate exact location of all underground electrical wiring and fiber optic cable.
- C. BDI will provide electronic copies of all drawings in the bid plans set on a CD for use by the contractor.

END OF SECTION 16010

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following electrical materials and methods:
 - 1. Concrete equipment bases.
 - 2. Cutting and patching for electrical construction.
 - 3. Touchup painting.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication and installation of supports and anchorage for electrical items.
- D. Coordination Drawings for electrical installation.
 - 1. Prepare Coordination Drawings according to "Submittals" to a 1/4-inch-equals-1-foot (1:50) scale or larger. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems and installations. Indicate locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Sections. Include the following:
 - a. Provisions for scheduling, sequencing, moving, and positioning equipment in the building during construction.
 - b. Plans, elevations, and details, including the following:
 - 1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.

- 2) Sizes and locations of required concrete pads and bases.
- 3) Cross section of underground ducts at all pipe crossings showing clearance.

- E. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70 for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other components.
- B. Arrange for chases, slots, and openings in structures during progress of construction to allow for electrical installations.
- C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- E. Coordinate connecting electrical service to components furnished under other Sections.

PART 2 - PRODUCTS

2.1 CONCRETE EQUIPMENT BASES

- A. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.2 TOUCH-UP PAINT

- A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- B. Install items level, plumb, and parallel and perpendicular to other systems and components, except where otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Give right of way to raceways and piping systems installed at a required slope.

3.2 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.3 TOUCH-UP PAINTING

- A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

END OF SECTION 16050

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Identification for raceway and metal-clad cable.
 2. Identification for conductors and communication and control cable.
 3. Underground-line warning tape.
 4. Warning labels and signs.
 5. Instruction signs.
 6. Equipment identification labels.
 7. Miscellaneous identification products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1, ANSI C2, and ANSI Z635.4.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.
- E. Install all signs and labels horizontal (level) and consistent for similar equipment and panels.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
 2. Tensile Strength: 50 lb, minimum.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

2.4 QUALITY

- A. All label shall be preprinted with the original print. Photocopies shall not be allowed. All labels shall be clearly readable in the eyes of the owner, or the contractor shall reprint labels at no additional expense to the contract amount.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with snap-around label.
1. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
1. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
 2. Mechanical and Electrical Supervisory System: Green and blue.
 3. Control Wiring: Green and red.
- C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
1. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.
- D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape, and identify each ungrounded conductor according to source and circuit number.
1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
1. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
 2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
 4. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway. During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches above duct. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall. The Contractor shall utilize one color of warning tape to identify electrical and control ducts throughout the plant.
1. Description:
 - a. Permanent, bright-colored, continuous-printed, polyethylene tape.
 - b. Not less than 6 inches wide by 4 mils thick.
 - c. Compounded for permanent direct-burial service.
 - d. Embedded continuous metallic strip or core.
 - e. Printed legend shall indicate type of underground line.
- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
 2. Comply with NFPA 70 and 29 CFR 1910.145.

3. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
4. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
5. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
6. Warning label and sign shall include, but are not limited to, the following legends:
 - a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

I. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with ENGINEER/OWNER APPROVED instructions where needed for system or equipment operation. Instructions are needed for all equipment unless otherwise noted.
 - a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 - b. The engraved legend shall be 1/2 " White letters on Brown face, and punched or drilled for mechanical fasteners.
 - c. The signs shall be installed with stainless hardware.
2. Emergency Operating Instructions: Install emergency operating instruction signs at equipment used for power transfer, safety shutdown, or any other locations requiring operation in an emergency.
 - a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 - b. The engraved legend shall be 1/2 " White letters on Red face, and punched or drilled for mechanical fasteners.
 - c. The signs shall be installed with stainless hardware.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
 - a. Indoor and Outdoor Equipment: Use engraved, laminated acrylic or melamine labels, punched or drilled for screw mounting. Identification labels shall have white letters on a dark-gray background. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high. Mount labels with stainless hardware.
 - b. Labels for field mounted equipment shall include the name of the equipment, and the location from which power is feed. See example below:
 - 1) Grit Pump
 - a) Grit Pump 1-1
 - b) Fed From Grit Control Panel 1, Circuit Breaker 16
 - 2) RAS Pump
 - a) RAS PUMP 2-4
 - b) Fed From MCC – RAS/WAS 2 , Cubicle 5B
 - c. Elevated Components: Increase the size of the labels and letters to those appropriate for viewing from the floor.
2. Equipment to Be Labeled:
 - a. Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
 - b. Electrical control panels, and enclosures.
 - c. Access doors and panels for concealed electrical items.
 - d. Disconnect switches.
 - e. Enclosed circuit breakers.
 - f. Push-button stations.
 - g. Contactors.
 - h. Monitoring and control equipment.
 - i. Uninterruptible power supply equipment.
 - j. Terminals, racks, and patch panels for signal and control functions.
 - k. Control systems
 - l. Field mounted control devices
 - m. Field mounted instruments

3.2 INSTALLATION PRACTICES

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Attach non-adhesive signs and plastic labels with stainless steel (316L) screws or rivets including any auxiliary hardware appropriate or required for the location and substrate.
- D. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes LARGER than No. 10 AWG if authorities having jurisdiction permit, field applied.
 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 3. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- F. All product labels and installations shall be clearly readable in the eyes of the owner, or the contractor shall reprint and re-install labels at no additional expense to the contract amount.
- G. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION 16075

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 16140 - WIRING DEVICES

PART 6 - GENERAL

6.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

6.2 SUMMARY

- A. This Section includes the following:
 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 2. Receptacles with integral surge suppression units.
 3. Isolated-ground receptacles.
 4. Snap switches and wall-box dimmers.
 5. Wall-switch.

6.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. SPD: Surge protection device.
- F. UTP: Unshielded twisted pair.

6.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

6.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain all wiring devices and associated wall plates from a single manufacturer and one source. (No deviation without written permission from the owner and engineer.)
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

6.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 7 - PRODUCTS

7.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

7.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5381 (single), 5352 (duplex).
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; CR 5253IG.
 - b. Leviton; 5362-IG.

- c. Pass & Seymour; IG6300.
2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

7.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. Cooper; GF20.
 2. Pass & Seymour; 2084.

7.4 SPD RECEPTACLES

- A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 1449, with integral SPD in line to ground, line to neutral, and neutral to ground.
 1. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 volts and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
 2. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
- B. Duplex SPD Convenience Receptacles:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5362BLS.
 - b. Hubbell; HBL5362SA.
 - c. Leviton; 5380.
 2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R.
- C. Isolated-Ground, Duplex Convenience Receptacles:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; IG5362BLS.
 - b. Hubbell; IG5362SA.
 - c. Leviton; 5380-IG.
 2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

7.5 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

- A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Crouse-Hinds.
 - b. EGS/Appleton Electric.
 - c. Killark; a division of Hubbell Inc.
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; IG2310.
 - b. Leviton; 2310-IG.
 - 2. Description: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

7.6 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
- C. Pilot Light Switches, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221PL for 120 V and 277 V.
 - b. Hubbell; HPL1221PL for 120 V and 277 V.
 - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
 - d. Pass & Seymour; PS20AC1-PLR for 120 V.
 - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

- D. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

7.7 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.05-inch- thick anodized aluminum.
 - 3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant die-cast aluminum with lockable cover.

7.8 MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Wiremold Company (The).
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: PVC.
- D. Wire: No. 12 AWG.

7.9 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: As selected by Engineer, unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: Red.
 - 3. SPD Devices: Blue.
 - 4. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

PART 8 - EXECUTION

8.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

8.2 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification."
1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

8.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 115 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 3. Ground Impedance: Values of up to 1 ohm are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective

devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 16140

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 16150 – ELECTRIC MOTORS

PART 9 - GENERAL

9.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

9.2 SUMMARY

- A. Section includes general requirements for single-phase and poly-phase electric motors for use in the water and waste water environment

9.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices and features to be compatible with the following:
 1. Motor controllers.
 2. Torque, speed, and horsepower requirements of the load.
 3. Ratings and characteristics of supply circuit and required control sequence.
 4. Ambient and environmental conditions of installation location.

9.4 REFERENCES

- A. ANSI/AFBMA 9-1990, Load Ratings and Fatigue Life for Ball Bearings
- B. ASTM B117-90, Test Method of Salt Spray (Fog) Testing
- C. IEEE Standard 85-1973, IEEE Standard Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery
- D. IEEE Standard 112-1991, IEEE Standard Test Procedure for Polyphase Induction Motor and Generators
- E. IEEE Standard 841-1994, IEEE Standard for Petroleum and Chemical Industry - Severe Duty
- F. NEMA MG 13 -1984, Frame Assignments for Alternating Current Integral Horsepower Induction Motors

G. NEMA MG 1-1993, Motors and Generators

PART 10 - PRODUCTS

10.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe-duty motors.

10.2 DESIGN STANDARDS

- A. Motors shall be 3 phase induction machines rated continuous duty at 60 HZ, single voltage with across-the-line full voltage start, unless otherwise noted. Dual voltage motors are acceptable only for 230/460 volts.
- B. Production AC motors are available in 56 through 5811 frames at speeds of 3600, 1800, 1200, and 900RPM.
- C. Stock AC motors are available in 56T through 447T frames 1-200HP at speeds of 3600, 1800 and 1200RPM, 480 Volt designs.
- D. Motors comply with the frame size assignments of NEMA MG 13-1984.
 - 1. Any motors that require special modifications, such as "TZ" shafts or special "D" flanges shall be noted clearly in the submittals with spare recommendations from the manufacturer.
 - 2. All motors that are not standard NEMA 1964 re-rate "T" frame motors shall be factory painted blue with pink conduit boxes attached to be clearly identified to the owner. At installation, the Contractor shall paint the motors to the owners choice of color.
- E. NO IEC MOTORS WILL BE ALLOWED.
- F. Motor manufacturer shall be an active member of NEMA.
- G. Motor manufacturer shall have experience in the design and manufacture of similar products for a minimum of 10 years. Buy-out or private labeled motors are not acceptable.
- H. All fractional to 2 HP direct current (DC) motors shall be either permanent magnet or shunt wound design with a constant torque speed range or 20:1

- I. Acceptable motor manufacturers will be US Motors, General Electric, Reliance or engineer approved equal.

10.3 ENCLOSURES

- A. All vertical motors shall be NEMA Weather Protected type ONE unless located with 10 feet of a process treatment unit. Vertical motors located within 10 feet of a process treatment unit shall be TEFC, Mill & Chemical or Corro-duty rated.
- B. All general purpose horizontal motors for outdoor operation or location in hostile environments shall be TEFC and meet specification IEEE 841.
- C. All general purpose horizontal motors for indoor operation in a clean environment shall be open dripproof enclosure.
- D. All motors in hazardous locations shall be Division One explosion proof, as defined by UL, meeting the Class and Group as required by the hazard.

10.4 SERVICE CONDITIONS

- A. Motor are suitable for continuous duty operation without derating under the following service conditions:
 - 1. Exposure to ambient temperatures from -25C to 40C
 - 2. Exposure to altitudes up to 1000meters (3300feet)
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor. Motors may be constant or variable torque as required to meet the conditions of the load being serviced.
- C. Suitable for use in indoor or outdoor applications involving severe duty conditions such as high humidity or chemical laden, corrosive or salty atmospheres.
- D. Motors are capable of successfully accelerating inertia loads equal to what is specified in section 12.54 of NEMA MG 1-1193. 4.4 Variable Frequency Drive (VFD) or Full voltage, across-the-line starting.

10.5 ELECTRICAL DESIGNS

- A. Motors shall be NEMA Design B as defined in section 1.17.1.2 of NEMA MG 1-1993, unless specifically noted requiring different motor curves.
- B. Motors shall operate successfully at rated load under the combinations of voltage and frequency variations specified in section 12.44 of NEMA MG 1-1993.

- C. Motors shall operate successfully under running conditions at rated load and frequency when voltage unbalance at the motor terminals does not exceed 1%.
- D. Motors shall be premium efficient designs that exceed the efficiency values in Table 1 of IEEE Standard 841-1994. Efficiency testing is done in accordance with IEEE standard 112-1991, subclause 6.4 Method B. The nominal efficiency, $\frac{3}{4}$ load efficiency and guaranteed minimum efficiency, are stamped on the motor's nameplate.
- E. Motors shall utilize a non-hygroscopic, chemical and humidity resistant insulation system. The thermal rating of the system is Class F as defined in section 1.66 on NEMA MG1-1993.
- F. The stator windings for 1-200HP and under 600 volts are random or form wound with copper wire utilizing inverter grade insulation system that meets and exceeds NEMA MG1-1993 Part 31.
- G. Stator is double dipped and baked in varnish to form a heavy build that exceeds the test criteria of moisture resistance per NEMA MG-1.
- H. When operated at rated horsepower, voltage and frequency, the temperature rise of the stator winding does not exceed 80C when measured by winding resistance.
- I. Motors shall utilize the inverter grade insulation system which consists of at a minimum Class F or better insulation materials with additional phase insulating material, extra end-turn bracing and Class H spike resistant wire. The resultant system shall withstand 2000 volt transients without premature motor failure and have no cable limitations in motor application.
- J. Motors shall operate successfully under inverter running conditions at rated load with variation in the voltage or the frequency not exceeding the following conditions:
 - 1. +/-10% rated voltage at rated constant volts/hertz ratio except for specific torque boost situations.
 - 2. Motors shall operate successfully under running conditions at rated load and volts/hertz ratio when the voltage unbalance at the motor terminals does not exceed one percent.
- K. Inverter Operating Characteristics - With rated volts/hertz ratio applied, motor performance shall be as follows for critical operating characteristics:
 - 1. Torque - Motors shall meet or exceed the minimum locked rotor (starting) and breakdown torque specified in NEMA Standard MG1 Part 12 for Design B for the rating specified when on sine wave power.
 - 2. Currents -Maximum overload current shall be 150% of nameplate for 60 seconds or 175% for 3 seconds.
- L. Motors shall be rated for a 1.15 service factor on sine wave power and 1.0 service factor on VFD power in a 40C ambient.

10.6 MECHANICAL DESIGN

- A. Motors are equipped with ball bearings have AFBMA C/3 clearances and shall be the same size on both ends (with exception of 440T frame - minimum 6318 on Drive end bearing).
- B. Bearings are regreasable without disassembling the fan or fan cover and provide for the elimination of purged grease through fittings extending beyond the fan cover. Polyurea thickened grease shall be supplied.
- C. Inner bearing caps are provided for bearing retention and to prevent harmful amounts of lubricant from entering the motor interior.
- D. For direct coupled motors, stabilized bearing temperature shall not exceed a temperature rise of 45C for 4 and 6 pole motors and a maximum temperature rise of 50C for 2 pole motors as measured by a thermocouple on the surface of the bearing house.
- E. Bearings provide for an L-10 life of 200,000 hours per ANSI/AFBMA 9-1990 based on NEMA belting application limits per NEMA MG1-1993, section 14.41.
- F. Enclosures have a degree of protection IP55 (per NEMA MG1-1993 part 5). Bearing isolators are provided on all 143 to 5811 "T" frame motors to minimize entrance of moisture and contaminants into the bearing chamber. Motors shall be capable of field retrofit of an opposite drive end endshield bearing isolator.
- G. Condensation drain holes are provided at the low points in the end brackets and are supplied with corrosion resistant, breather drain plugs.
- H. Frame, brackets, fan cover and conduit box are a minimum of grade 25 cast iron.
- I. Rotor cage construction shall be of cast aluminum. The maximum permissible shaft runout at the end of the shaft extension of the assembled motor shall be:
 - 1. 0.875" to 1.625" diameter inclusive TIR < 0.001 6.10.2 Over 1.626" to 6.50" diameter, TIR,0.0015 (ball bearing) and , 0.002 (roller bearing)
- J. Motor mounting feet, when placed on a flat granite surface, shall not exceed 0.005" between the granite surface and the motor feet at each mounting bolt hole.
- K. A drilled and tapped hole is provided in the motor frame on the same side as the conduit box for grounding purposes. Motor frame feet are flat within 0.005 inch as an assembled unit.
- L. Ventilating fans are of non-sparking conductive plastic material. Most ratings use bi-directional fans. On ratings where uni-directional fans are used, the rotation of the fan is indicated by a permanent label on the outside of the motor.

- M. Conduit box is diagonally split, rotatable in 90 degree increments, and twice the volume as specified in Section 11.06.2 of NEMA MG1-1993. A ground lug is provided in the box. Gaskets are provided between the conduit box and frame and between conduit box base and cover providing a moisture resistant barrier.
- N. Shouldered eyebolts with a minimum safety factor of 10 are provided for motor lifting.
- O. All fastening hardware is hex-head bolts or socket head cap screws with a grade 5, zinc/cadmium plating.
- P. Motor cast iron components are oxide primed and painted with vinyl phenolic paint to surpass 250-hour salt spray test per ASTM B117-90.
- Q. Motor nameplate is stainless steel (316L) and secured with 4 stainless steel (316L) drive pins. Nameplates are capable of meeting 720-hour salt spray test per ASTM B117-90. Each nameplate contains the following information in addition to that noted in section 10.40 of NEMA MG1-1993.
 - 1. AFBMA bearing ID
 - 2. Manufacture date code
 - 3. Compliance with IEEE Standard 841-1994
 - 4. Motor weight
 - 5. Guaranteed minimum efficiency
 - 6. Maximum space heater surface C temperature, if provided, when operating at rated voltage in a 40C ambient
 - 7. Balance
 - 8. NEMA MG1 Part 31
- R. Machined frame to endshield joints are protected by an application of 2 part epoxy before assembly.

10.7 AIRBORNE SOUND

- A. Motor sound power level when measured at a no load condition shall not exceed 90 dBA when determined in accordance with IEEE Standard 85-1973.

10.8 VIBRATION

- A. Motor vibration measured in any direction on the bearing housing meets the levels listed below when tested per section 12.08 of NEMA MG1-1993:
 - 1. Unfiltered vibration at rated voltage and frequency does not exceed 0.08 in/s peak velocity for 2, 4 and 6 pole motors and .06 in/s peak velocity for 8 pole motors.
 - 2. Filtered vibration does not exceed 0.05 in/s peak velocity at a frequency of 2f (twice line frequency)
 - 3. Unfiltered axial vibration does not exceed 0.06 in/s peak velocity on bearing housing (does not apply to roller bearings)

10.9 ACCESSORIES

- A. Winding thermostats shall be in each phase of the motor. There shall be one per phase, NC, connected in series with leads terminating in the auxiliary outlet box.
- B. Grounding provisions shall be in the main terminal box.
- C. For vertical hollow shaft motors, a ball-type non-reversing ratchet shall be provided to prevent back-spin of the pump and motor. Maximum reverse rotation shall be limited to 5 degrees or arc.
- D. Stabilizing bushings shall be provided on all vertical hollow shaft motors applied to pumps with mechanical seals. All 3600RPM hollow shaft motors shall be provided with stabilizing bushings.
- E. Motors 20HP and above shall be started on soft starts or variable frequency drives.
- F. Each motor over 20HP shall be equipped with a suitably sized space heater to prevent condensation from forming while the motor is not running. The space heater shall be 120V, single phase.
- G. All motors shall be provided with suitable coupling for connection to mechanical loads.

10.10 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Capacitor start, inductor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 11 - EXECUTION

11.1 PRODUCTION TESTS

- A. The following tests are performed on all motors:
 - 1. Measurement of winding resistance
 - 2. No load readings of current, power, and speed at rated voltage and frequency
 - 3. Mechanical vibration check as described in Section 2.8 of this specification
 - 4. High potential test in accordance with section 12.03 of NEMA MG1-1993
- B. The following test information is recorded and provided to the Owner in a three ring binder.
 - 1. Winding Resistance
 - 2. No load current, voltage and speed
 - 3. The following five unfiltered vibration readings, measured as described in 2.8 VIBRATION drive end (horizontal, vertical, and axial) and opposite drive end (horizontal and vertical)

11.2 WARRANTY

- A. Motor components shall have a full five year performance warranty on sine wave power and three year warranty on inverter power. The warranty shall cover all material and labor required to correct any failures of the motor components during the warranty period.
- B. The contractor shall be fully responsible for proper storage of motors prior to placing in service in accordance with the manufacturers' recommendations and instructions. Any problem with motors at start up due to mishandling or by not adhering to the manufacturers' recommendations for storage will be the sole responsibility of the contractor. All costs to repair the motors due to any mishandling or improper storage will be at no cost to the owner, the supplier, or the manufacturer of the motor, but shall be entirely the responsibility of the contractor.
- C. The warranty period shall commence upon acceptance by the Owner during the start-up period.

END OF SECTION 16150

SECTION 16269 - VARIABLE FREQUENCY CONTROLLERS

PART 12 - GENERAL

12.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

12.2 SUMMARY

- A. This Section includes solid-state, PWM, VFCs for speed control of three-phase, squirrel-cage induction motors.
- B. Related Sections include the following:
 - 1. Division 16 Section "Surge Suppression" for low-voltage power, control, and communication surge suppressors.

12.3 DEFINITIONS

- A. BMS: Building management system.
- B. IGBT: Integrated gate bipolar transistor.
- C. LAN: Local area network.
- D. PID: Control action, proportional plus integral plus derivative.
- E. PWM: Pulse-width modulated.
- F. VFC: Variable frequency controller.
- G. VFD: Variable frequency drive.

12.4 SUBMITTALS

- A. Product Data: For each type of VFC. Include dimensions, mounting arrangements within control panels, shipping and operating weights, and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.
- B. Shop Drawings: For each VFC.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Each installed unit's type and details.
 - b. Nameplate legends.
 - c. Short-circuit current rating of integrated unit.
 - d. Listed and labeled for series rating of overcurrent protective devices in combination controllers by an NRTL acceptable to authorities having jurisdiction.
 - e. Features, characteristics, ratings, and factory settings of each motor-control center unit.
 2. Wiring Diagrams: Power, signal, and control wiring for VFCs. Provide schematic wiring diagram for each type of VFC.
- C. Coordination Drawings: Control panel, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs where conductors are prohibited. Show VFC layout and relationships between electrical components and adjacent devices. Show support locations, type of support, and weight on each support. Indicate field measurements.
- D. Qualification Data: Manufacturer and testing agency.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For VFCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 1. Routine maintenance requirements for VFCs and all installed components.
 2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
- G. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

12.5 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.
- B. **Testing Agency Qualifications:** An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. **Testing Agency's Field Supervisor:** Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- C. **Source Limitations:** Obtain VFCs of a single type through one source from a single manufacturer.
- D. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NFPA 70.
- F. **Product Selection for Restricted Space:** Drawings indicate maximum dimensions for VFCs, minimum clearances between VFCs, and adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

12.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver VFCs in shipping splits of lengths that can be moved past obstructions in delivery path as indicated.
- B. Store VFCs indoors in clean, dry space with uniform temperature to prevent condensation. Protect VFCs from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- C. If stored in areas subject to weather, cover VFCs to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

12.7 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:
 - 1. Ambient Temperature: 0 to 40 deg C.
 - 2. Humidity: Less than 90 percent (noncondensing).
 - 3. Altitude: Not exceeding 3300 feet.

- B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner no fewer than two weeks in advance of proposed interruption of electrical service.
 - 2. Indicate method of providing temporary electrical service.
 - 3. Do not proceed with interruption of electrical service without Owner's written permission.

- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

12.8 COORDINATION

- A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

- B. Coordinate features of VFCs, installed units, and accessory devices with pilot devices and control circuits to which they connect.

- C. Coordinate features, accessories, and functions of each VFC and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

12.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spare Fuses: Furnish one spare for five installed, but no fewer than one set of two of each type and rating.
2. Indicating Lights: Two of each type installed.

PART 13 - PRODUCTS

13.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Rockwell Automation; Allen-Bradley Co.; Industrial Control Group.
 - a. Series: PowerFlex 755
 2. Or Owner approved equivalent.

13.2 VARIABLE FREQUENCY CONTROLLERS

- A. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.
 1. Provide unit suitable for operation of premium efficiency motor as defined by NEMA MG 1.
- B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- C. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.
- D. Unit Operating Requirements:
 1. Input ac voltage tolerance of 380 to 500 V, plus or minus 10 percent.
 2. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
 3. Minimum Efficiency: 96 percent at 60 Hz, full load.
 4. Minimum Displacement Primary-Side Power Factor: 96 percent.
 5. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
 6. Starting Torque: 100 percent of rated torque or as indicated.
 7. Speed Regulation: Plus or minus 1 percent.

- E. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.
 - 1. Electrical Signal: 4 to 20 mA at 24 V.
- F. Internal Adjustability Capabilities:
 - 1. Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3. Acceleration: 2 to a minimum of 22 seconds.
 - 4. Deceleration: 2 to a minimum of 22 seconds.
 - 5. Current Limit: 50 to a minimum of 110 percent of maximum rating.
- G. Self-Protection and Reliability Features:
 - 1. Input transient protection by means of surge suppressors.
 - 2. Under- and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
 - 3. Motor Overload Relay: Adjustable and capable of NEMA ICS 2, Class 10 performance.
 - 4. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
 - 5. Instantaneous line-to-line and line-to-ground overcurrent trips.
 - 6. Loss-of-phase protection.
 - 7. Reverse-phase protection.
 - 8. Short-circuit protection.
 - 9. Motor overtemperature fault.
- H. Multiple-Motor Capability: Controller suitable for service to multiple motors and having a separate overload relay and protection for each controlled motor. Overload relay shall shut off controller and motors served by it when overload relay is tripped.
- I. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.
- J. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.
- K. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
- L. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

M. Input Line Conditioning:

1. Provide Line Filters capable of reducing harmonics to less than 10% THD.
2. Filter shall be provided by the following manufacturer and in accordance with their recommendations based on installation:
 - a. Trans Coil Inc.
 - b. MTE Corporation

N. VFC Output Filtering:

1. Provide load reactors capable of reducing transients base upon installation requirements, of which the following shall be a minimum:
 - a. Output Reactor: Distances of less than 200 feet.
 - b. dV/dT Filter: Distances of 200 feet to 800 feet.
2. Filter shall be provided by the following manufacturer and in accordance with their recommendations based on installation:
 - a. Trans Coil Inc.
 - b. MTE Corporation

O. Status Lights: Inner (dead front) door-mounted indicators shall indicate the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

P. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

Q. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in control panel inner (dead front) door and connected to indicate the following controller parameters:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Motor usage (hour).
7. Fault or alarming status (code).
8. PID feedback signal (percent).
9. DC-link voltage (VDC).
10. Set-point frequency (Hz).

11. Motor output voltage (V).
- R. Control Signal Interface:
1. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
 2. Pneumatic Input Signal Interface: 3 to 15 psig.
 3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the PLC or other control systems:
 - a. 4-20 mA.
 - b. RS485.
 - c. Keypad display for local hand operation.
 4. Output Signal Interface:
 - a. A minimum of 1 analog output signal (4-20 mA), which can be programmed to any of the following:
 - 1) Output frequency (Hz).
 - 2) Output current (load).
 - 3) DC-link voltage (VDC).
 - 4) Motor torque (percent).
 - 5) Motor speed (rpm).
 - 6) Set-point frequency (Hz).
 5. Remote Indication Interface: A minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:
 - a. Motor running.
 - b. Set-point speed reached.
 - c. Fault and warning indication (overtemperature or overcurrent).
 - d. PID high- or low-speed limits reached.
 6. DeviceNET Interface.
- S. Communications: Provide an RS485 interface allowing VFC to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory.
- T. Integral Disconnecting Means: NEMA AB 1, molded-case switch with lockable handle.
- U. Isolating Switch: Non-load-break switch arranged to isolate VFC and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

- V. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

13.3 ENCLOSURES

- A. NEMA 1 or NEMA 12, mounted in Motor Control Center enclosure as indicated on the drawings.

13.4 ACCESSORIES

- A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
- B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
- C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
- D. Control Relays: Auxiliary and adjustable time-delay relays.
- E. Standard Displays:
 - 1. Output frequency (Hz).
 - 2. Set-point frequency (Hz).
 - 3. Motor current (amperes).
 - 4. DC-link voltage (VDC).
 - 5. Motor torque (percent).
 - 6. Motor speed (rpm).
 - 7. Motor output voltage (V).
- F. Historical Logging Information and Displays:
 - 1. Real-time clock with current time and date.
 - 2. Running log of total power versus time.
 - 3. Total run time.
 - 4. Fault log, maintaining last four faults with time and date stamp for each.
- G. Current-Sensing, Phase-Failure Relays for Bypass Controller: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

13.5 FACTORY FINISHES

- A. Finish: Manufacturer's standard industrial gray paint applied to factory-assembled and -tested VFCs before shipping.

PART 14 - EXECUTION

14.1 EXAMINATION

- A. Examine areas, surfaces, and substrates to receive VFCs for compliance with requirements, installation tolerances, and other conditions affecting performance.
- B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

14.2 APPLICATIONS

- A. Select features of each VFC to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, controller, and load.
- B. Select horsepower rating of controllers to suit motor controlled.

14.3 INSTALLATION

- A. Anchor each VFC assembly to control panel according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with mounting surface.
- B. Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 16 Section "Fuses."

14.4 IDENTIFICATION

- A. Identify VFCs, components, and control wiring according to Division 16 Section "Electrical Identification."
- B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

14.5 CONTROL WIRING INSTALLATION

- A. Install wiring between VFCs and remote devices according to Division 16 Section "Conductors and Cables."
- B. Bundle, train, and support wiring in enclosures.
- C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
 - 1. Connect selector switches with control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

14.6 CONNECTIONS

- A. Conduit installation requirements are specified in other Division 16 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.
- B. Ground equipment according to Division 16 "Grounding and Bonding."

14.7 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
 - 1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Assist in field testing of equipment including pretesting and adjusting of solid-state controllers.
 - 3. Report results in writing.
- C. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- D. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
- E. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

14.8 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

14.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain variable frequency controllers. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 16269

SECTION 16289 - SURGE SUPPRESSION

PART 15 - GENERAL

15.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

15.2 SUMMARY

- A. This Section includes SPDs for low-voltage power, control, and communication equipment.
- B. Related Sections include the following:
 - 1. Division 16 Section "Wiring Devices" for devices with integral SPDs.

15.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. SVR: Suppressed voltage rating.
- C. SPD: Surge protection device.

15.4 SUBMITTALS

- A. Product Data: For each type of product indicated, include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.
- B. Product Certificates: For transient voltage suppression devices, signed by product manufacturer certifying compliance with the following standards:
 - 1. UL 1283.
 - 2. UL 1449.
- C. Field quality-control test reports, including the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements of this specification and the manufacturers specifications for the device.
 - 3. Failed test results and corrective action taken to achieve requirements.

- D. Operation and Maintenance Data: For surge protection devices to include in emergency, operation, and maintenance manuals.
- E. Warranties: Special warranties specified in this Section.

15.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."
- E. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."
- F. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

15.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- B. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
 - 2. Operating Temperature: 30 to 120 deg F.
 - 3. Humidity: 0 to 85 percent, noncondensing.
 - 4. Altitude: Less than 20,000 feet above sea level.

15.7 COORDINATION

- A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.
- B. Coordinate surge protection devices with Division 16 Section "Electrical Power Monitoring and Control."

15.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within five years from date of Substantial Completion.

15.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Replaceable Protection Modules: One of each size and type installed.

PART 16 - PRODUCTS

16.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Current Technology, Inc.
 - 2. Liebert Corporation; a division of Emerson.
 - 3. Surge Suppression Incorporated.
 - 4. Advanced Protection Technologies, Inc.

16.2 SERVICE ENTRANCE SUPPRESSORS

- A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:
 - 1. LED indicator lights for power and protection status.
 - 2. Audible alarm, with silencing switch, to indicate when protection has failed.
 - 3. One set of dry contacts per phase rated at 5 A and 250-V ac, for remote monitoring of protection status. (Contacts shall be connected in either series or parallel as required to provide a single input to the plant control system.)
- B. Peak Single-Impulse Surge Current Rating: 300 kA per phase.

- C. Connection Means: Permanently wired.
- D. Protection modes and UL 1449 SVR for delta circuits with voltages of 480V, 3-phase, 3-wire circuits shall be as follows:
 - 1. Line to Line: 1500 V for 480V.
 - 2. Line to Ground: 1000 V for 480V.

16.3 PANELBOARD SUPPRESSORS

- A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:
 - 1. LED indicator lights for power and protection status.
 - 2. Audible alarm, with silencing switch, to indicate when protection has failed.
 - 3. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.
- B. Peak Single-Impulse Surge Current Rating: 50 kA per phase.
- C. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 208Y/120, 3-phase, 4-wire circuits shall be as follows:
 - 1. Line to Neutral: 400 V for 208Y/120.
 - 2. Line to Ground: 400 V for 208Y/120.
 - 3. Neutral to Ground: 400 V for 208Y/120.
- D. Protection modes and UL 1449 SVR for delta circuits with voltages of 480V, 3-phase, 3-wire circuits shall be as follows:
 - 1. Line to Line: 1500 V for 480V.
 - 2. Line to Ground: 800 V for 480V.

16.4 PLUG-IN SURGE SUPPRESSORS

- A. Description: Non-modular, plug-in suppressors with at least four 15-A, 120-V ac, NEMA WD 6, Configuration 15-15R receptacles, suitable to plug into a NEMA WD 6, Configuration 15-15R receptacle; with the following features and accessories:
 - 1. LED indicator lights for power and protection status.
 - 2. LED indicator lights for reverse polarity and open outlet ground.
 - 3. Circuit breaker and thermal fusing. When protection is lost, circuit opens and cannot be reset.
- B. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
- C. Protection modes and UL 1449 SVR shall be as follows:
 - 1. Line to Neutral: 475 V.
 - 2. Line to Ground: 475 V.
 - 3. Neutral to Ground: 475 V.

16.5 ENCLOSURES

- A. Interior enclosures to be NEMA 1.
- B. Exterior enclosures to be NEMA 4X, Stainless Steel (316L).

PART 17 - EXECUTION

17.1 INSTALLATION OF SURGE PROTECTION DEVICES

- A. Install devices at each service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install devices for each panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
 - 1. Provide multipole, 60 circuit breaker as a dedicated disconnect for suppressor, unless otherwise indicated.

17.2 PLACING SYSTEM INTO SERVICE

- A. Do not energize or connect service entrance equipment, panelboards, control terminals, and data terminals to their sources until surge protection devices are installed and connected.

17.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust equipment installation, including connections, and to assist in field testing. Report results in writing.
 - 1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. Testing: Perform the following field tests and inspections and prepare test reports:
 - 1. After installing surge protection devices, but before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Complete startup checks according to manufacturer's written instructions.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters, and provide the Owner with documentation of the test results.
- C. Remove and replace malfunctioning units and retest as specified above.

17.4 TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transient voltage suppression devices.
- B. The Contractor shall provide two (2) four-hour training courses for up to 5 employees on consecutive days. Each course shall be a minimum of 4 hours.
- C. All training shall be performed at the Owner's facility.

END OF SECTION 16289

SECTION 16491 - FUSES

PART 18 - GENERAL

18.1 RELATED DOCUMENTS

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

18.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers, and motor-control centers.
 - 2. Spare-fuse cabinets.

18.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
 - 5. Coordination charts and tables and related data.
 - 6. Fuse sizes for elevator feeders and elevator disconnect switches.
- B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

18.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

18.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

18.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

18.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 19 - PRODUCTS

19.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Bussmann, Inc.
 2. Edison Fuse, Inc.
 3. Ferraz Shawmut, Inc.
 4. Littelfuse, Inc.

19.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

19.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull. (Install in the Admin. Building Instrumentation and Electrical shop as directed by the Owner)
 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 2. Finish: Gray, baked enamel.
 3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
 4. Fuse Pullers: For each size of fuse, where applicable, from fuse manufacturer.
 5. Include in the cabinet a complete list of fuses used in the facility. (include: size, type, model, rating, quantity, and location)

PART 20 - EXECUTION

20.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

20.2 FUSE APPLICATIONS

- A. Cartridge Fuses (provide fuse type indicated below unless otherwise shown on Drawings or required by breaker coordination study):
 1. Service Entrance: Class T, fast acting.
 2. Feeders: Class RK1, time delay.
 3. Motor Branch Circuits: Class RK5, time delay.
 4. Other Branch Circuits: Class RK5, time delay.
 5. Control Circuits: Class CC, fast acting.

20.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s).

20.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Division 16 Section "Electrical Identification" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 16491

SECTION 16900 – SYSTEMS INTEGRATION

PART 21 - GENERAL

21.1 SUMMARY

- A. The System Integrators shall be responsible for integrating the furnished equipment, material, and software into a fully operational control system.
- B. The Control System Integrator shall work directly for the Owner. The Process System Integrator shall work directly for the individual Process Manufacture.
- C. The Control System Integrator will be responsible for supplying the following products and services:
 - 1. All field instruments not associated with process equipment.
 - 2. All fiber optic cabling.
 - 3. All fiber optic patch cables.
 - 4. All fiber optic breakout enclosures.
 - 5. All fiber to copper converters (except those associated with the packaged process equipment control panels).
 - 6. All CAT 5e patch cables (except those associated with the packaged process equipment control panels).
 - 7. All computer networking equipment not shown installed in the PLC control panels, or packaged process equipment control panels, but required for a complete and operational system. Coordinate with Process Systems Integrator.
 - 8. All workstations and peripherals.
 - 9. All backup devices and accessories associated with scope of work.
 - 10. All control panels not associated with process equipment (unless otherwise indicated on the drawings).
 - 11. Fiber optic breakout enclosures. These enclosures shall be used to terminate the fiber.
 - 12. All fiber optic cable and connections required for the project. All fiber optic cable shall be breakout, 12 strand, interlock armor with an overall PVC jacket designed to be installed in a High Voltage Duct System, unless otherwise indicated on the drawings.
 - 13. The integrator shall be responsible for providing all fiber optic terminations for the project.
 - 14. Providing all PLC/SCADA HMI updates to reflect removed and additional process equipment, and incorporating Process System Integrators furnished screens. Coordinate with Process Systems Integrator.
 - 15. All miscellaneous items required for a fully operational control system.

- D. The Process System Integrator will be responsible for supplying the following products and services:
1. Control Panels and all associated components/devices for process equipment only (unless otherwise indicated on the drawings).
 2. Shall coordinate with Control Systems Integrator upfront for type and style of programming to be used with PLC and SCADA system.
 3. All field instruments associated with process equipment.
 4. All fiber to copper converters associated with the packaged process equipment control panels. Coordinate specification and communication requirements with Control Systems Integrator.
 5. All CAT 5e patch cables associated with process equipment.
 6. Providing all SCADA HMI screens to reflect all additional process equipment. Coordinate with Control Systems Integrator.
 7. All miscellaneous items required for a fully operational process system, and as required by Control Systems Integrator within process equipment for a fully operational control system.
- E. The System Integrators shall provide all software for this project to be installed by the Integrator. This software shall include but not be limited to the following: all PLC code, all HMI screens, all SCADA software, all reporting applications, all database configurations, and miscellaneous software as required to produce a fully operational system.
- F. The Integrators shall provide the following drawing for the control and electrical system (Each of these drawings shall be submitted and approved as a shop drawing.):
1. Block interconnection drawings for the control system and associated electrical equipment (including connections to process control panels).
 2. Point to Point wiring diagrams for all equipment connected to the control system.
 3. Control Panel Drawing for any panel being built by the Integrator.
 4. Equipment specification sheets.
 5. Flow charts and control narratives for all control system logic to be approved by the Owner prior to implementation.
- G. The Integrator shall provide the following Operation and Maintenance Manuals for the control system (Each of these shall be custom written by the Integrator. In addition, each manual shall be submitted and approved as a shop drawing.):
1. Control System Operations Manual
 2. Control System Maintenance Manual
 3. Laminated Trouble Shooting Guides for both the Operators and the Maintenance Staff
- H. The Contractor shall furnish and install all wiring, piping, conduits and necessary mounting and accessory equipment to provide a complete and fully operational instrumentation and control system.

- I. In addition to the requirements listed, the System Integrator shall provide the services and functions as defined in the project plans and specifications including:
 1. Develop the control algorithms and code.
 2. Develop the HMI graphics for the plant control system modifications.
 3. Develop System Reports.
 4. Integrate all of the system components and packaged system data in to the plant control system.
 5. Implement the design and functionally test for each process unit in scope of contract.
 6. Provide system wide Factory Acceptance Testing.
 7. Communicate and coordinate with the Contractor on the project construction, installation, and testing schedules.
 8. Communicate shall occur between the contractor's Control Systems Integrator and the Process Systems Integrators for communication hardware and protocols.
 9. Provide operator and maintenance training on the operation and maintenance of the plant control system.
 10. Provide field start-up services during the construction period to ensure all devices are properly installed and configured.
 11. Field test all I/O points and control algorithms for compliance with the function requirements specification, project plans, and project specifications.
 12. Provide operation and maintenance manuals for the plant control system.
 13. Provide archived system configuration files for disaster recovery purposes.
 14. Post Start-Up Services to ensure operation of the facility after initial start-up and for "As-Built" documentation functions.

21.2 SYSTEM INTEGRATOR QUALIFICATIONS

- A. The following is the Control Systems Integrators for the Owner:
 1. Automation Control Service.
- B. The Process Manufacture shall be responsible for the approval of its Process Systems Integrator, but shall still meet the qualifications as outlined within the specifications.
- C. The Integrator shall be engaged full time in the design and manufacturer of PLC based control systems. The Integrator shall have documented experience in the municipal water and wastewater market.
- D. The Integrator shall be of a sufficient size that the proposed project will utilize less than 20% of the total programming and project management man-hours that the Integrator has available in any given month. The Integrator shall provide a staffing plan that documents how this requirement will be meet.
- E. The Control Systems Integrator shall maintain a local office within 100 driving miles of the project site for the past two years (Process Systems Integrator is excluded from the

distance limitation). This office shall be equipped with programming equipment, and staffed with a minimum of 3 programmers and 5 service technicians capable of performing routine maintenance, trouble shooting, and field programming changes on the proposed PLC control systems.

- F. The control system Integrator shall be an Allen-Bradley authorized “Solution Provider” or “System Integrator”.
- G. The control system Integrator shall have a panel shop located at their main facility and shall be able to obtain a UL listing for control panels.
- H. All software development for this project shall be done in the local office.
- I. The System Integrators shall stage a factory acceptance test for the control system at their local office. During this test, the Integrator shall demonstrate the complete operation of the control system including any field I/O and network connections. The test shall also have actual dynamic loads provided for each motor starter and VFD circuit connected to the control system.
- J. Project Staffing:
 - 1. Project Manager (for Control Systems Integrator):
 - a. The Project Manager shall be a registered professional engineer licensed in the State of Florida and shall oversee all aspects of the control system project.
 - b. The Project Manager shall have documented experience in the design and construction management of instrumentation / control and electrical systems. This experience shall include emergency power systems, variable frequency drive systems, harmonic correction, voltage drop and load flow analysis, breaker coordination, motor starters, conduit & conductor installation, and PLC / HMI programming.
 - c. The Project Manager shall be located in the Integrators local office.
 - d. The Project Manager shall be the primary contact for the Owner and Engineer.
 - e. The Project Manager shall personally meet with the Owner and Engineer to review the shop drawing submittals.
 - f. The Project Manager shall be onsite monthly to attend meetings with the Owner, Engineer, and Contractor.
 - g. The Project Manager shall be on site during the start-up and testing period for the proposed control system.
 - h. Prior to power being applied to any control devices, the Project Manager shall send the Owner and Engineer a letter indicating that the Project Manager has reviewed the work and is satisfied that the installation is in accordance with the Shop Drawings, equipment manufactures recommendations, good industry practices, and the NEC.
 - 2. Programmers:

- a. All Programmers shall be Graduate Engineers or Computer Science Majors with a 4 year college degree. As a minimum, all programmers shall have 5 years of experience in PLC and HMI programming.
- 3. Service Technicians:
 - a. All Service Technicians shall have a minimum of a 2 year Associates Degree in some field related to computers or electrical maintenance.
 - b. All Service Technicians shall have a minimum of five years of experience in PLC systems and HMIs.
 - c. All Service Technicians shall be capable of programming the proposed PLCs and shall pass a proficiency test to the Engineer's satisfactions.
 - d. All Service Technicians shall have experience troubleshooting: motor starters, PLC, computer, and HMI systems.
 - e. Service Technicians shall show proficiency in using the following equipment: volt meters, oscilloscopes, PLC programming software, HMI configuration tools

21.3 PLC / HMI PROGRAMMING

- A. All PLC code shall be written in either "Function Block" style. The System Integrator may use "Ladder Logic" for simple logic functions with the Engineer and Owner's approval prior to programming.
- B. All PLC / HMI code shall be supplied to the Owner with fully descriptive comments. All HMI code shall be supplied to the Owner with fully descriptive screen and tag data.
- C. The Integrator shall provide the Owner with a flow chart of all PLC code as well as a written algorithm of the codes functions.
- D. The graphic standards to be used for all HMI equipment shall be coordinated with the process equipment providers. All control panel screens will be custom.
- E. The Integrator shall provide the Owner with an I/O map of all process variables in the PLC.
- F. All PLC code shall be the property of the Owner.
- G. The Contractor shall provide three copies of all commented PLC, HMI, and Operator Interface code/script/screen layouts to the Owner in electronic format prior to acceptance by the Owner. Any documentation not containing symbol information or comments will not be considered acceptable.

21.4 TRAINING

- A. The Contractor shall require that the instrumentation and control system Integrator plan, schedule and conduct a thorough and comprehensive training program designed to meet

the general and specific needs of the Owner's operating and maintenance personnel. The training program shall include training on the completed system at the Owner's site.

- B. Training, except that conducted during start-up and maintenance visits by service technicians, shall be conducted by professional training specialists employed by the instrumentation and control system Integrator.
- C. The Integrator shall submit a training syllabus to the Engineer as a shop drawing for approval.
- D. As a minimum the Integrator shall provide 1, four hour classes for the treatment facility operators for operational training.
- E. As a minimum the Integrator shall provide 1, four hour classes for the treatment facility maintenance staff on maintenance and troubleshooting.

21.5 ADDITIONAL REQUIREMENTS

- A. The Integrators shall include 24 hours of additional onsite PLC programming and screen development for use during the construction of the control system in their base bid. These hours shall be used as directed by the engineer or the Owner to add additional screens and control loops as required.

PART 22 - HUMAN-MACHINE INTERFACE (HMI) / REPORTING

- 2.1 The Human-Machine Interface software for the SCADA HMI shall be based upon the existing installation and shall be field verified. The Control Systems Integrator shall be responsible for providing all necessary licenses, drivers, and required network and software packages as required, for the configuration as detailed in the project plans. The Integrator shall be required to provide the necessary HMI screens to monitor and control the equipment installed in this project. The Integrator shall be required to submit the proposed HMI screens to the Engineer and Owner for approval a minimum of eight weeks prior to the factory testing.
- 2.2 All available functions represented on the screens shall be easily identified. The Operator shall not be required to navigate multiple levels of menus to perform a control function. (No more than 2 key strokes to get to any major screen from any screen and no more than 3 key strokes to get to any screen or popup from any screen.)
- 2.3 All alarms generated by equipment installed on the project shall be displayed in the alarm summary page. The Integrator shall coordinate with the Owner when configuring the system alarms and subsequent actions. The use of HMI alarm tags will not be allowed unless sufficient reason is submitted and approved.

PART 23 - EXECUTION

23.1 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall coordinate the Control System Integrators during construction, testing, start-up, calibration and acceptance of the instrumentation and control system. The Process Manufacture shall coordinate the Process System Integrators during construction, testing, start-up, calibration and acceptance of the instrumentation and control system. The Contractor is responsible for a complete and fully operational instrumentation and control system.

23.2 GENERAL INSTALLATION

- A. The instrumentation and control system, peripherals, and accessory equipment shall be installed in accordance with the equipment manufacturer's instructions and located as shown on the Contract Drawings or as approved by the Engineer.
- B. The Contractor shall coordinate the installation, placing and location of system components, their connections to the process components, panels, cabinets and devices, as required to complete the work subject to the Engineer's approval. The Contractor shall be responsible to insure that all field wiring for power and signal circuits between existing devices, the proposed control system are correctly done in accordance with best industry practice to insure a satisfactory functioning installation

23.3 TEST AND ACCEPTANCE

- A. The Engineer and Owner shall witness Acceptance Tests, On-site Operability Tests and System Acceptance Tests.

23.4 INSTALLATION

- A. All equipment and devices for the instrumentation and control system shall be installed in the locations shown on the drawings, in accordance with the manufacturer's recommendations, and in compliance with the requirements of these specifications.
- B. The Control System Integrator shall include 16 man-hours for installation assistance in their bids. These hours will be on the site hours and exclude travel. Any hours not used for installation assistance shall be used for Owner Directed Field Programming Changes. The electrical contractor shall provide two instrument electricians to work with the integrator during the installation and termination of the wiring to the PLCs.

23.5 FIELD ACCEPTANCE TESTS

- A. No power shall be activated to any part of the instrumentation and control system until the Engineer receives a written certified statement by the system supplier that the installation is complete and ready for energizing. The Contractor is responsible for proper coordination and scheduling, and any damage to the instrumentation and control system.
- B. After the installations are completed, the Contractor through the System Integrators, shall test each component of the instrumentation and control system. After all systems are operating properly, the Contractor shall notify the Engineer and demonstrate the full operation of the system. The Contractor shall make all necessary adjustments and correct or replace faulty equipment to the satisfaction of the Engineer.
- C. The Control System Integrator shall include 8 man-hours for field I/O checkout in their bids. These hours will be on the site hours and exclude travel. Any hours not used for I/O checkout shall be used for Owner Directed Field Programming Changes. The electrical contractor shall provide two instrument electricians to work with the integrator during the Field I/O checkout time.
- D. The control system integrator shall be required to provide all test equipment necessary to test the control system and computer networks (both fiber and radio) per industry standards.

23.6 FIELD CALIBRATION

- A. All instrumentation and controls shall be calibrated in the presence of the Engineer in accordance with the manufacturer's instructions to the accuracy specified.
- B. The Contractor shall provide field calibration as necessary until the project is considered Substantially Complete by the Engineer.

23.7 MAINTENANCE AND CALIBRATION PERIOD

- A. During the first year of operation after substantial completion of the entire project, the Contractor shall provide maintenance and calibration services for the newly installed instrumentation and control systems. All maintenance and calibration activities shall conform to the manufacturer's requirements and shall be provided by a certified technician. This work shall include all labor, tools, equipment, materials and all other expenses at no additional cost to the Owner. Calibration and maintenance shall be

performed every three months at a minimum. (The integrator shall include 40 man-hours per quarter for the required maintenance period.)

23.8 START-UP SERVICES

- A. The Control System Integrator shall include 16 man-hours for Start-up in their bids. These hours will be on the site hours and exclude travel. Any hours not used for Start-up shall be used for Owner Directed Field Programming Changes. The electrical contractor shall provide one instrument electrician to work with the integrator during the Start-up time.

PART 24 - SOFTWARE STANDARDS AND COVENANTS PHASE

1.1

- 4.1 The Control Systems Integrator shall be responsible for defining the software standards and design covenants to be followed throughout the project, including the covenants and standards to be used by the packaged system vendors. As part of this requirement the following shall be defined and approved by the Engineer:

- A. Tag database design
 - 1. Establish the tag naming conventions
 - 2. Define the system tag
 - 3. Define the operating parameters for each tag (i.e. Alarm ranges, default values, triggered events, etc.)
- B. PLC Code Standards
 - 1. Variable naming conventions
 - 2. Code structure
 - 3. Commenting/documentation conventions
- C. HMI Standards
 - 1. Screen graphic standards
 - a. User Security
 - b. Menu locations
 - c. Window types
 - d. Alarm notification
 - 2. Color standards
 - a. Normal colors
 - b. Warning colors
 - c. Fault colors
 - d. Informational colors
 - 3. Naming conventions
 - 4. Commenting/documentation
- D. Packaged system requirements

1. Log structures
 2. Report structures
 3. Trend structures
 4. Alarm management
- E. Asset management
1. Asset definitions
 2. Asset disaster recovery
 3. Asset service level agreements
 4. Asset forms
 5. Asset reports
 6. Work order definitions
 7. Inventory definitions
- F. Network Architecture
1. Network Hardware standards
 - a. Network architecture diagram
 2. Network Definitions
 - a. Service Level Agreement
 - b. Device definitions
 - c. Server Organization
 - d. External user connections
 - e. Firewall definitions
- G. Power Monitoring
1. Define the plant power monitoring scope
 - a. Parameters to be monitored
 - b. Parameter sampling rates
 - c. Define alarm limits
 - d. Define triggered events
- H. Testing and Acceptance Procedures
1. Develop the general test procedure requirements and standards
 2. Develop specialized test procedures for the following:
 - a. Plant Network test
 - b. Network switches
 - c. Fiber optic network
 - d. Wireless network
 - e. Process system/packaged system network(s)

PART 25 - AS-BUILT DOCUMENTATION

- 5.1 The Control System Integrator shall coordinate with the Process Systems Integrators and provide the Owner with a complete set of AutoCAD 2007 control drawings for the project. These drawing shall include loop sheets, system block diagrams, starter schematics, and PID drawings. The drawings shall indicate all wiring numbers.

- 5.2 The Integrator shall provide detailed documentation of all computer code developed for this project. This documentation shall include but not be limited to: flow charts, written descriptions, comments in PLC code, and HMI scripting. All software and code developed for this project shall be considered property of the Owner.
- 5.3 All As-Built documentation shall be provided in both paper and electronic formats

END OF SECTION 16900

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 16910 – CONTROL PANEL CONSTRUCTION

PART 26 - GENERAL

26.1 SCOPE

- A. The Supplier shall furnish, test, and startup all furnished electrical control panels and control system components related to their furnished equipment.
- B. Specifically included are the following control panels:
 - 1. Screen Control Panel(s) and corresponding Sub-Control Panel(s) (by process manufacture systems integrator).
 - 2. Grit Removal System Control Panel(s) and corresponding Sub-Control Panel(s) (by process manufacture systems integrator).
 - 3. Updating of existing SCADA HMI programming and screens (by contractor/owner systems integrator).
 - 4. Fiber Optic cable and Terminations for system (by contractor/owner systems integrator).
 - 5. Provide Fiber Optic Patch Panel, as required on drawings (by contractor/owner systems integrator)
 - 6. Contractor/owner systems integrator and process manufacture systems integrator(s) shall coordinate and be responsible for a complete and operational communication system, including the coordination of wavelength transmission for all (new & existing) media converters.

26.2 SUBMITTALS

- A. Product Data: For each type of product supplied. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
- C. Connection Diagrams: For each type of product supplied, provide a terminal connection diagram showing terminal numbers and corresponding function for each terminal connection. These same terminal references shall be utilized in the point-to-point wiring diagrams.
- D. Additional Shop Drawing Requirements:
 - 1. Point-to-Point Wiring Drawings.

2. Process Loop Drawings.
3. Fabrication and nameplate legend drawings.
4. Internal wiring schematic drawings.
5. Systems schematic drawings illustrating all components being supplied complete with electrical interconnections.
6. Computer input/output lists and a written description of the control strategy to be applied.

PART 27 - PRODUCTS

27.1 GENERAL REQUIREMENTS FOR CONTROL PANELS

- A. All control panels shall be constructed in accordance with the following standards: National Electrical Manufacturers Association (NEMA), Institute of Electrical and Electronics Engineers (IEEE), Underwriter Laboratories (UL), Nation Fire Protection Association (NFPA), and Instrumentation Systems and Automation Society (ISA)
- B. All control panels shall be constructed in a UL approved production facility and bare all applicable UL labels for panel construction.
- C. The completed panel shall be factory tested prior to shipment. Field installation by the Contractor shall consist only of setting the panel in place and making necessary pneumatic and/or electrical connections.
- D. All control panels shall be designed to operate at the service voltage as indicated in the project plans.

27.2 CONTROL PANEL ENCLOSURES

- A. All enclosures and control panels shall be rated as follows:
 1. Interior, not subject to corrosive environment: NEMA 1 / NEMA 12
 2. Exterior, and indoor areas subject to corrosive environment: NEMA 4X
- B. All enclosures, control panels, and associated hardware interior and exterior hardware shall be constructed of stainless steel (316L).
- C. All control panels containing voltages above 50V shall be provided with a CUSTOM built "Sequester" External Disconnect (as indicated on drawings) Enclosure Packages as manufactured by Hoffman. The disconnect used shall be an Allen-Bradley non-fused disconnect or main circuit break disconnect (size / type as required), as indicated on drawings or specifications.
- D. All interior components shall be clearly identified with plastic identification nametags. The tags shall be white with black lettering.

- E. All control panels shall be construction with a 3-point steel latching mechanism and padlocking stainless steel handles. Latch rods to have rollers for easier door closing.
- F. Door shall be provided with heavy gauge continuous stainless steel (316L) hinges.
- G. All control panels shall be constructed of 14 gauge stainless steel. Control panels shall also include a 10 gauge mild steel sub-panel mounted on collar studs for equipment mounting.
- H. All control panel seams shall be continuously welded and ground smooth.
- I. Exterior control panel doors shall be removable by pulling the stainless steel hinge pin.
- J. Data pockets shall be provide on all interior panel doors. The equipment supplier shall provide laminated schematics in each pocket for the associated control panel.
- K. All cabinets shall be sized to accommodate the equipment required plus 25% spare space.
- L. All control panels shall be provided with a mild steel dead front panel capable of protecting the operator from a bolted fault within the control panel with the outer door open.

27.3 CONTROL PANEL COOLING REQUIREMENTS

- A. Sun shields shall be supplied as required to keep the equipment mounted inside the control panels operating within the manufacturers operating temperature requirements.
 - 1. Provide sunshields for all panels located outside.
 - 2. Sun shields shall have a space of 6" around the top and sides of the panels.
- B. All exterior control panels designed for exterior mounting shall be provided with equipment rated for 60° Celsius.
- C. All control panels with VFDs, Soft Starts, PLCs, and other components requiring special cooling, for operations purposes, shall be located inside a climate controlled building. Building shall be provided by contractor. Contractors shall coordinate dimensional and cooling/heating requirements with system integrators.

27.4 PLC EQUIPMENT

- A. All control panels that perform logic or control functions shall be provided with a Programmable Logic Controller (PLC). The Programmable Logic Controllers shall be an Allen-Bradley Compactlogix series 1769-L35E.

- B. All Programmable Logic Controllers shall be supplied with a minimum of 1.5 Megabytes of available user memory and shall be provided with a removable 64Megabyte CompactFlash card for nonvolatile memory.
- C. The Programmable Logic Controller shall be provided with the following communication ports as a minimum: one RS-232 serial port, one Ethernet communication module, and one DeviceNet communication module. The Contractor shall be required to provide all communication modules as required for communication with equipment connected to the PLC and for connection to the control system network.
- D. The Programmable Logic Controller I/O shall be Allen-Bradley series 1769 Compact I/O modules.
- E. The Programmable Logic Controller Power Supply shall be an Allen-Bradley Controllogix series 1769-PA4 power. The power supply shall be sized to provide 25% spare capacity.
- F. All PLC units shall be provided with battery backup. All exterior control panels shall be provided with a battery back-up system that consists of a power supply / battery charger and re-chargeable batteries. The use of an off the shelf UPS shall not be considered acceptable.
- G. As indicated on the drawings, the control panels shall be supplied with a Human Machine Interface (HMI) that allows the operator to control and monitor the status of the devices connected/controlled by the associated control panel. The operator interface shall be mounted on the interior dead-front panel and shall be provided with sun/weather shields. The Human Machine Interface shall be provided with Touch/Keypad functions and an Ethernet communication module. The Human Machine Interface shall be Allen-Bradley Panelview 1250 Color (provide high bright display for exterior panels) or Engineer approved equal. The HMI shall be provided with 32 MB of flash RAM and a Ethernet communication connection. All exterior mounted HMI devices shall be provided with sun visors. In addition, all HMI devices shall be configured to use screen with a 5 minute delay.
 - 1. Screen Control Panel(s) shall be provided with HMI.
 - 2. Grit Removal Control Panel(s) shall be provided with HMI.
- H. Each control panel shall be supplied with a DIN rail mounted industrial Ethernet switch with redundant ST style fiber optic connections for connection of the control panel to the control system network. The industrial Ethernet switches shall be Hirschmann RS2-TX series or Engineer approved equal. All switches shall be provided with at least two spare RJ-45 Ethernet ports.
- I. Each control panel shall be provided with a fully functional network CAT 5 Ethernet connection on the dead front of the control panel for maintenance.

- J. Control panels that require wireless industrial Ethernet connections shall be provided with industrial wireless Ethernet access points or client modules (based on the network layout as shown in the project plans). The wireless industrial Ethernet components shall be Siemens Scalance W series or Engineer approved equal.
- K. All industrial Ethernet components shall be provided with removal configuration plugs which allow for easy replacement and storage of configuration parameters without need for addition programming software or cables.

27.5 PLC / HMI PROGRAMMING

- A. All PLC code shall be written in either “Structured Text” or “Function Block” style.
- B. All PLC / HMI code shall be supplied to the owner with fully descriptive instruction and rung comments. All HMI code to be supplied to the owner with fully descriptive screen and tag data.
- C. The control panel manufacture shall provide the owner with a flow chart of all PLC code as well as a written algorithm of the codes functions.
- D. The owner will define the graphic standards to be used for all HMI equipment. The control panel manufactures shall assume that all control screens will be custom.
- E. The control panel manufacture shall provide the owner with an I/O map of all process variables in the PLC.
- F. All PLC code shall be the property of the owner.
- G. The Contractor shall provide three copies of all commented PLC, HMI, and Operator Interface code/script/screen layouts to the Owner in electronic format prior to acceptance by the Owner. Any documentation not containing symbol information or comments will not be considered acceptable.

27.6 CONTROL PANEL WIRING

- A. Wiring, where required, shall be general-purpose open type, neatly bundled and laced or installed in plastic wiring troughs. Wire shall be stranded No. 14 AWG minimum, with thermoplastic insulation rated for 600V and 90 degrees C.
- B. All equipment mounting backboards shall be provided with nonmetallic slotted ducts. All nonmetallic slotted ducts shall have spare space equal to 40% of the depth of the duct.
- C. Wiring colors shall be as follows:
 - 1. All ungrounded AC conductors operating at the supply voltage shall be “Black”

2. All ungrounded AC control conductors operating at voltage less than supply shall be "RED"
 3. All ungrounded DC control conductors shall be "Blue"
 4. All ungrounded AC control conductors or wires that remain energized when the main disconnect is in the "OFF" position shall be "Yellow"
 5. All grounded AC current carrying conductors shall be "White"
 6. All grounded DC current carrying conductors shall be "White with a Blue stripe"
 7. All grounded AC current carrying conductors that remain energized when the main disconnect is in the "OFF" position shall be "White with a Yellow stripe"
 8. All ground conductors shall be "Green"
 9. A wiring color code legend shall be mounted inside the control panel door.
- D. All wires entering and leaving all panels shall be terminated at barrier type terminal strips with integral surge protection. All terminals shall be identified and labeled per the Owner's standard naming conventions. It shall be the Supplier's responsibility to coordinate with the Owner for the accepted naming conventions. (All terminal strips shall be designed for #12 AWG, THWN-2, 90 degree C field wiring for terminations.)
 - E. No terminal strip may be located closer than 8" from any side or bottom of the control panel. This is designed to allow for adequate wire bending radius for field terminations.
 - F. All wiring shall be clearly marked with an identification number consistent with the wiring schematic.
 - G. Devices mounted on the enclosure door or interior dead front panel shall be run in spiral wrap to avoid pinch points when opening and closing the enclosure door(s) or interior panels

27.7 SURGE PROTECTION

- A. All power and digital I/O signals shall be protected from surges at the control panel with suitable surge suppression devices. Panel mounted surge protection shall be Plug in Style & DIN rail mounted to allow for easy replacement. The power and digital I/O signals shall be protected with solid state surge suppression devices manufactured by Phoenix Contact or Engineer approved equal. MOV only type surge suppression is not acceptable.
- B. All analog I/O signals shall be protected by loop powered isolators manufactured by Phoenix Contact or Engineer approved equal.
- C. Lightning Protection and surge suppression devices shall be provided for all radio and telemetry equipment. The Lighting protection and surge suppression devices shall be manufactured by Phoenix Contact or Engineer approved equal.

- D. All incoming power to the control panel shall be protected by Phoenix Contacts “Trabtech” surge protectors or Engineered approved equal rated for the voltage being supplied. Protection shall be provided for all phase and neutral conductors.

27.8 PANEL MOUNTED DEVICES

- A. Indicating lights shall be LED, heavy duty, push-to-test type, oil tight, industrial type with integral transformer for 120 VAC applications. Lenses shall be colored as noted on drawings or as required by the equipment manufacturers if not specified on the drawings. Legend plates shall be factory engraved as required. Lights shall be Allen-Bradley Bulletin 800T 30.5mm or approved equal.
- B. Momentary pushbuttons to be heavy duty, oil tight, industrial type with full guard and momentary contact rated at 10 Amps continuous at 120 VAC. Legend plates shall be factory engraved as required. Pushbutton shall be Allen-Bradley Bulletin 800T 30.5mm or approved equal.
- C. Selector switches, on/off and H.O.A. to be heavy duty, oil tight, industrial type with contact rated at 120 VAC, 10 amps continuous service. Legend plates shall be factory engraved as required. Switches shall be Allen-Bradley Bulletin 800T 30.5mm or approved equal.
- D. Current to voltage converters, 4-20mA_{dc} to 1-5V_{dc} shall be as manufactured by Phoenix Contact or Engineer approved equal.
- E. D.C. power supplies shall be as manufactured by PLC Manufacturer, Phoenix Contact, or approved equal and shall be sized for 1.5 times the application requirements. (No open power supplies will be allowed.)
- F. All relays shall be Allen-Bradley. Units shall be hermetically sealed in metal can with octal plug. Contacts to be 120Vac/60Hz at 10 amps. Unit to incorporate lamp in parallel with relay coil. All relays to be DPDT. Provide hold down clamps for all relays.
- G. All circuit breakers shall be of the same AIC rating as the panel or MCC to which they are connected, and shall be required to selectively coordinate above 0.1 seconds.
- H. All motor starters shall be manufactured by Allen Bradley. All starters shall be NEMA rated (no IEC devices). All motor speed controllers shall have the following capabilities: remote start/stop, status output, running output, and remote speed.
- I. All motor starters shall be provided to match the overload devices (size/type as required). The overloads shall provide status to the control panel programmable logic controller. The programmable logic controller shall have the ability to control and monitor the associated starter.

- J. All reduced voltage starters (size/type as required with bypass contactors) shall be manufactured by Allen Bradley. Each reduced voltage starter shall be supplied with a DeviceNet communication module for the control and monitoring of the associated device.
- K. All variable frequency drives shall match the same manufacturer and type as provided under the specification section “Variable Frequency Controllers” series (size/type as required). Each variable frequency drive shall be supplied with a DeviceNet communication module for the control and monitoring of the associated device.
- L. H-O-A selector switches are required for each motor starter contained within a control panel. All adjustable speed controllers shall be provided with a manual speed adjustment devices (separate from any HMI or Operator Interface Panel), which may be located on the face of the enclosure. H-O-A selector switches and manual speed switches shall allow the operator to control all motors and valves manually in the event of a PLC failure.
- M. Runtimes for each motor starter located in the control panel shall be tracked in the PLC and displayed on the HMI.
- N. Power distribution blocks shall be block style distribution blocks manufactured by Ferraz Shawmut or Engineer approved equal. All distribution blocks shall be provided with polycarbonate safety covers to provide dead front protection. The safety cover shall have a test prod hole for testing purposes
- O. Fuse blocks/holders shall be UL style fuse blocks manufactured by Ferraz Shawmut or Engineer approved equal.
- P. General purpose fuses shall be Ferraz Shawmut UL Power Fuse style or Engineer approved equal. Unless otherwise noted the fuse rating and type shall be determined based on the equipment (which the fuse is protecting) manufacturer’s recommendations for overcurrent protection.
- Q. Semiconductor fuses shall be Ferraz Shawmut Amp Trap series fuses or Engineer approved equal. Unless otherwise noted the fuse rating and type shall be determined based on the equipment (which the fuse is protecting) manufacturer’s recommendations for overcurrent protection.
- R. All control transformers shall be sized to provide 25% spare capacity. The transformer connections shall be provided with protective covers to guard against accidental contact, and the transformer shall be provided with primary and secondary fusing per the manufacturer’s recommendations. **This project does not require control transformers since control power will be provided from outside the panel. Provide label on panel indicating two (2) separate power feeds into control panel, one for equipment and one for control power. Provide circuit breaker disconnect**

for control power. Equipment power and control power disconnects shall be clearly labeled.

- S. Each control panel shall be provided with a ground fault duplex service receptacle that is accessible from the interior dead-front panel. The service receptacle shall be capable of providing 15A at 125VAC
- T. Each control panel shall be provided with a series connected suppression filter system to protect the programmable logic controller and instrumentation power from high-frequency noise and electrical transients. The suppression filter shall be a current technology LoadGuard or Engineer approved equal.
- U. All intrinsically safe barrier relays shall be UL listed and shall be manufactured by Warrick or Engineer approved equal.
- V. All circuit breakers shall be Cutler-Hammer. A main circuit breaker shall be provided for each control panel as indicated on the drawings.
- W. Each starter located inside the control panel shall be provide with a Hand-Off-Auto (H-O-A) selector switch located on the dead front of the control panel. The switch shall be provided to allow the operator to operate the starters in the event of control system failure.
- X. Pilot lights shall be provided for each starter located inside the control panel. The lights shall be as follows: Green (Run), Red (Off), Amber (Fault).
- Y. Control power transformers shall be provided in each control panel (as required) with a supply voltage other than 120V or 120/208V. Control power transformers shall be manufactured by Eaton Cutler-Hammer or Square D company and provided with both primary and secondary fuses per the NEC.

27.9 MISCELLANEOUS

- A. Engraved laminated plastic nameplates shall be furnished for each front panel mounted instrument. The Contractor shall coordinate with the Owner for nameplate color and naming conventions. All instruments and components shall be tagged on rear with embossed plastic tape labels.
- B. No pneumatic tubing shall be installed inside the control panels.

PART 28 - EXECUTION

28.1 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall coordinate the work of the service personnel during construction, testing, and acceptance of the work.
- B. The Contractor shall receive final approval on all panel, enclosure, and equipment layouts by the Engineer prior to fabrication or installation.

28.2 QUALITY ASSURANCE

- A. All control panels shall be factory tested and certified prior to releasing for shipment. The testing shall consist of but not limited to the following:
 - 1. Point to point testing of all wiring prior to application of power
 - 2. The intended supply voltage shall be applied to the control panel and all components shall be tested for proper operation and calibration.
 - 3. The programmable logic controller and operator interface code shall be loaded, and each shall be tested for functionality.
 - 4. All components shall be checked to confirm that each device has been installed per the plans and specifications as well as the Manufacturer's recommendations.
 - 5. The enclosure shall be inspected for defects and shall be repaired or replaced if necessary.
 - 6. All labeling and identification tags shall be verified and be clean and visible.
- B. An Electrical Engineer, registered in the state of Florida, shall be required to document the results of the control panel testing. The documentation shall contain the results of the tests listed above as well as any rework items and subsequent repairs that were required prior to shipment. In addition he/she must certify this document prior to the release for shipment. Prior to shipment all one copy of the applicable documentation shall be placed in the drawing pocket of each enclosure, and three copies shall be sent to the Engineer.

28.3 INSTALLATION

- A. All equipment and devices for the work shall be installed in the locations shown on the drawings, in accordance with the manufacturer's recommendations, and in compliance with the requirements of these specifications.
- B. The Contractor shall be responsible for coordinating the installation of all equipment in the proposed locations with all other trades performing work on the project that may be affected.

28.4 FINAL INSPECTION

- A. Include all changes and/or alterations in the control panels prior to final inspection and acceptance by the owner.
- B. Any changes and/or alterations in the Control Panels shall be reflected/updated in all Control Panel Schematics prior to acceptance by the Owner. This includes all electronic copies delivered to the Owner.

END OF SECTION 16910

SECTION 16950 – FIELD INSTRUMENTS

PART 29 - GENERAL

29.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

29.2 SUMMARY

- A. This Section includes the following:
 - 1. Level Transmitters
- B. Related Sections: Division 16.

29.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base air ratings on sea-level conditions.
- B. Operating Temperature: 35 degrees F to 100 degrees F.
- C. Environment: Wastewater.

29.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:
 - 1. Sensor housing, NEMA rating.
 - 2. Power requirements.
 - 3. Sensitivity ranges.
 - 4. Mounting requirements.
- C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connections.

- D. Coordination Drawings, including plumbing/connection plans and sections drawn accurately to scale. Submit with Shop Drawings. Show layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
- E. Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.
- F. Maintenance data for units to include in the operation and maintenance manual specified in Division 1 and in Division 15 Section “Basic mechanical Requirements”.

29.5 QUALITY ASSURANCE

- A. Electrical Component Standard: provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
- B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

29.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver units as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Lift and support units with the manufacturer’s designated lifting and covering.

29.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements. Verify clearances for installation.

29.8 COORDINATION AND SCHEDULING

- A. Coordinate with the Owner for the equipment shop drawings (including wiring schematics) and location of mounting areas.

29.9 EXTRA MATERIALS

- A. Furnish any spare parts that are expected to be replaced within a 1-year period in sufficient quantity to keep monitoring equipment operating for a minimum period of one year.

29.10 INSTRUMENT QUANTITIES FOR BIDDING PURPOSES

- A. Refer to drawings and process manufacturer equipment list.

PART 30 - PRODUCTS

30.1 Provided by:

- 1. Directly incorporated with Process Manufacturer's Equipment:
 - a. Provided by Process Manufacturer's Systems Integrator.
- 2. General, not directly related to Process Manufacturer's Equipment:
 - a. Owner's designated Control Systems Integrator.

30.2 MANUFACTURERS & SUPPLIERS

- 1. Manufacturer's: Subject to compliance with requirements list in the project specifications.
- 2. Supplier's: Suppliers shall be located within a 100-mile radius of the project.

30.3 LEVEL TRANSMITTERS

Manufacturer:	Endress & Hauser
Sensor Model:	Waterpilot FMX167
Application:	Wastewater
Type:	Hydrostatic
Approval:	Class 1, Division 1
Range:	0 – 25ft (minimum)
Accuracy:	0.2%
Temperature Range:	-10 to 70 degrees Celsius
Material:	Stainless Steel (316L)
Output Signal:	4-20mA with overvoltage protection
Supply Voltage:	10 – 30V DC
Housing:	Stainless Steel (316L), Heavy Duty, IP68
Cable Length:	Coordinate with drawings
* Install with Endress & Hauser guide tube, terminal box (IP67) with filter, and RIA45 display unit.	

30.4 WARRANTY

- A. The equipment shall be warranted for a period of two years after startup.
- B. Components failing to perform as specified by the engineers, or as represented by the manufacture, or proven defective in service during the warranty period, shall be replaced, repaired or satisfactorily modified by the manufacture without cost to the Owner when returned to the manufacture.

30.5 WORKMANSHIP

- A. All materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform within the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

30.6 SPARE PARTS

- A. Provide 10% spare parts for all sensors, transmitters, and pressure gauges provided, but no less than 1 of each size and type.

30.7 LIGHTNING PROTECTION

- A. Each electronic transmitter shall be provided with a Phoenix PLUGTRAB SPD for both the power and the 4-20 mA signal in a NEMA 4X stainless steel (316L) hinged junction box adjacent to the transmitters.

PART 31 - EXECUTION

31.1 DEMONSTRATION

- A. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.
- B. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout".
- C. Demonstrate operation of products specified in this Section. Conduct walking tour of the Project. Briefly identify location and describe function, operation, and maintenance of each product.

31.2 INSTALLATION

- A. Install according to manufacturer's written instructions.
- B. Install units with clearances for service and maintenance.
- C. Contractor shall install required electric conduit and cables for all field instruments. Each electric field instrument shall be supplied with 3#12 in a 1" C to the nearest power panelboard unless otherwise indicated on the project drawings. In addition, 2-2#18 AWG twisted-shielded pair(s) of signal wire in a 1" C shall be provided to the nearest PLC plant control panel unless otherwise shown on the project drawings.

- D. All transmitters shall be provided with sun/rain hoods.

31.3 CONNECTIONS

- A. Electrical: Conform to applicable requirements in Division 16 Sections.
- B. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

31.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation and electrical connections, and to report results in writing.
- B. Contractor shall install all equipment and related accessories before having the manufacturer's field service. If additional trips are required due to incorrect installation, Contractor shall pay for the costs for the field services.

31.5 DOCUMENTATION

- A. Manuals: Provide the Owner with original copies of the installation, operation, maintenance, and calibration manuals as provided with the equipment. In addition provide the original warranty cards and product literature. Copies of this information shall not be accepted.

END OF SECTION 16950

THIS PAGE LEFT BLANK INTENTIONALLY

**RISK MANAGEMENT POLICY AND STANDARDS
FOR
AGREEMENTS, CONTRACTS AND LEASES**

DEFINITIONS

The following definitions apply to these Risk Management Provisions:

Contract - The contract or agreement of which these Risk Management Provisions are a part for the construction, alteration, repair, or demolition of a structure or facility.

Organization - The Emerald Coast Utilities Authority, a local governmental body of the State of Florida, its Board, officers, employees, volunteers, representatives, and agents.

Other Party - The other party to the Contract of which these Risk Management Provisions are a part, any subsidiaries or affiliates, officers, employees, volunteers, representatives, agents, contractors, and subcontractors.

HOLD HARMLESS

The Other Party agrees to hold the Organization and the members of its governing board and its other officers and employees harmless against all claims for bodily injury, sickness, disease, death, personal injury, or damage to property or loss of use resulting therefrom, arising out of or related to the Contract, to the extent such claims are caused by the negligence, recklessness, or intentional wrongful misconduct of the Other Party and persons or entities employed or utilized by the Other Party in the performance of the Contract.

PAYMENT ON BEHALF OF ORGANIZATION

The Other Party agrees to pay on behalf of the Organization all claims described in the above "Hold Harmless" paragraph, and to pay the reasonable costs and fees of the attorneys selected by the Organization, at trial and on appeal, to defend the Organization and its officers and employees against such claims. Provided, however, that the total liability of the Other Party to the Organization under the above "Hold Harmless" paragraph and this "Payment on Behalf of Organization" paragraph shall not exceed the sum of One Million Dollars (\$1,000,000) per claim or occurrence.

Such payment on behalf of the Organization shall be in addition to any and all other legal remedies available to the Organization and shall not be considered to the exclusive remedy of the Organization.

LOSS CONTROLS/SAFETY

Precaution shall be exercised at all times by the Other Party for the protection of all persons, including employees, and property. The Other Party shall comply with all laws, regulations, or ordinances relating to safety and health, and shall make special effort to detect hazardous conditions and shall take prompt action where loss control/safety measures should reasonably be expected.

The Organization may order work to be stopped if conditions exist that present immediate danger to persons or property. The Other party acknowledges that such stoppage will not shift responsibility for any loss or damages from the Other Party to the Organization.

SEVERABILITY

The provisions of these Risk Management Provisions are severable. In the event a court of competent jurisdiction should declare any provision of these Risk Management Provisions to be void or contrary to public policy such provision shall be stricken from these Risk Management Provisions, and the remaining provisions shall be enforced as though the provision determined to be void or contrary to public policy had not been included herein.

INSURANCE - BASIC COVERAGES REQUIRED

The Other Party shall procure and maintain the following described insurance, except for coverages specifically waived by the Organization, on policies and with insurers acceptable to the Organization. These insurers shall have A.M. Best (or equivalent) rating of no less than A:VII unless otherwise agreed to by the Organization.

These insurance requirements shall not limit the liability of the Other Party. The Organization does not represent these types or amounts of insurance to be sufficient or adequate to protect the Other Party's interests or liabilities, but are merely minimums.

Except for workers compensation, the Other Party waives its right of recovery against the Organization, to the extent permitted by its insurance policies.

The Other Party's deductibles/self-insured retentions shall be disclosed to the Organization and may be disapproved by the Organization. They shall be reduced or eliminated at the option of the Organization. The Other Party is responsible for the amount of any deductible or self-insured retention.

Insurance required of the Other Party or any other insurance of the Other Party shall be considered primary, and insurance of the Organization, if any, shall be considered excess, as may be applicable to claims which arise out of the Hold Harmless, Payment on Behalf of Organization, Insurance, Certificates of Insurance and any Additional Insurance provisions of this agreement, contract or lease.

Additional Insured

Except for workers compensation and professional liability, the Other Party's insurance policies shall be endorsed to name the Organization as an additional insured for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by the Other Party's acts or omissions; or the acts or omissions of those acting on the Other Party's behalf; in the performance of the Other Party's ongoing operations for the Organization. The preferred Commercial General Liability coverage endorsement is ISO Form CG 20 10.

Workers Compensation Coverage

The Other Party shall purchase and maintain workers compensation insurance for all workers compensation obligations imposed by state law and employer's liability limits of at least \$100,000 each accident and \$100,000 each employee/\$500,000 policy limit for disease.

The Other Party shall also purchase any other coverages required by law for the benefit of employees.

General, Automobile and Excess or Umbrella Liability Coverage

The Other Party shall purchase and maintain coverage on forms no more restrictive than the latest editions of the Commercial General Liability and Business Auto policies of the Insurance Services Office.

Minimum limits of \$1,000,000 per occurrence for all liability must be provided, with excess or umbrella insurance making up the difference, if any, between the policy limits of underlying policies (including employers liability required in the Workers Compensation Coverage section) and the total amount of coverage required.

Commercial General Liability Coverage - Occurrence Form Required

Coverage A shall include bodily injury and property damage liability for premises, operations, products and completed operations, independent contractors, contractual liability covering this agreement, contract or lease, broad form property damage, and property damage resulting from explosion, collapse or underground (x,c,u) exposures.

Coverage B shall include personal injury.

Coverage C, medical payments, is not required.

The Other Party is required to continue to purchase products and completed operations coverage, at least to satisfy this agreement, contract or lease, for a minimum of three years beyond the Organization's acceptance of renovation or construction projects.

Business Auto Liability Coverage

Business Auto Liability coverage is to include bodily injury and property damage arising out of ownership, maintenance or use of any auto, including owned, nonowned and hired automobiles and employee nonownership use.

Excess or Umbrella Liability Coverage

Umbrella Liability insurance is preferred, but an Excess Liability equivalent may be allowed. Whichever type of coverage is provided, it should be at least “following form” and shall not be more restrictive than the underlying insurance policy coverages.

EVIDENCE/CERTIFICATES OF INSURANCE

Required insurance shall be documented in Certificates of Insurance, including indication that the policy(s) is endorsed to provide the Organization at least 30 days in advance notice of cancellation, nonrenewal or adverse change.

New Certificates of Insurance are to be provided to the Organization at least 15 days prior to coverage renewals.

If requested by the Organization, the Other Party shall furnish complete copies of the Other Party’s insurance policies, forms and endorsements.

For Commercial General Liability coverage the Other Party shall, at the option of the Organization, provide an indication of the amount of claims payments or reserves chargeable to the aggregate amount of liability coverage.

Receipt of certificates or other documentation of insurance or policies or copies of policies by the Organization, or by any of its representatives, which indicate less coverage than required does not constitute a waiver of the Other Party’s obligation to fulfill the insurance requirements herein.

ADDITIONAL INSURANCE

If checked below, the Organization requires the following additional types of insurance.

Property Coverage for Leases

The Other Party shall procure and maintain for the life of the lease, all risk/special perils (including sinkhole) property insurance (or its equivalent) to cover loss resulting from damage to or destruction of the building, improvements and personal property/contents. The policy shall cover 100% replacement cost, and shall include an agreed value endorsement to waive coinsurance.

Coverage shall also include continued full payment of rents to the Organization for up to one year after damage or destruction of the property.

Commercial General Liability Coverage Project Aggregate

Because the Commercial General Liability form of coverage includes an annual aggregate limitation on the amount of insurance provided, a separate project aggregate limit of \$1,000,000 is required by the Organization for this agreement or contract.

Liquor Liability Coverage

In anticipation of alcohol being served, the Other Party shall provide evidence of coverage for liquor liability in an amount equal to the general/umbrella/excess liability coverage. If the general liability insurance covers liquor liability (e.g. host or other coverage), the Other Party's agent or insurer should provide written documentation to confirm that coverage already applies to this agreement, contract or lease. If needed coverage is not included in the general/umbrella/excess liability policy(ies), the policy(ies) must be endorsed to extend coverage for liquor liability, or a separate policy must be purchased to provide liquor liability coverage in the amount required.

Owners Protective Liability Coverage

For renovation or construction contracts the Other Party shall provide for the Organization an owners protective liability insurance policy (preferably through the Other Party's insurer) in the name of the Organization.

This is redundant coverage if the Organization is named as an additional insured in the Other Party's Commercial General Liability insurance policy. However, this separate policy may be the only source of coverage if the Other Party's liability coverage limit is used up by other claims.

Builders Risk Coverage

Builders Risk insurance is to be purchased to cover subject property for special perils (all risks or equivalent) of loss (including theft and sinkhole), subject to a waiver of coinsurance, and covering on-site and off-site storage, transit and installation risks as indicated in the Installation Floater and Motor Truck Cargo insurance described hereafter, if such coverages are not separately provided.

If flood and/or earthquake risks exist, flood and/or earthquake insurance are to be purchased.

If there is loss of income, extra expense and/or expediting expense exposure, such coverage is to be purchased.

If boiler and machinery risks are involved, boiler and machinery insurance, including coverage for testing, is to be purchased.

The Builders Risk insurance is to be endorsed to cover the interests of all parties, including the Organization and all contractors and subcontractors. The insurance is to be endorsed to cover testing and to grant permission to occupy.

Installation Floater Coverage

Installation Floater insurance is to be purchased when Builder's Risk insurance is inappropriate, or when Builder's Risk insurance will not respond, to cover damage or destruction to renovations, repairs or equipment being installed or otherwise being handled or stored by the Other Party, including off-site storage, transit and installation. The amount of coverage should be adequate to provide full replacement value of the property, repairs, additions or equipment being installed, otherwise being handled or stored on or off premises. All risks coverage is preferred.

Motor Truck Cargo Coverage

If the Installation Floater insurance does not provide transportation coverage, separate Motor Truck Cargo or Transportation insurance is to be provided for materials or equipment transported in the Other Party's or other vehicles from place of receipt to building sites or other storage sites. All risks coverage is preferred.

Contractor's Equipment Coverage

Contractor's Equipment insurance is to be purchased to cover loss of equipment and machinery utilized in the performance of work by the Other Party. All risks coverage is preferred.

Fidelity/Dishonesty Coverage - for Employer

Fidelity/Dishonesty insurance is to be purchased to cover dishonest acts of the Other Party's employees, including but not limited to theft of vehicles, materials, supplies, equipment, tools, etc., especially property necessary to work performed.

Fidelity/Dishonesty/Liability Coverage - for Organization

Fidelity/Dishonesty/Liability insurance is to be purchased or extended to cover dishonest acts of the Other Party's employees resulting in loss to the Organization.

Garage Liability Coverage

Garage Liability insurance is to be purchased to cover the Other Party and its employees for its garage and related operations while in the care, custody and control of the Organization's vehicles.

Garagekeepers Coverage (Legal Liability Form)

Garagekeepers Liability insurance is to be purchased to cover the Other Party's liability for damage or other loss, including comprehensive and collision risks, to the Organization's vehicles while in the care, custody and control of the Other Party. This form of coverage responds only when the Other Party is legally liable for the loss.

Garagekeepers Coverage (Direct-Excess Form)

Garagekeepers Liability insurance is to be purchased to cover damage or other loss, including comprehensive and collision risks, to the Organization's vehicles while in the care, custody and control of the Other Party. This form of coverage responds on a legal liability basis, and also without regard to legal liability on an excess basis over any other collectible insurance.

Watercraft Liability Coverage

Because the Other Party's provision of services involves utilization of watercraft, watercraft liability coverage must be provided to include bodily injury and property damage arising out of ownership, maintenance or use of any watercraft, including owned, nonowned and hired.

Coverage may be provided in the form of an endorsement to the general liability policy, or in the form of a separate policy covering Watercraft Liability or Protection and Indemnity for bodily injury and property damage.

United States Longshoremen and Harborworkers Act Coverage

The Workers Compensation policy is to be endorsed to include United States Longshoremen and Harborworkers Act Coverage for exposures which may arise from this agreement or contract.

Jones Act Coverage

The Workers Compensation policy is to be endorsed to include Jones Act Coverage for applicable exposures (for work on, over or in navigable waters) which may arise from this agreement or contract.

Aircraft Liability Coverage

Because the Other Party's provision of services involves utilization of aircraft, aircraft liability coverage must be provided to include bodily injury and property damage arising out of ownership, maintenance or use of any aircraft, including owned, nonowned and hired.

The minimum limits of coverage shall be \$__,000,000 per occurrence, Combined Single Limit for Bodily Injury (including passenger liability) and Property Damage.

Pollution/Environmental Impairment Liability Coverage

Pollution/environmental impairment liability insurance is to be purchased to cover pollution and/or environmental impairment which may arise from this agreement or contract. The recommended minimum coverage is \$1,000,000. The coverage period shall be extended beyond the date of the completed project, until the expiration date of the performance bond.

PROFESSIONAL LIABILITY, MALPRACTICE AND/OR ERRORS OR OMISSIONS

If checked below, the Organization requires the following terms and types of insurance for professional, malpractice, and errors or omissions liability.

Hold Harmless

The following replaces the previous Hold Harmless wording.

The Organization shall be held harmless against all claims for bodily injury, sickness, disease, death or personal injury or damage to property or loss of use resulting therefrom arising out of performance of the agreement or contract, unless such claims are a result of the Organization's sole negligence.

The Organization shall also be held harmless against all claims for financial loss with respect to the provision of or failure to provide professional or other services resulting in professional, malpractice, or errors or omissions liability arising out of performance of the agreement or contract, unless such claims are a result of the Organization's sole negligence.

Professional Liability/Malpractice/Errors or Omissions Insurance

The Other Party shall purchase and maintain professional liability or malpractice or errors or omissions insurance with minimum limits of \$__,000,000 per occurrence.

If a claims made form of coverage is provided, the retroactive date of coverage shall be no later than the inception date of claims made coverage, unless the prior policy was extended indefinitely to cover prior acts.

Coverage shall be extended beyond the policy year either by a supplemental extended reporting period (ERP) of as great duration as available, and with no less coverage and with reinstated aggregate limits, or by requiring that any new policy provide a retroactive date no later than the inception date of claims made coverage.

The Other Party shall procure and maintain the following described insurance, except for coverages specifically waived by the Organization, on policies and with insurers acceptable to the Organization.

These insurance requirements shall not limit the liability of the Other Party. The Organization does not represent these types or amounts of insurance to be sufficient or adequate to protect the Other Party's interests or liabilities, but are merely minimums.

Except for workers compensation, the Other Party waives its right of recovery against the Organization, to the extent permitted by its insurance policies.

The Other Party's deductibles/self-insured retentions shall be disclosed to the Organization and may be disapproved by the Organization. They shall be reduced or eliminated at the option of the Organization. The Other Party is responsible for the amount of any deductible or self-insured retention.

Insurance required of the Other Party or any other insurance of the Other Party shall be considered primary, and insurance of the Organization shall be considered excess, as may be applicable to claims which arise out of the Hold Harmless, Payment on Behalf of Organization, Insurance, Certificates of Insurance and any Additional Insurance provisions of this agreement, contract or lease.

EMERALD COAST UTILITIES AUTHORITY

GENERAL PROVISIONS

PURCHASE ORDER/CONTRACT

1. Supplies are of domestic origin unless indicated by quoter.
 - 1.a. If you are unable to quote, please advise. This request does not commit Emerald Coast Utilities Authority to pay any cost incurred in the preparation or submission of this quotation or to procure or contract for supplies or services.
2. DELIVERY, INSPECTION AND ACCEPTANCE – Delivery, inspection and acceptance will be at destination unless otherwise provided. Until delivery and acceptance and after any rejections, risk of loss will be on the Contractor unless loss results from negligence of ECUA. Notwithstanding the requirements for any ECUA inspection and test contained in specifications applicable to this contract, except where specialized inspections or tests are specified for performance solely by ECUA, the contractor shall perform or have performed the inspections and tests required to substantiate that the supplies and services provided under the contract conform to the drawings, specifications, and contract requirements listed herein, including if applicable, the technical requirements for the manufacturer's part numbers specified herein.
3. ENTIRE AGREEMENT – The terms, specifications and drawings included in this order when duly executed constitute the entire agreement between the parties unless otherwise stated on the face of the order. No modification or waiver of terms of this agreement shall be binding unless in writing signed by a duly authorized representative of ECUA and confirmed by such a representative of the Vendor. This agreement shall be interpreted in accordance with the laws of the State of Florida.
4. DELIVERY OF EXCESS QUANTITIES OF \$100 OR LESS – The Contractor is responsible for the delivery of each item quantity; within allowable variations, if any. If the Contractor delivers and ECUA receives quantities of any item in excess of the quantity called for (after considering any allowable variation in quantity) such excess quantities will be treated as being delivered for the convenience of the Contractor. ECUA may retain such excess quantities up to \$100 in value without compensating the interests therein. Quantities in excess of \$100 will, at the option of ECUA, either be returned at the Contractor's expense or retained and paid for by ECUA at the contract unit price.
 - 4.a. DELIVERIES – In the event of failure to deliver material of the quality or within the time specified, ECUA may cancel order and buy elsewhere. Failure of ECUA to exercise this option with respect to any installment shall not be deemed a waiver with respect to future installments, if any.

5. DELIVERY TICKETS – All shipments under this agreement shall be accompanied with delivery tickets, or sales slips, in triplicate, which shall contain the following minimum information.

- a. Name of supplier;
- b. Blanket Purchase Order number;
- c. Date of Call;
- d. Call number;
- e. Itemized list of supplies or services furnished;
- f. Quantity, unit price and extension of each item, less applicable discounts (unit price and extensions need not be shown when incompatible with the use of automated systems, provided that the invoice is itemized to show this information); and
- g. Date of delivery or shipment.

Upon delivery, the receiving office will retain one copy of the related delivery ticket and will sign the other two copies and return them to the supplier or his agent. One of these copies may subsequently be required to support the invoice.

6. PAYMENTS – Invoices shall be submitted in triplicate (one copy shall be marked “Original”) unless otherwise specified, and shall contain the following information: Contract or Order number, item number, contract description of supplies or services, sizes, quantities, unit prices and extended totals. Bill of Lading number and weight of shipment will be shown for shipments of Bills of Lading. Unless otherwise specified, payment will be made on partial deliveries accepted by ECUA when the amount due on such deliveries so warrants.

7. DISCOUNTS – In connection with any discount offered, time will be computed from date of delivery suppliers to carrier when acceptance is at the point of origin or from date of delivery at destination when delivery and acceptance are at these points or from the date the correct invoice or voucher is received in the office specified by ECUA, if the latter is later than date of delivery. Payment is deemed to be made for the purpose of earning the discount on the date of mailing of the ECUA check.

8. CONVICT LABOR – In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment except as provided by Public Law 89.176, September 10, 1965 (18 U.S.C. 40821ch21) Executive Order 11755, December 29, 1973.

9. COVENANT AGAINST CONTINGENT FEES – The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty ECUA shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

- 10.a. CONTINGENCIES – Neither party shall be liable for delays or defaults due to acts of God, government authority or public enemy, war, fires, floods, epidemics, strikes, labor troubles, freight embargoes, or contingencies reasonably beyond its control. The party so affected upon prompt written notice to the other party shall be excused from making or taking deliveries hereunder to the extent of such prevention or restriction. At ECUA’s option, deliveries so omitted shall be made on notice thereof to the Vendor, upon cessation of such contingency even though such might have been operative at the date of this order.
10. GRATUITIES – (a) ECUA may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found after notice and hearing by the Executive Director or his duly authorized representative, that gratuities (in the form of entertainment, gifts or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of ECUA with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract, provided, that the existence of the facts upon which the Executive Director or his duly authorized representative make such findings shall be in issue and may be reviewed in any competent court, (b) in the event this contract is terminated as provided in paragraph (a) hereof, ECUA shall be entitled (1) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor and (2) as a penalty and in addition to any other damages to which it may be entitled by law to exemplary damages in an amount (as determined by the Executive Director or his duly authorized representative) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee, (c) The rights and remedies of ECUA provided in this clause shall not be exclusive or in addition to any other rights and remedies provided by law or under the contract.
11. CONDITION FOR ASSIGNMENT – This (contract or purchase order) shall not be assigned in full or in part without the consent of ECUA. Such consent shall not relieve the Contractor from its obligations and liabilities.
12. GOVERNMENT REGULATIONS – Vendor warrants that all applicable laws and regulations of governmental authority, covering the production, sale and delivery of the materials specified herein, have complied with and shall indemnify and save ECUA harmless from and against any liability or loss resulting from Vendor’s failure to do so.
13. TAXES – ECUA is exempt from Federal Taxes on transportation charges and any Federal Excise Tax. If you prepaid transportation, do not pay tax as ECUA will not reimburse you for the taxes paid. ECUA is exempt from State Sales Tax.

14. **CHANGES** – The Purchasing and Stores Manager may at any time, by written order, and without notice to the sureties, make changes, within the general scope of this contract, in (i) drawings, designs, or specifications, where the supplies to be furnished are to be specially manufactured for ECUA in accordance therewith; (ii) method of shipment or packing and (iii) place of delivery. If any such change causes an increase or decrease in the cost of, or the time required for the performance of this contract, whether changed or not changed by any such order, an equitable adjustment shall be made by written modification of this contract.

Any claim by the Contractor for adjustment under this clause must be asserted within 30 days from the date of receipt by the Contractor of the notification of change provided that the Purchasing and Stores Manager, if he decides that the facts justify such action, may receive and act upon any such claim asserted prior to final payment, under the contract. Failure to agree to any adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled “Disputes.” However, nothing in this clause shall excuse the Contractor from proceeding with this contract as changed.

15. **TERMINATION FOR DEFAULT** – The Purchasing and Stores Manager, by written notice, may terminate this contract, in whole or in part, for failure of the Contractor to perform any of the provisions hereof, in such event, the Contractor shall be liable for damages; including the excess cost of reprocurring similar supplies or services; provided that if (i) it is determined for any reason that the Contractor was not in default or (ii) the Contractor’s failure to perform is without his and his subcontractors control, fault or negligence, the termination shall be deemed to be a termination for convenience under paragraph 17. As used in this provision the term “subcontractor” and “subcontractors” means subcontractors at any tier.

16. **TERMINATION FOR CONVENIENCE** – The Purchasing and Stores Manager, by written notice, may terminate this contract, in whole or in part, when it is in the best interest of ECUA. If this contract is for supplies and is so terminated, the Contractor shall be compensated for goods delivered and accepted up to the date of termination at the discretion of the Executive Director. To the extent that this contract is for services and is so terminated, ECUA shall be liable only for payment in accordance with the payment provisions of this contract for services rendered prior to the effective date of termination.

17. **ASSIGNMENT OF CLAIMS** – Claims for monies due or to become due under this Contract shall be assigned only pursuant to the Assignment of Claims Act of 1940, as amended (31 U.S.C 203, 41 U.S.C. 15). However, payments to an assignee of monies under this contract shall not, to the extent provided in said Act, as amended be subject to reduction or set-off (see Clause 12).

18. **EXTENT OF OBLIGATION** – ECUA is obligated under a call-type Purchase Order only to the extent of authorized calls actually placed against this agreement.

19. **PRICING** – The prices to ECUA for all purchases made under this Agreement shall be as low as or lower than those charged the suppliers most favored customer, in addition to any discounts for prompt payment.
20. **WARRANTIES** – The Manufacturer of the equipment supplied under this specification shall provide, at a minimum, a non-prorated warranty for a period of twenty-four (24) months commencing on satisfactory start-up and acceptance by the Owner, or thirty (30) months from date of delivery, whichever occurs last. The Manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified, the Manufacturer shall, at his option, promptly repair, modify, or replace the defective equipment, or Owner's payment for the products shall be refunded.
21. **PATENTS** – Vendor shall protect and indemnify ECUA against all claims, judgments and expenses arising from infringement or any patent by any of the goods delivered hereunder. Vendor shall defend or settle at its own expense any proceeding brought against ECUA for such infringement provided Vendor is notified promptly of the commencement of such proceeding and is given authority, information and assistance by ECUA for the defense or settlement thereof.
22. **INSTALLATION** – If this order required the services of ECUA experts or employees of ECUA safety rules and fire regulations, Vendor assumes full responsibility for their acts and omissions and agrees to save ECUA harmless from any claims arising therefrom and to accept exclusive liability for payroll and other taxes imposed upon the employer by law. Vendor will undertake to keep the materials and premises involved free from any lien whatever for materials and labor incident to the performance of Vendor's obligations hereunder. If Vendor furnishes materials and services for construction and improvement of realty and the installation of personalty for a lump sum amount, Vendor agrees to furnish an analysis thereof as ECUA may reasonably require for accounting purposes. Vendor shall be solely responsible for materials furnished by ECUA on other than a charge basis in connection with this order.
23. **NON-DISCLOSURE** – Without prior written consent of ECUA in each instance, Vendor shall not reveal to a third party the details, characteristics or any information on materials made to the special order for ECUA or use reproductions thereof and any promotional media or reveal that, ECUA is purchasing the materials hereunder.
24. **COMMERCIAL WARRANTY** – The Contractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the Contractor gives to any customer for such supplies or services and that the rights and remedies provided herein are in addition to and do not limit any rights to the Emerald Coast Utilities Authority by any other clause of this contract.
25. **DEVIATION FROM SPECIFICATIONS** – Emerald Coast Utilities Authority has the sole authority to determine if any deviation from the specifications cited is acceptable.

EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The contractor will in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers which he has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further contracts with the Emerald Coast Utilities Authority. Provided, however, that no such action shall be taken without prior notice to the contractor and an opportunity for a hearing before the governing Board of the Emerald Coast Utilities Authority or its designee.

(5) The contractor will include the provisions of paragraphs (1) through (4) in every subcontract or purchase order for an amount exceeding ten thousand dollars (\$10,000) in any twelve (12) month period, so that such provisions will be binding upon each subcontractor or vendor.

Signature

Date

Name & Title of Signer

CERTIFICATION OF NONSEGREGATED FACILITIES

By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts or purchase orders exceeding \$10,000; that he will retain such certifications in his files and make them available to the Emerald Coast Utilities Authority upon request.

Provided, however, that such certifications shall not be required in the case of purchase orders or contracts which, in case of a Federal Government contract or subcontract, would be exempt from compliance with the Equal Opportunity Clause by 41 CFR S60-1.5. This section provides for the exemption of transactions not exceeding \$10,000, contracts and subcontracts for indefinite quantities established not to exceed \$10,000 in any contract year, contracts with certain educational institutions, work on or near Indian reservations, facilities (including, but not limited to, agencies, instrumentalities or subdivision of state or local government) which are separate and distinct from activities of the prime contractor or subcontractor related to the performance of the contract or subcontract, and emergencies involving national security.

Signature	Date
Name & Title of Signer	

DRUG-FREE WORKPLACE FORM

The undersigned vendor in accordance with Florida Statute 287.087 hereby certifies that _____ does:

(Name of Business)

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business’s policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 1893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee’s community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Bidder’s Signature

Date

Company: _____

Bid/RFP/PO: _____

EMERALD COAST UTILITIES AUTHORITY
BID NUMBER: 2013 03
BAYOU MARCUS WATER RECLAMATION FACILITY
HEADWORKS EQUIPMENT
PROPOSAL FORM

TO: EMERALD COAST UTILITIES AUTHORITY
PENSACOLA, FLORIDA

DATE: _____

GENTLEMEN:

IN ACCORDANCE WITH YOUR REQUEST FOR BIDS, INSTRUCTIONS AND SPECIFICATIONS, ATTACHED HERETO, AND SUBJECT TO ALL CONDITIONS THEREOF, I (WE), THE UNDERSIGNED, HEREBY PROPOSE AND AGREE IF THIS PROPOSAL IS ACCEPTED, TO CONTRACT WITH THE EMERALD COAST UTILITIES AUTHORITY TO FURNISH ANY ITEMS OR SERVICE REQUESTED HEREIN AND DELIVER SAME WITHOUT ADDITIONAL COST TO THE EMERALD COAST UTILITIES AUTHORITY AT THE SPECIFIED LOCATION FOR THE BID(S) LISTED BELOW.

THE UNDERSIGNED FURTHER DECLARES THAT HE HAS CAREFULLY EXAMINED THE SPECIFICATIONS AND IS THOROUGHLY FAMILIAR WITH THEM AND THEIR PROVISION. HE FURTHER DECLARES THAT NO OTHER PERSON OTHER THAN THE BIDDER HEREIN NAMED HAS ANY INTEREST IN THIS PROPOSAL OR IN THE CONNECTION WITH ANY OTHER PERSON(S) MAKING PROPOSAL FOR THE SAME ARTICLES, AND IT IS IN ALL RESPECTS FAIR AND WITHOUT COLLUSION AND FRAUD.

FAILURE TO PROVIDE ALL OF THE FOLLOWING INFORMATION MAY RESULT IN AUTOMATIC REJECTION OF BID.

HEADWORKS EQUIPMENT

ITEM A:

PERFORATED PLATE SCREENS WITH CONTROLS

MANUFACTURER AND MODEL NO: _____

NUMBER OF SCREENS: 2 UNIT COST: \$ _____

TOTAL COST: \$ _____

ITEM B:

GRIT REMOVAL SYSTEM/GRIT DEWATERING SYSTEM WITH CONTROLS

MANUFACTURER AND MODEL NO: _____

NUMBER OF SYSTEMS: 2 UNIT COST: \$ _____

TOTAL COST: \$ _____

ITEM C:

GRIT PUMPS

MANUFACTURER AND MODEL NO: _____

NUMBER OF SCREENS: 2 UNIT COST: \$ _____

TOTAL COST: \$ _____

ALTERNATE ITEM C1:

SPARE GRIT PUMP (SHALL BE THE SAME MANUFACTURER AND MODEL NO. AS
BASE BID ITEM (C)

NUMBER OF PUMPS: (1) TOTAL COST \$ _____

PAYMENT TERMS:

FOR UNITS PLACED INTO SERVICE WITHIN 180 CALENDAR DAYS OF DELIVERY
FOR BID ITEMS A AND B AND WITHIN 240 CALENDAR DAYS OF DELIVERY FOR
BID ITEMS C AND C1:

APPROVED SHOP DRAWINGS:.....	20%
RECEIPT OF O&M MANUALS:.....	10%
DELIVERY OF ALL EQUIPMENT:.....	60%
SUCCESSFUL START-UP OF EQUIPMENT:.....	10%

FOR UNITS PLACED INTO SERVICE 181 CALENDAR DAYS OR MORE AFTER
DELIVERY FOR BID ITEMS A AND B, AND 241 CALENDAR DAYS OR MORE AFTER
DELIVERY FOR BID ITEMS C AND C1:

APPROVED SHOP DRAWINGS:.....	20%
RECEIPT OF O&M MANUALS:.....	10%
DELIVERY OF ALL EQUIPMENT:.....	70%

PAYMENT TERMS:

BIDDER: _____

(FOB PENSACOLA)

BY: _____
(PRINT OR TYPE)

WARRANTY:

SIGNATURE: _____

TITLE: _____

ADDRESS: _____

ITEMS ENCLOSED:

___ QUALIFICATIONS DATA

TELEPHONE:() _____

FAX NUMBER:() _____

FEID NUMBER: _____

EMAIL ADDRESS: _____

FOR EVALUATION OF THE BIDS, IT IS ESSENTIAL THAT THE FOLLOWING BE INCLUDED IN THE SUBMISSION (ALL CONTACT INFORMATION SHALL INCLUDE AS A MINIMUM, THE OWNER'S NAME, POINT OF CONTACT, PHONE NUMBER, FAX NUMBER AND E-MAIL ADDRESS)

ITEM A, PERFORATED SCREENS W/CONTROLS:

EXCEPTIONS: YES _____ NO _____

(EXCEPTIONS INCLUDE THE WHOLE BID DOCUMENT, OUR SPECIFICATIONS, INSTRUCTIONS TO BIDDERS AND GENERAL PROVISIONS).

___ WRITTEN WARRANTY

___ NO. OF WEEKS FOR SHOP DRAWINGS SUBMISSION AFTER RECEIPT OF PURCHASE ORDER

___ NO. OF WEEKS FOR OPERATION & MAINTENANCE MANUAL SUBMISSION AFTER RECEIPT OF APPROVED SHOP DRAWINGS.

___ NO. OF WEEKS FOR DELIVERY OF ALL EQUIPMENT AFTER RECEIPT OF APPROVED SHOP DRAWINGS.

- ___ CATALOGUE CUTS, MODEL NUMBERS, WEIGHTS, DIMENSIONS, ETC. OF ALL MAJOR EQUIPMENT
- ___ SUPPLIERS COMPREHENSIVE AND COMPLETE SCOPE OF SUPPLY FULLY DESCRIBED
- ___ SUPPLIERS NEAREST WARRANTY SERVICE CENTERS AND CONTACT INFORMATION
- ___ CONCEPTUAL LAOUT DRAWINGS
- ___ SUPPLIERS LIST OF REFERNECES AND SIMILAR PROJECTS

ITEM B, GRIT REMOVAL SYSTEM/GRIT DEWATERING SYSTEM W/CONTROLS:

EXCEPTIONS: YES _____ NO _____

(EXCEPTIONS INCLUDE THE WHOLE BID DOCUMENT, OUR SPECIFICATIONS, INSTRUCTIONS TO BIDDERS AND GENERAL PROVISIONS).

- ___ WRITTEN WARRANTY
- ___ NO. OF WEEKS FOR SHOP DRAWINGS SUBMISSION AFTER RECEIPT OF PURCHASE ORDER
- ___ NO. OF WEEKS FOR OPERATION & MAINTENANCE MANUAL SUBMISSION AFTER RECEIPT OF APPROVED SHOP DRAWINGS.
- ___ NO. OF WEEKS FOR DELIVERY OF ALL EQUIPMENT AFTER RECEIPT OF APROVED SHOP DRAWINGS.
- ___ CATALOGUE CUTS, MODEL NUMBERS, WEIGHTS, DIMENSIONS, ETC. OF ALL MAJOR EQUIPMENT
- ___ SUPPLIERS COMPREHENSIVE AND COMPLETE SCOPE OF SUPPLY FULLY DESCRIBED
- ___ SUPPLIERS NEAREST WARRANTY SERVICE CENTERS AND CONTACT INFORMATION
- ___ CONCEPTUAL LAOUT DRAWINGS

ITEM C, GRIT PUMPS

EXCEPTIONS: YES _____ NO _____

(EXCEPTIONS INCLUDE THE WHOLE BID DOCUMENT, OUR SPECIFICATIONS, INSTRUCTIONS TO BIDDERS AND GENERAL PROVISIONS).

- ___ WRITTEN WARRANTY
- ___ NO. OF WEEKS FOR SHOP DRAWINGS SUBMISSION AFTER RECEIPT OF PURCHASE ORDER

- _____ NO. OF WEEKS FOR OPERATION & MAINTENANCE MANUAL SUBMISSION AFTER RECEIPT OF APPROVED SHOP DRAWINGS.
- _____ NO. OF WEEKS FOR DELIVERY OF ALL EQUIPMENT AFTER RECEIPT OF APPROVED SHOP DRAWINGS.
- _____ CATALOGUE CUTS, MODEL NUMBERS, WEIGHTS, DIMENSIONS, ETC. OF ALL MAJOR EQUIPMENT
- _____ SUPPLIERS COMPREHENSIVE AND COMPLETE SCOPE OF SUPPLY FULLY DESCRIBED
- _____ SUPPLIERS NEAREST WARRANTY SERVICE CENTERS AND CONTACT INFORMATION

IT IS ESSENTIAL THAT THE SUBMISSION INCLUDE SIGNED AFFIDAVITS ON THE BELOW LISTED FORMS.

EXECUTED ATTACHED FORMS:

- _____ BID BOND
- _____ PROPOSAL FORM
- _____ DRUG-FREE WORKPLACE FORM
- _____ EQUAL OPPORTUNITY FORM
- _____ CERTIFICATION OF NON-SEGREGATED FACILITIES FORM