



CITY OF TAMPA

Bob Buckhorn, Mayor

CONTRACT ADMINISTRATION DEPARTMENT

Michael W. Chucran, Director

ADDENDUM NO. 3

DATE: February 9, 2016

Contract 15-C-00037; Howard F. Curren AWTP Diffused Air Reactor Improvements, Phase I

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

Item 1: Special Conditions, Section 11.0 Record Drawings: Replace with the following wording:

During the course of the work, Contractor shall maintain, at the site, a clean undamaged set of the Contract documents. Contractor shall mark set, on a daily basis, with location and progress of all contract work. Any and all changes and adjustments shall be incorporated in the 'As-Built' plans, shown in red.

Drawings shall be on site at all times and available for review by the City. Failure of Contractor to have drawings on site and/or up to date may result in suspension of work until situation is corrected. Extension of contract will not be granted for such condition.

At conclusion of work, the Contractor shall provide the city with one (1) complete hardcopy set and one (1) complete set of electronic high resolution color As-Built plans, clean and damage free incorporating all changes and adjustments. Electronic files will be issued to the Contractor by the City of Tampa. These files will be AutoCAD DWG, AutoCAD DWF or Adobe PDF latest versions.

Item 2: Change the following section references: Section 40 94 13 change to Section 13620; Section 40 95 00 change to Section 13625; and Section 40 95 23 change to Section 13625 in the following Technical Specifications:

- | | |
|------------------|--|
| a. Section 13620 | Digital Process Control Computers |
| b. Section 13625 | Process Control Input/Output Modules |
| c. Section 13630 | Dissolved Oxygen Process Measurement Devices |
| d. Section 13635 | pH Level Process Measurement Devices |
| e. Section 13640 | Total Suspended Solids Process Measurement Devices |
| f. Section 13645 | Dual Ammonium and Nitrate Process |
| g. Section 13650 | Ammonium Process Measurement Devices |
| h. Section 13655 | Nitrate Process Measurement Devices |

Item 3: Section 13615 Process Instrumentation and Controls - Products: Replace existing section with the attached revised Section 13615.

306 E. Jackson Street, 4N • Tampa, Florida 33602 • (813) 274-8456 • FAX: (813) 274-8080

Item 4: Section 14610 Manual Davit Crane: Replace existing section with the attached revised Section 14610.

Item 5: Section 15000 Mechanical – General Requirements Part 2 – Products, Section 2.01 Fabrication and Manufacturer, Section F Nameplates: Replace existing wording with the following:

All equipment and slide gates shall have an identification nameplate. The nameplates shall be of Type 304 stainless steel, No.6 finish, not less than No. 16 gauge with indented stamped lettering. Nameplates shall be attached to equipment bases in accessible locations. Nameplates shall be fastened, in a permanent manner arranged not to damage equipment, with not less than four stainless steel fasteners. All nameplates shall be of the same size (approximately 3- by 8-inch) and shall conform to the following standard sample:

<i>Sewage Pump</i>	<i>(Name of item)</i>
<i>SC-P-1</i>	<i>(General type of designation, final list furnished by Engineer)</i>
	<i>(12 digit number) (Furnished by Engineer)</i>

Lettering shall be block style in size and spacing to suit the nameplate. A sample nameplate including fastenings shall be submitted to the Engineer for approval prior to manufacture of any of the nameplates. Stainless steel identification nameplates shall not be painted.

Item 6: Add Section 16190 Supporting Devices

Item 7: Add the following standardization letters:

- a. Programmable Logic Controller (PLC)
- b. Graphic Touchscreen Human Machine Interface (HMI)
- c. Low Voltage Variable Frequency Drives

Item 8: Section 01020 Allowances: Revise allowance to read \$250,000.00

Item 9: Replace the second plan sheet labeled E-106 through plan sheet E-109 with the attached plan sheets E-107 – E-110.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to Contract Administration@tampagov.net.



Jim Greiner, P.E., Contract Management Supervisor

SECTION 13615

PROCESS INSTRUMENTATION AND CONTROLS - PRODUCTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Attention is drawn to the requirement that all instrumentation and control equipment specified herein shall be furnished by the same System Supplier who shall provide all other related equipment as specified in Section 13600.
- B. System Supplier shall furnish all labor, materials, equipment, and services required to install and place into operation the field instrumentation and controls specified herein and as shown on the Contract Drawings.
- C. Any auxiliary devices such as lightning/surge protectors, relays, timers, isolators, signal boosters, etc., which are necessary for complete operation of the system, or to perform the functions specified, shall be included whether or not they are specifically shown on the drawings.
- D. System Supplier shall coordinate programming of the programmable logic controllers with the local control panel supplier specified in other sections of these specifications and motor control center supplier and all other related equipment supplied by other vendors.

1.02 RELATED WORK

- A. System Supplier shall be responsible for supplying and installing all equipment as defined in this section and the following related sections:
 - 1. Section 13600 - Instrumentation General Provisions
- B. System Supplier shall be responsible for coordinating with the work to be performed as defined in section 13600.

1.03 QUALIFICATIONS

- A. All System Suppliers shall comply fully with the qualification requirements stated in specification section 13600.

1.04 SUBMITTAL REQUIREMENTS

- A. Refer to Section 13600 - Instrumentation General Provisions.

1.05 FINAL DOCUMENTATION

- A. Final Documentation requirements are defined in specification Section 13600.

1.06 QUALITY CONTROL

- A. Quality Control requirements are defined in specification Section 13600.

1.07 PRODUCT HANDLING

- A. Product handling requirements are defined in specification Section 13600.

1.08 TOOLS AND TEST EQUIPMENT

- A. In addition to the general tools and test equipment defined in specification section 13600, the System Supplier shall provide any items, such as calibration fixtures, patch cables, test leads, etc. necessary for properly checking field operation of equipment supplied under this section.

1.09 SPARE PARTS

- A. Spare parts shall be provided for all field replaceable components so there is one spare for every five like items or part thereof.
- B. All spares shall be packed in a manner suitable for long-term storage and shall be adequately protected against corrosion, humidity and temperature.
- C. Storage and handling instructions shall be provided with each spare part.
- D. One year's supply of paper, ink cartridges, calibration gases, etc., as required for the equipment being supplied, shall be provided. Items with less than one year's shelf life shall be provided at required intervals to ensure reliable systems operation throughout the first year following system acceptance.

1.10 Provide all Xylem instruments with a warranty upgrade package except as noted.

PART 2 - PRODUCTS

2.01 FIELD MOUNTED INSTRUMENTS

A. Thermal Mass Flow Sensor

Tags:

ISA Designation	Service
FE/FIT-111	Aeration Train #1 Zone #1
FE/FIT-112	Aeration Train #1 Zone #2
FE/FIT-113	Aeration Train #1 Zone #3
FE/FIT-114	Aeration Basin #1 Zone #4
FE/FIT-115	Aeration Basin #1 Zone #5
FE/FIT-116	Aeration Basin #1 Zone #6
	Uninstalled Spare

1. Type: Thermal dispersion type linear flow meter that measures the differential temperature between two RTD's and produces an output signal linear to the mass flow rate of air.
2. Required Features:
 - a. Performance Requirements:
 - 1) Repeatability: ± 1 percent of full scale.
 - 2) Signal Output: 4-20 mdc, 1200 ohms max. load.
 - 3) Operating Pressure: Maximum of 1250 psig
 - 4) Flow Element Range: 0.25 to 200+ FPS at standard conditions.
 - 5) Power Input: 115 VAC, ± 15 VAC, 16 watts max
 - 6) Flow: $\pm 1\%$ reading + 0.5% full scale. Temperature: $\pm 2^\circ$ F [$\pm 1^\circ$ C]
 - b. Operating Temperature:
 - 1) Flow Element: -50 F to 350 F.
 - 2) Electrical Housing: 0 F to 150 F.
 - c. Calibration: Factory calibrated at flow range under given conditions.

d. Construction Features:

- 1) Process Connection: Threaded NPT, 1-inch minimum.
- 2) Insertion Length: Tip of probe to extend past centerline of pipe. Pipe size as shown.
- 3) Process Wetted Parts: All welded 316L stainless steel or Hastelloy C for all wetted surfaces.
- 4) Sensor Housing: Explosion proof Class 1, Group C and D, Division 1 and 2.
- 5) Remote Electronics Housing: NEMA-4 enclosure painted with corrosion resistant epoxy paint system (NEMA 4X).

e. Mounting:

- 1) Remote electronics housing shall be remotely mounted from the sensor housing at locations shown. Provide complete Type 316 stainless steel mounting hardware.
- 2) Provide hot-tap type flow element mounting with isolation valve and packing gland for removal/reinsertion of element without shutting down the line. Materials shall be compatible with process air piping material. Standard: 0.75 or 1 inch male NPT stainless steel compression fitting with adjustable Teflon ferrule rated up to 150 psig [10 bar (g)] and 200°F [93°C], or metal ferrule rated up to 250 psig [17 bar (g)] and 350°F [177°C]

2. Accessories:

- a. Provide one portable calibrator unit for field checking and adjusting flowmeter calibration.
- b. Local Indication:
 - 1) Flow Rate Indicator: Liquid Crystal Display (LCD) with 3-1/2 digits scaled in SCFM.
 - 2) Totalizer: 8 digit Liquid Crystal Display (LCD) counter with lithium battery backup.
- c. Interconnecting Cable: Provide standard interconnecting cable between sensor head housing and remote electronic housing. Cable length as required per installation shown.
- d. Provide special temperature compensation circuitry for 90 F process temperature range.
- e. Flow conditioners (Vortab VMR Flow Conditioning Tube)
- f. Provide transient surge protection, DIN rail mounted in a 316 stainless steel box.

3. Product and Manufacturer: Provide one of the following:
 - a. ST-98 Series as manufactured by Fluid Components, Incorporated.

B. Multi Parameter Analyzer/Controller

Tags:

ISA Designation	Service
Xylem IQSN	Aeration Train #1

1. General:
 - a. Function: Serve as interface control for remote monitoring of multiple analytical elements.
 - b. Type: Microprocessor
 - c. Parts: Transmitter unit, mounting hardware, and connectors.
2. Performance:
 - a. Signal Interface: The recommended maximum is 20 elements per controller. There are fourteen (14) probes in Train 1.
 - (1) Connected Analyzer Elements: AE-111A, AE-111B, AE-112A, AE-112B, AE-113A, AE-114A, AE-115A, AE-115B, AE-116A, AE-116B, AE-116C, AE-116D, AE-116E
 - (2) Output: Ethernet TCP/IP
3. Transmitter Features:
 - a. Indicator: black and white back-light LCD
 - b. Portable.
 - c. Main Display: Operator configurable, displaying up to eight (8) parameters simultaneously.
 - d. Auxiliary Display: Temperature, sensor diagnostics, etc.
 - e. Scale Range: field selectable.
4. Enclosure:
 - a. Provide a 316 stainless steel type NEMA 3R free-standing enclosure to mount the analyzer components. Enclosure to include panel heater, 120VAC circuit breaker, fiberoptic media converter, DIN rail mounted surge protection, circuit breaker and ground lug. Door shall include a 3-point latch and stainless steel handle.
5. Mounting: Rack mounted.
6. Power: 105-250VACc, 50/60-Hz.

7. Accessories:
 - a. Air burst compressor typical for some probes as specified herein.
8. Manufacturer, Model: Xylem Sanitaire System

C. Dissolved Oxygen, Luminescent Element

Tags:

ISA Designation	Service
AE-111A	Aeration Train #1 Zone #1
AE-112A	Aeration Train #1 Zone #2
AE-113A	Aeration Train #1 Zone #3
AE-114A	Aeration Basin #1 Zone #4
AE-115A	Aeration Train #1 Zone #5
AE-116A	Aeration Train #1 Zone #6
	Uninstalled Spare

1. General:
 - a. Function: Continuously measure, indicate and transmit a signal proportional to dissolved oxygen of a process fluid.
 - b. Type: Luminescent.
 - c. Parts: Element, interconnecting cable, and accessories.
2. Performance:
 - a. Range: 0 to 20 mg/l
 - b. Accuracy:
 - (1) ± 0.05 mg O₂/L in the range less than 1 mg O₂/L
 - (2) ± 0.10 mg O₂/L in the range greater than 1 mg O₂/L
 - c. Response Time:
 - (1) 90 percent of the final (true) reading (t₉₀) in less than 150 seconds [60 seconds for FDO@ 701] and 95 percent of the final (true) reading in less than 200 seconds. 90-percent: 40 seconds.
3. Element:
 - a. Type: Photocell sensed, nephelometric sensor used for continuous flow, continuous reading.
 - b. Operating Temperature Range: 0 to 60 degrees C.
 - c. Materials:
 - (1) See specification 13630 – 2.3.
 - d. Process Connections: submerged
 - e. Mounting: Handrail.

4. Manufacturer: Xylem

D. Ammonium Monitoring Probe

Tags:

AE-115B	Anoxic Basin #1 Zone #5 (NH ₄ -N)
AE-116D	Anoxic Basin #1 Zone #6 (NH ₄ -N)
	Uninstalled Spare

1. General:
 - a. Function: Continuously measure, indicate and transmit a signal proportional to ammonium level of a process fluid.
 - b. Type: Potentiometric ion-selective measurement
 - c. Parts: Element, interconnecting cable, and accessories.

2. Performance:
 - a. Range: 0 to 1000 mg/L NH₄-N
 - b. Lower Limit: 0.2 mg/L NH₄-N
 - c. Accuracy:
 - (1) 5 % of measured value +0.2 mg/lL (with standard solutions) NH₄-N Below 1 mg/l: plus or minus 0.1 mg/l.
 - d. Response Time:
 - (1) <3 min
 - e. Measuring Interval: Continuous
 - f. Flow: < 4 m/s max

3. Element:
 - a. Type: Potentiometric ion-selective measurement
 - b. pH Range: 5 to 9 pH
 - c. Materials:
 - (1) Sensor: Stainless steel
 - (2) Probe: 316 Stainless Steel.
 - d. Process Connections: submerged
 - e. Mounting: Rail Mount.

4. Accessories:
 - a. Automatic air cleaning unit for each probe with on/off switch and 115V power supply.

5. Manufacturer: Xylem.

6. Provide a 1 year service contract for probes as part of this bid.

E. Nitrate Monitoring Probes
Tags:

ISA Designation	Service
AE-112B	Aeration Basin #1 Zone #2
AE-113B	Aeration Basin #1 Zone #3 (Alternate Input Point from Zone #2 sensor)
AE-116C	Aeration Basin #1 Zone #6
	Uninstalled Spare

1. General:
 - a. Function: Continuously measure, indicate and transmit a signal proportional to nitrite or nitrate level of a process fluid.
 - b. Type: Ion Selective
 - c. Parts: Element, interconnecting cable, and accessories.
 - d. Path length: 2 mm
2. Performance:
 - a. Range: 0.1 - 50 mg/L NO₃-N
 - b. Accuracy:
 - (1) ± 3 % of measured value +0.5 mg/l (with standard solutions)
 - c. Response Time:
 - (1) ≥ 1 min
 - d. Measuring Interval: ≥ 1 to 30 min (fixed values selectable)
3. Element:
 - a. Type: Ion selective measurement
 - b. Process Connections: submerged
 - c. Mounting: Vertical Fixed Point Mount.
4. Manufacturer: Xylem

2.02 OTHER FIELD EQUIPMENT

A. Intrinsic Safety Barriers

1. Intrinsic safety barriers shall be passive devices requiring no external voltage supply and supplied with series resistors, series fuse and shunt zener diodes to limit the transfer of energy to levels required by intrinsically safe protection between safe and hazardous locations.
2. Unit shall be Factory mutual approved and certified for use in accordance with National Fire Protection Association (NFPA 493 of 1978).

3. Unit shall be as manufactured by R. Stahl, Inc. or approved equal.

2.03

PANELS

Designation	Incoming Power	Enclosure Rating	Remarks
ACP-1	120V, 1 phase, 3 wire	NEMA 4X 316 SS	Provide load center for power distribution to remote devices

A. Components

1. Discrete Control Distribution within Panels:

- a. All discrete I/O control points shall be 120VAC power.
- b. All discrete field I/O control points entering panel shall be protected with a surge protection unit, as manufactured by Phoenix Contact Trabtech.
- c. Programmable Logic Controller (PLC)

1) General:

- a) The programmable logic controller (PLC), as specified herein, shall be provided under this section and located within the control panel. RAM capacity shall be determined by size of project.
- b) The programmable logic controller (PLC) shall calculate and store at least four hours of two-minute data (instantaneous) for all analog values (except pump speed) in case of communication failure with Plant SCADA System. After communication is reestablished to SCADA Servers, update historical data with this information as required.

2) Programmable Controller:

- a) The PLC CPU shall be as manufactured by GE Series Rx3i with Ethernet using ETM001 Communications Card. The City has officially standardized on GE PLC's – no alternates will be considered. The Standardization Certificate of Conditions and Circumstances is included hereinafter.

- b) Each discrete input module shall accept up to sixteen (16) 120Vac input signals received from devices such as pushbuttons, selector switches, pressure switches, temperature switches, or limit switches and converts them into voltage logic levels that can be processed by the controller. Input signals shall be wired in two (2) groups of eight signals per module. Each group of eight points shall be protected by a .16 amp external indicating fuse block. Each input shall be optically isolated and protected with a red LED to indicate the presence of the 24Vdc power (circuit closed indication). A green LED shall be provided to indicate the presence of the I/O module supply voltage of each group. Discrete input modules shall be as manufactured by GE.

- c) Each discrete output module shall provide eight (8), relay switched, 120Vac output signals that can drive loads up to 1 amp such as relays, starters, and solenoid valves. The outputs shall be optically isolated from the system. Output signals shall be field wired in two groups of four (4) outputs per module. Each group of four points shall be protected by an external .16A indicating fuse block. Each output shall be isolated and provided with a red LED to indicate the output is turned "on". A green LED shall be provided to indicate the presence of the required 24Vdc supply voltage. External, panel mounted, 10Amp, interposing relays shall be provided for interfacing to control devices that are external to the local control panel or to devices that exceed the rating of the output module. Where LED type status indicators are used, a loading resistor shall be installed to prevent leakage current from keeping the lamps falsely lit. Discrete input modules shall be as manufactured by GE.

- d) Analog input modules shall be eight channels with opto-isolation. Inputs shall accept 4-20mA DC signals. Input shall be set for Unipolar with Offset and Extended Resolution mode to detect loss of signal or low input indication. Resolution shall be 11 bit plus sign with a 10 ms conversion time. The four points shall be protected by an external .16A indicating fuse block. A green LED shall be provided to indicate the presence of

the required 24Vdc supply voltage. A second green LED shall be provided to indicate the module is healthy. Removal of any panel-mounted devices shall not interrupt the input signals to the PLC. Analog values shall continue to function properly. Inputs shall be provided for Flow and Level. Analog input modules shall be as manufactured by GE.

- e) Analog Output Module shall be eight channels with opto-isolation. Outputs shall drive 4-20mA DC signals. Output shall be set for Unipolar with Offset and Extended Resolution mode to detect loss of signal or low input indication. Resolution shall be 11 bit plus sign with a 10 ms conversion time. The four points shall be protected by an external .16A indicating fuse block. A green LED shall be provided to indicate the presence of the required 24Vdc supply voltage. A second green LED shall be provided to indicate the module is healthy. Removal of any panel-mounted devices shall not interrupt the input signals to the PLC. Analog values shall continue to function properly. Outputs shall be provided for VFD speed pacing. Analog output modules shall be as manufactured by GE.

- f) Power supply modules shall be as manufactured by GE.

3) PLC Ladder Logic Software

- a. The System Integrator shall program PLC to perform, and warrant proper system operation as described in this document.
- b. The Owner shall be sole owner of all programming software described in this contract, the use of any proprietary software other than described in this contract will not be accepted.
- c. All points used in Ladder logic shall be documented and labeled so Owners personnel can identify each point and its function.
- d. Control (Command) points shall be programmed such that control can be performed from HAND

field devices (such as a selector switch) or from REMOTE by operator interface or HMI SCADA system, as described in contract. In some applications this will require that OR logic be in the program. The control description shall include how the HMI software should handle the commands.

- e. PLC Command points shall be “SET” from HMI or Remote SCADA system. Command example: To start Pump #1, the HMI system shall set the bit to a 1 at address 02001.2 and to stop the pump the HMI shall set the same bit to a 0 (zero) at the same address 02001.2.
 - f. Programmer shall keep the amount of points needed to control equipment to a minimum; project is licensed to a limited amount of HMI points to be used.
 - g. Provide a Device Specific, Control Description in one (1) document. The document shall provide all information about controlling each specific device in the same area of the document. This prevents the user from looking in four (4) different places for information on one (1) device.
 - h. Provide the Product Authorization License for Proficy ME 7.0.
 - i. All PLC logic instructions (all coils, contacts and registers), shall be programmed and labeled using GE Proficy Machine Edition 7.0 programming software.
 - j. System Integrator shall furnish the Owner’s Technician with Basic PLC Operation training.
- d. Relays:
- 1) Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits. All relays shall have screw type terminal interface. Terminals shall have a permanent, legible identification. Relays shall be mounted such that the terminal

identifications are clearly visible and all terminals are readily accessible.

- 2) General-purpose relays shall be used for logic and switching power to external loads and shall be DIN rail mounted, general purpose, medium power, and industrial type. Minimum mechanical life expectancy shall be 10,000,000 operations and electrical life expectancy of 100,000 operations at rated load. They shall be of the dust cover enclosed, plug-in type, with 8 or 11 pin, screw terminal, snap-on sockets. Relays shall have a maximum of three form C contacts rated for 10 amperes at 120V ac and be equipped with coil status indicator lamps and hold down springs. Relays shall be as manufactured by Potter-Brumfield series KRPA, KUP, or Omron Type G2R or approved equal.

e. Power Supplies:

- 1) Provide dc power supplies as required to power instruments requiring external dc power, including two-wire transmitters, dc relays.
- 2) Power supplies shall convert 120V ac, 60-Hz power to dc power of the appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that the instruments being supplied can operate within their required tolerances.
- 3) Output over voltage and over current protective devices shall be provided with the power supply to protect the instruments from damage due to power supply failure and to protect the power supply from damage due to external failure. Provide NEMA 1 enclosure for all power supplies. Power supplies shall be DIN rail mounted such that dissipated heat does not adversely affect other components.
- 4) Power supplies shall be manufactured by Omron or Equal.

f. Wiring: Wiring within panels, consoles, racks, and cabinets shall meet the following requirements:

- 1) AC power wiring shall be 600 VAC, 12 AWG tinned stranded unless otherwise noted.

- 2) All Discrete Output control wiring to be orange in color, 300 VAC no less than, 16 AWG, Tinned Stranded Copper type B/N 16/19 or Belden 8500 or XHHW, insulated wire or equal.
- 3) All Discrete Input control wiring to be red in color, 300 VAC no less than, 16 AWG, Tinned Stranded Copper type B/N 16/19 or Belden 8500 or XHHW, insulated wire or equal.
- 4) Control wiring routed to MCC and field shall be no less than 14 AWG multi-conductor Tray Cable, Stranded Copper type PVC, THWN or XHHW, insulated wire or equal.
- 5) All internal analog wiring, (PLC to field terminal), shall be properly labeled and color coded White for positive and Black for negative polarity, no less than 18 AWG, Shielded Tinned Stranded Copper type Belden or equal.
- 6) All analog field signal cable exiting enclosure, outer jacket shall be labeled with dot matrix printed shrink tube type wire labels. All shield drain wire shall be insulated and properly terminated per ISA and OEM standards. Labels shall identify terminal number, PLC logic reference number and affiliated process variable, properly color coded white for positive and black negative, no less than 16 AWG, Twisted Shielded Stranded Tinned Copper Signal type wire, Belden # 8719 or equal.
- 7) Wiring shall be numbered and tagged at each termination. Heat shrunk dot matrix wire markers shall be provided at each wire termination point internal and external to each panel(s). Wire tags shall be marked with legible machine printed markings and numbers. Adhesive or taped on tags will not be accepted. Each wire shall have a unique tag number assigned and be clearly identified on the approved shop drawings. Tagging scheme shall identify the designated component tag and terminal number destination.
- 8) Wiring for special signals such as communications, digital data, and multiplexed signals shall be labeled and use manufacturer's standard cables.

- 9) All wires to internal components shall be connected to the "inside" of the field interface terminal strip. All wires to external components shall be connected to the "outside" of the field interface terminal strip. No more than two wires shall be connected to any one terminal point.
- 10) All panel wiring not run in wire ducts shall be bundled and tied.
- 11) Wiring shall not be spliced or tapped except at device terminals or terminal blocks.
- 12) Control and signal wiring shall be restrained by plastic ties or ducts. Hinge wiring shall be secured at each end so that any bending or twisting will be around the longitudinal axis of the wire and the bend area shall be protected with a sleeve.
- 13) Where panel components are provided for future equipment, wiring from the components to the panel terminal blocks shall be provided.

g. Wire Color Coding

- 1) Power Wiring: Phase A shall be black with brown phasing tape, Phase B black with orange tape, and Phase C black with yellow tape.
- 2) Internally powered AC Control Wiring: Control panel wiring associated with control circuits that are de-energized when the main panel disconnect is opened shall be color coded "Red".
- 3) Externally powered AC Control Wiring: Control panel wiring associated with control circuits that remain "Hot" when the main panel disconnect is opened shall be color coded "Yellow".
- 4) All yellow wiring leaving panels shall be brought to an isolated set of terminal blocks.
- 5) Low voltage, DC Wiring: Blue (DC+); White with Blue or White with red and black -tracer (DC-).

- 6) DC Control Wiring: Dark Blue (+) and White with Blue tracer (-).

- 7) Neutral: White

Exception: Where prefabricated wire bundles are used, it is permissible to identify the neutral at every termination with a white shrink tube at least 12 inches long.

- 8) Ground: Green

- 9) Field interface wiring shall be black and white pairs unless otherwise noted or required by the National Electrical Code.

- 10) Intrinsically safe Light Blue

- 11) 24 VAC power wire shall be orange and brown.

h. Wire Duct

- 1) Panel wire duct shall be provided between each row of components and adjacent to each terminal strip. Wire ducts shall be a minimum of one inch wide and three inches deep with removable snap-on covers and perforated walls for easy wire entrance. Wire ducts shall be constructed of non-metallic materials with voltage insulation in excess of the maximum voltage carried therein.

- 2) Empty panel wire duct shall be provided for all field connections to the terminal blocks.

- 3) A minimum of two inches shall be provided between wire duct and terminal block assemblies

- 4) Wiring duct shall not be filled to more than 60% visible fill.

i. Wiring Interface: All wiring including spares entering or leaving each panel, console, rack or cabinet shall be terminated and identified as follows:

- 1) Analog and discrete signal wiring shall be terminated at numbered terminal blocks. All wire shall be labeled with terminal number and PLC logic reference number.

- 2) Wiring for special signals such as communications, digital data, and multiplexed signals may be terminated at manufacturer's standard connectors.
- j. Terminal Blocks: Terminal blocks for panels, consoles, racks, and cabinets shall meet the following requirements:
- 1) All terminal blocks shall be 600-volt rated and shall be provided for termination of all circuits entering or leaving all panels. Terminal blocks shall have screw clamp compression, dead front barriers with current bar providing direct contact with wire between the compression screw and yoke. Yoke, current bar, and clamping screw shall be constructed of high strength and high conductivity metal. Yoke assembly shall guide all strands of wire into the terminal. Current bar shall provide dependable vibration-proof connections. Terminals shall be constructed to allow connection of wires without any special preparation other than stripping. Individual terminals shall be rail mounted to create a complete assembly such that jumpers can be installed with no loss of space on terminal or rail.
 - 2) Terminal block components shall be sized to allow insertion of all necessary wire sizes and types. Legible, factory machine printed markings and numbers shall be provided for terminal block identifications on both the inside and outside tracks of the terminal block assembly. Terminal blocks shall be numbered in numerical order.
 - 3) Sufficient terminal blocks shall be provided to terminate all wires routed to the panel, all spare points and spare conductors. In addition, the greatest of 20 percent or four unused spare terminals shall be provided
 - 4) All connections for future functions shall be wired to numbered terminal blocks, grouped separate from the terminal blocks in use. Terminal blocks shall be grouped to keep 120V ac circuits separate from the 24V dc circuits.
 - 5) Terminal blocks shall be CSA certified and UL approved.
 - 6) Control type terminal blocks shall be as manufactured by WAGO, Entrlec, SQ-D or Owner approved equal. Analog signals (4-20 mA dc) shall be connected to knife type

disconnect terminal. Shields required to be grounded shall be terminated. Signal shields shall be grounded at only point within a loop. Use blocks when passing the shields through.

- k. Grounding: Panels, consoles, racks and cabinets shall be provided with an isolated tinned copper grounding bus and lugs for all signal and shield ground connections. This ground bus shall be grounded at a common signal ground point. The signal grounding system shall meet National Electrical Code requirements. (See section 16450 Grounding System)
 - 1) Each analog loop shall be grounded at a single point for the loop. This single point shall be at location of the dc power supply for the loop. Keep all in separate conduit away from parallel runs or AC wiring.
 - 2) Each analog loop shall have its wire shields connected to ground at a single point for the loop. Shields shall be grouped and connected to ground at the same point as the analog signal ground.
- l. Analog Signal Isolators and Surge Protectors: Instruments on different panels, cabinets, or enclosures shall not be wired in series. Provide din rail mount analog signal isolators as manufactured by Moore Industries model SCX or M-Systems model M2VS, for analog signals that are sent from one panel or cabinet to another. All analog signals entering or leaving the control system shall be protected at both ends of loop by a surge arrester as manufactured by Phoenix Contact Trabtech.
- m. Uninterruptable Power Supply
 - 1) Capacity VA/Watts 850/510
 - 2) Voltage (Single Phase) 120 V + 10%, -20% 230 V +/- 20%
 - 3) Frequency 50 or 60 Hz, +/- 10% (auto-sensing)
 - 4) OUTPUT Simulated sine wave 120 V +/- 5% 230 V +/- 5%
 - 5) Frequency (on battery) 50 or 60 Hz, +/- 0.5% auto-sensing
 - 6) Transfer Time <4 milliseconds
 - 7) Protection

- a. Unit Input Circuit breaker for overload and short circuit protection
 - b. Overload Protection UPS automatic shutdown if overload exceeds 105% of nominal at 20 s, 120% at 10 s, 130% at 3 seconds
 - c. Short Circuit UPS output cut off immediately.
- 8) BATTERY
- a. Type Sealed, maintenance-free, lead acid batteries
 - b. Typical Recharge Time to 90% of full capacity 8 hours
 - c. Backup Time at full load, 4 min. 2 min. 4 min. 2 min.
- 9) ALARM
- a. ON Battery Slow beeping every 4 seconds
 - b. Battery Low Rapid beeping every second
 - c. Overload Continuous beeping sound
- 10) ENVIRONMENT
- a. Ambient Operation 0–95% humidity, non-condensing. 50°C up to 10,000 ft. (3000 m).
 - b. Audible Noise <40 dBA (1 m from surface)
- 11) SAFETY/APPROVALS
- a. UL 1778 C-UL Recognized for industrial applications in accordance with UL 508A without de-rating. Overvoltage Category 3, Pollution Degree 3. FCC Part 15, Subpart B, Class A. CE Marked; LVD: EN62040-1-1; EMC: EN50091-2, EN61000-3-2, EN61000-3-3, IEC801-2, IEC801-3, IEC801-4, IEC1000-2-2
- 12) Minimum Quantity Per Panel
- a. Two (2)
- 13) Manufacturer
- a. Sola
 - b. Schneider
- n. Human Machine Interface (PLC Local HMI)
- 1) All alarm statuses, motor run statuses, control statuses and automatic operation shall be through the local HMI panel. Manual operations shall be independent of the PLC.

- 2) The local HMI panel shall operate from 24 VDC, 1.6A max.
- 3) The local HMI panel shall include a 15” color analog resistive touch screen with VGA 1024 x 768 resolution and 16 BIT color graphics.
- 4) The local HMI panel shall be standard with 256 MB flash/RAM.
- 5) The local HMI panel shall be compatible with serial protocol and Ethernet protocol.
- 6) The local HMI panel shall include an RS-232 port, an Ethernet 10 Base-T port and two (2) USB ports.
- 7) The local HMI panel shall be pre-programmed with graphical screen software, including alarms, trends, event logging, animation, security and symbol library.
- 8) The local HMI panel shall be rated for NEMA 4/12 and IP65.
- 9) The local HMI panel shall be a Maple Systems HMI 5150P touch screen. The City has officially standardized on Maple HMI’s – no alternates will be considered. The Standardization Certificate of Conditions and Circumstances is included hereinafter.

PART 3 - EXECUTION

3.01 GENERAL

- A. Instrumentation and accessory equipment shall be installed in accordance with specification section 13600 and as specified herein.
- B. Unless specifically shown otherwise in the Drawings, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands as detailed on the installation detail drawings provided by the instrument manufacturer. All instrumentation connections shall be provided with shutoff and drain valves. For differential pressure transmitters, three-way valve manifolds shall also be provided. For slurries, chemical or corrosive fluids, diaphragm seals with flushing connections shall be provided.
- C. All piping to and from field instrumentation shall be provided with necessary unions, test tees, couplings, adapters, and shut-off valves.
- D. Field instruments requiring power supplies shall be provided with local electrical shut-offs and fuses as required.

- E. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded as directed by the manufacturer of the instrumentation equipment, but in no case shall more than one ground point be employed for each shield.
- F. Lifting rings shall be removed from all panels and assemblies once in position. Plugs of the same color as the panel shall then be installed in the holes.
- G. System Supplier shall coordinate the installation, placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Engineer's approval.
- H. System Supplier shall ensure that all field wiring for power and signal circuits are in accordance with best industry practice, and provide for all necessary system grounding to insure a satisfactory functioning installation.

END OF SECTION

SECTION 14610

MANUAL DAVIT CRANE

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish and install one (1) manual davit crane to lift a submersible horizontal propeller pump as shown on the Drawings. The installation shall be in complete conformity with the Drawings and Specifications and the instructions and recommendations of the equipment manufacturer, as approved by the Engineer.

1.02 RELATED WORK

- A. Start-up and Demonstration: Section 01650.
- B. Operations and Maintenance Data: Section 01730.
- C. Concrete: Division 3.
- D. Painting: Section 09900.
- E. Piping, Valve, and Equipment Identification System: Section 09905.
- F. Submersible Horizontal Propeller Pump: Section 11209.

1.03 QUALIFICATIONS

- A. The manual davit crane shall be the standard product of manufacturers who regularly engage in the production of this type of equipment and who are fully experienced, reputable, and qualified in the manufacture of the equipment to be furnished. The equipment shall be designed, constructed, delivered, and installed in accordance with the best practices and methods. Each component and ancillary equipment item furnished under this specification shall be the product of a manufacturer having successful record of operation, manufacturing and servicing the equipment for a minimum of five (5) years. Manufacturer shall supply Engineer with previous installation details.
- B. The manual crane shall be as manufactured by Them Inc., Series 5PT20 or an approved equal.

1.04 SUBMITTALS

- A. Shop Drawings: Submit shop drawings in accordance with Division 1.

- B. Operating and Maintenance Manuals: Provide operating and maintenance manuals in accordance with the applicable provisions of Division 1.

1.05 OPERATING INSTRUCTIONS

- A. A factory representative who has a complete knowledge of the proper operation and maintenance shall be provided for a minimum of one (1) 8-hour working day to instruct a representative of the Owner and the Engineer on proper operation and maintenance of the equipment. This work may be conducted in conjunction with the inspection of installation and test run as provided under Part 3 – Execution. If there are difficulties in the operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

1.06 GUARANTEE

- A. The equipment manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects of design, material and workmanship in accordance with Tampa Agreement. In the event the equipment fails to perform as specified during the guarantee period, the equipment manufacturer shall promptly repair or replace the defective equipment without cost to the Owner.

PART 2 – PRODUCTS

2.01 MANUAL DAVIT CRANE

- A. A davit manual crane assembly constructed of Type 304 stainless steel shall be supplied for each horizontal propeller pump. The crane assembly shall be permanently located at each mast in order to facilitate pump removal and replacement for service.
- B. The boom shall telescope up to 4 different lengths allowing a maximum hook reach of at least 82 inches measured from mast center to hook center. The entire assembly shall have a minimum load carrying capacity of at least twice the weight of the pump at the maximum boom arm reach. The weight of the pump is expected to be 625 pounds. Contractor shall coordinate with pump manufacturer to ensure crane is designed for the correct weight.
- C. In order to achieve safe and effective rotation of the mast under lifting loads, a turning arm handle shall be located on the mast. Handles located elsewhere will require excessive effort and are deemed unsafe and nonfunctional and will not be considered acceptable. The mast and boom shall rotate 360 degrees in the base on pin bearing and bearing sleeve. Such rotation shall permit the pump to be removed from the tank in a single lifting and rotation motion.

- D. Hook height shall be adjustable by moving the boom up or down between 5 degrees above horizontal and 45 degrees from vertical, with a minimum of 54 inches between the lowest position and the highest position with the boom fully extended. Bboom angle shall be adjustable at all times, including when under full rated load, with a hand operated screw jack acting to raise or lower the boom between horizontal and 45 degrees from vertical.
- E. A manually operated stainless steel winch assembly shall be supplied with a load capacity equal to at least twice the weight of the pump. Winch shall have machine cut gears, an adjustable handle that mounts securely to the drive shaft, bronze and radial ball bearings, stainless steel fasteners, and a positive load holding Weston style brake able to stop and hold the load automatically if the winch handle is released. Winch shall include the Thern Quick Disconnect feature allowing quick attachment and detachment of wire rope equipped with a swaged ball anchor. The winch shall include ¼” 7 x 19 type 304 stainless steel lifting cable. A 28 ft. length of cable shall be supplied with each assembly.
- F. Crane base shall be as manufactured by Thern, Inc., Series 5B20. Crane base shall allow for removal of the mast and shall have a pin bearing to support the end of the mast and a Nyloil MDX bearing sleeve to support the mast at the top of the base. A roller/ball bearings and locking pin kit shall be provided to allow for smooth and easy 360 degree crane rotation under load and to lock the crane in place.
- G. The base shall be wall mounted. Anchor bolts shall be Type 316 stainless steel and shall be supplied by the manufacturer.
- H. Provide a 304 stainless steel mast extension. The minimum height of the boom shall be 36 inches plus 15 inches from the mast extension between mounting surface and the underside of the boom in all base configurations.

PART 3 – EXECUTION

3.01 GENERAL

- A. The equipment manufacturer shall furnish the services of a competent and experienced representative who has complete knowledge of proper operation and maintenance of the equipment for a period of one (1) day to inspect the installed equipment and to provide instructions to the plant personnel. The final copies of operation and maintenance manuals specified in Division 1 must have been delivered to the Engineer prior to scheduling the instruction period with the Owner.

3.02 INSTALLATION

- A. Each unit shall be installed in accordance with the manufacturer's instructions and accurately aligned in relation to related equipment.

- B. The Contractor shall supply all necessary temporary lifting equipment, labor, and all other requirements for satisfactory installation.

3.03 INSPECTION

- A. Upon completion of installation, the Contractor, in the presence of the Engineer and a qualified manufacturer's representative, shall demonstrate the functioning of all component parts to the satisfaction of the Engineer.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

1.0 GENERAL

- 1.01 Scope: This Section includes the requirements for channel strut used for miscellaneous framing and supports.
- 1.02 Submittals: Submit manufacturer's catalog data for proposed channel strut, including fittings and clearly showing finish and load ratings.

2.0 PRODUCTS

- 2.01 General: Channel strut shall be Type 316 stainless steel, with continuous opening along one side designed to receive nuts and other devices for hangers. Provide nominal 9/16 inch holes or slots at top surface for securing to structure as necessary.
- 2.02 Load Rating: Minimum channel size and gauge shall be such that a uniformly distributed load of 150 pounds will not cause a deflection greater than 1/360 of span length over a beam span of 72 inches. The same beam shall support a concentrated load of 130 pounds minimum at center of span without exceeding the above deflection. Load rating of channel for all applications shall be increased as necessary so that imposed load, whether concentrated or distributed, does not cause a greater deflection than given above.
- 2.03 Finish
- A. After fabrication, channel strut shall be chemically cleaned and degreased.
 - B. Accessories: All fasteners, brackets, clips, bolts, rods, nuts and other related items for use with channel strut shall be 316 stainless steel.
- 2.04 Acceptable: B-Line and Unistrut.

3.0 EXECUTION

- 3.01 General: Secure to structural elements by welding, bolting or by other means acceptable to the Engineer. Provide all necessary accessories to safely support imposed loads.
- 3.02 Touch-Up: After installation, touch-up all tool marks, cut ends and other areas where finish has been damaged.

- 3.03 Finish Cuts: File all ends smooth on channel strut which has been cut, removing burrs and sharp edges.

END OF SECTION

**STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES**

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Programmable Logic Controller (PLC)

Name of Manufacturer: GE Intelligent Platforms, Inc. (formerly GE Fanuc Automation)

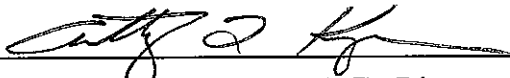
Conditions and circumstances for Standardization. Please be specific:

GE Intelligent Platforms PLCs have been installed at the HFC Wastewater Treatment Plant and our regional pumping stations to provide flexible control, data acquisition, data processing, and SCADA communications for a large variety of mechanical and hydraulic systems. The GE PLC is very robust, reliable, full featured, and user friendly. Due to the large installed base, our Technicians are very familiar with the hardware and programming software required to configure the GE PLC and its wide assortment of peripherals.

Standardizing on the GE PLC will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department

Director's Signature:

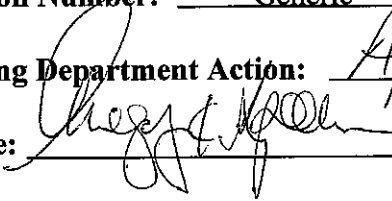


Anthony Kasper, P.E., Director of Wastewater Department

Date of Request: 6/28/12

Requisition Number: Generic **Buyer Name:** _____

Purchasing Department Action: Approved

Signature:  _____ **Date:** 6-28-2012

**STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES**

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Graphic Touchscreen Human Machine Interface (HMI)

Name of Manufacturer: Maple Systems, Inc.

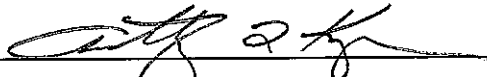
Conditions and circumstances for Standardization. Please be specific:

Maple System Graphic Touchscreen HMIs have been installed at the HFC Wastewater Treatment Plant and many of our regional pumping stations as an Operator interface for programmable logic controllers (PLC) and to provide an interactive graphic terminal for pumping station status and fault annunciation. The Maple HMI has proven to be rugged, reliable, and very user friendly. The Technicians and Operators are very familiar with the features of this product and in-kind replacement of existing HMIs will require no mechanical adjustments, reprogramming, or Operator training.

Standardizing on Maple System HMI will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department

Director's Signature:

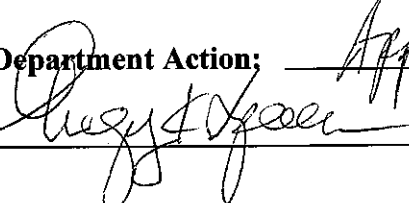


Anthony Kasper, P.E., Director of Wastewater Department

Date of Request: 6/28/12

Requisition Number: Generic **Buyer Name:** _____

Purchasing Department Action: Approved

Signature:  _____

Date: 6-28-2012

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Low Voltage Variable Frequency Drives

Name of Company considered Single Source: Yaskawa

Conditions and circumstances for the single source. Please be specific:

The City of Tampa Wastewater Department operates and maintains over 220 pumping stations and the Howard F. Curren Advanced Wastewater Treatment plant. In many of the pump stations and at many locations in the treatment plant, low voltage variable frequency drives (VFDs) are required to control electrical motors. These motors operate pumps, fans and blowers that are critical to pumping and treating wastewater.

Over the last 10 years, Yaskawa VFDs have proven to be the most reliable VFDs the Wastewater Department has used. The Department has used a wide variety of VFDs over the last 25 years. Yaskawa VFDs have required little or no maintenance.

Standardizing on Yaskawa VFDs will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department

Director's Signature:



Ralph L. Metcalf, P.E., Director of Wastewater Department

Date of Request:

4/1/10

Requisition Number:

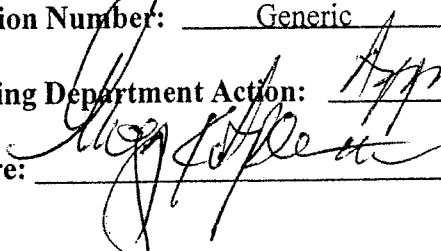
Generic

Buyer Name:

Purchasing Department Action:

Approved

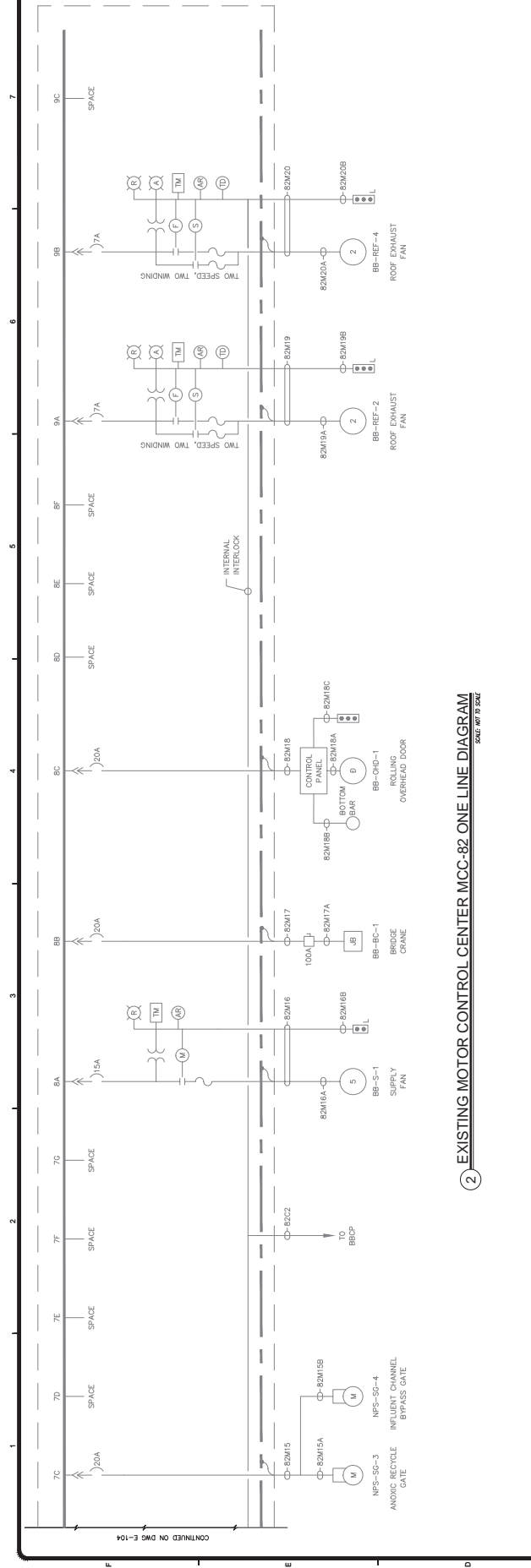
Signature:



Date:

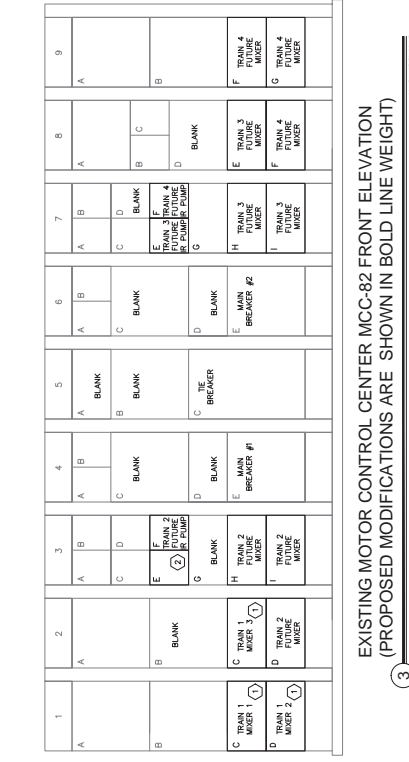
4-7-2010

Dimensions: Each not 1 inch, adjust scale accordingly.



EXISTING MOTOR CONTROL CENTER MCC-82 ONE LINE DIAGRAM
SCALE: 1/8" = 1' 0"

CIRCUIT NO.	CIRCUIT NAME		CIRCUIT TYPE	CIRCUIT CLASS.	CIRCUIT RATING	WIRE SIZE		CIRCUIT LENGTH	CIRCUIT TYPE	CIRCUIT TYPE	CIRCUIT TYPE	CIRCUIT TYPE	CIRCUIT TYPE
	DESCRIPTION	LOCATION				CONDUCTOR	INSULATION						
1	BB-S-1	SUPPLY FAN	M	M	500	1/0	90	100'					
2	BB-REF-2	ROOF EXHAUST FAN	M	M	500	1/0	90	100'					
3	BB-REF-4	ROOF EXHAUST FAN	M	M	500	1/0	90	100'					
4	BB-BC-1	BRIDGE CRANE	M	M	500	1/0	90	100'					
5	BB-S-1	SUPPLY FAN	M	M	500	1/0	90	100'					
6	BB-REF-2	ROOF EXHAUST FAN	M	M	500	1/0	90	100'					
7	BB-REF-4	ROOF EXHAUST FAN	M	M	500	1/0	90	100'					
8	BB-BC-1	BRIDGE CRANE	M	M	500	1/0	90	100'					
9	BB-S-1	SUPPLY FAN	M	M	500	1/0	90	100'					



EXISTING MOTOR CONTROL CENTER MCC-82 FRONT ELEVATION
(PROPOSED MODIFICATIONS ARE SHOWN IN BOLD LINE WEIGHT)
SCALE: 1/8" = 1' 0"

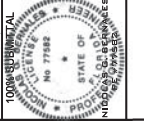
MCC KEYNOTES	GENERAL NOTES
<ul style="list-style-type: none"> 1. NEW 20 AMP, 3 POLE THERMAL MAGNETIC CIRCUIT BREAKER (TMB) AND CONTROL DEVICES TO MATCH EXISTING. 2. NEW 25 AMP, 3 POLE, 48,000 AC THERMAL MAGNETIC CIRCUIT BREAKER, FOR NEW TRAIN 1 INTERNAL RECYCLE PUMP. 	<ul style="list-style-type: none"> A. ENGRAVED PNEUMATIC MCC CIRCULAR LABELS ARE TO BE INSTALLED WITH WHITE LETTERS ON BLACK FIELD.

CITY OF TAMPA
HFC AWWP DIFFUSED AIR REACTORS
IMPROVEMENTS, PHASE I
EXISTING CONDITIONS PLAN
AND PERSPECTIVES

Project No.: 200-04MM-14001
Designed By: PAMMGB
Drawn By: PAMMER
Checked By: DABNGB

E-108

MARK	DATE	DESCRIPTION	BY



TF
TETRA TECH
ENGINEERING BUSINESS NO. 2429
www.tetra-tech.com
201 EAST PINE STREET SUITE 1000
ORLANDO, FL 32801
PHONE: (407) 839-3955 FAX: (407) 839-3790

Representatives, check on original drawing, if not 1 inch, detail scale accordingly.



④ ZONE 6 EAST PERSPECTIVE NTS



⑤ ZONE 6 EAST PERSPECTIVE NTS



⑥ ZONE 6 SOUTH PERSPECTIVE NTS



⑦ ZONE 6 NORTH PERSPECTIVE NTS



⑧ ZONE 6 EAST PERSPECTIVE NTS



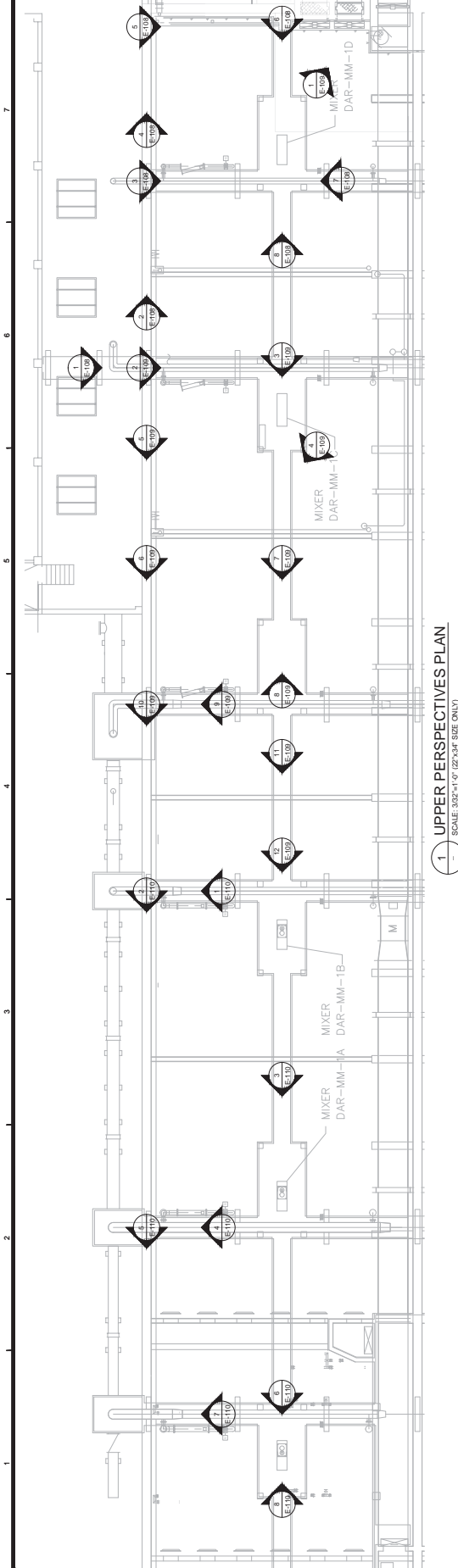
⑨ ZONE 6 WEST PERSPECTIVE NTS



⑩ ZONE 5 SOUTH PERSPECTIVE NTS



⑪ ZONE 6 SOUTH PERSPECTIVE NTS



Measurements taken on original drawing, if not 1 inch, adjust scale accordingly.


TETRA TECH
 ENGINEERING BUSINESS NO. 209
 www.tetratech.com
 201 EAST PINE STREET SUITE 1000
 ORLANDO, FL 32801
 PHONE: (407) 839-3955 FAX: (407) 839-3790

PROFESSIONAL SEAL
 STATE OF FLORIDA
 ENGINEER
 No. 77882
 LUIS A. MORALES
 1000 CENTRAL
 AVENUE, SUITE 200
 ORLANDO, FL 32801


MES GROUP
 1200 S. MILITARY TRAIL
 SUITE 200
 AUSTIN, TX 78741
 (512) 426-2711

BY	DATE	DESCRIPTION

CITY OF TAMPA
HFC AWWP DIFFUSED AIR REACTORS IMPROVEMENTS, PHASE I
EXISTING CONDITIONS PERSPECTIVES
 Project No.: 200-0444-1001
 Designed By: PALMBER
 Drawn By: PALMBER
 Checked By: DUBNOB

E-109



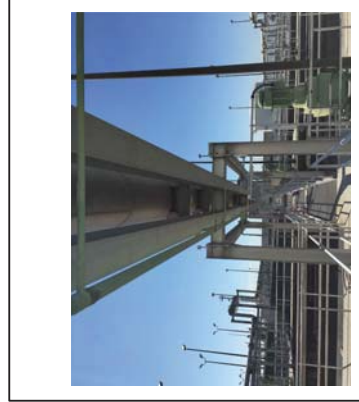
① ZONE 6 SOUTH-EAST PERSPECTIVE NTS



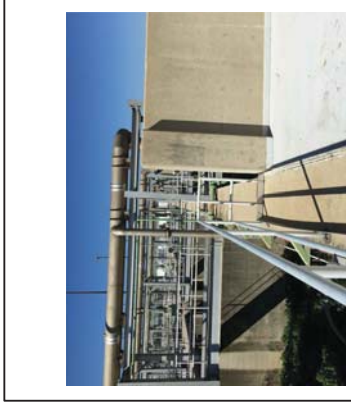
⑤ ZONE 5 WEST PERSPECTIVE NTS



⑨ ZONE 4 NORTH PERSPECTIVE NTS



② ZONE 5 SOUTH PERSPECTIVE NTS



⑥ ZONE 4 WEST PERSPECTIVE NTS



⑩ ZONE 4 WEST PERSPECTIVE NTS



③ ZONE 5 WEST PERSPECTIVE NTS



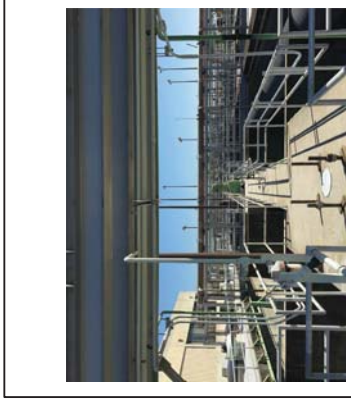
⑦ ZONE 4 WEST PERSPECTIVE NTS



⑪ ZONE 4 WEST PERSPECTIVE NTS



④ ZONE 5 NORTHWEST PERSPECTIVE NTS



⑧ ZONE 4 EAST PERSPECTIVE NTS



⑫ ZONE 3 WEST PERSPECTIVE NTS

Dimensions: 1 inch on original drawing, if not 1 inch, add scale accordingly.

E-110

Checked By: **DUBING**

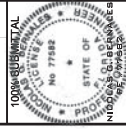
Drawn By: **PAMLER**

Designed By: **PAMMER**

Project No.: 200-0944-1001

CITY OF TAMPA
HFC AWWP DIFFUSED AIR REACTORS
IMPROVEMENTS, PHASE I
EXISTING CONDITIONS
PERSPECTIVES

MARK	DATE	DESCRIPTION	BY



TETRA TECH
ENGINEERING BUSINESS NO. 2029
www.tetra-tech.com
201 EAST PINE STREET SUITE 1000
ORLANDO, FL 32801
PHONE: (407) 839-3955 FAX: (407) 839-3790



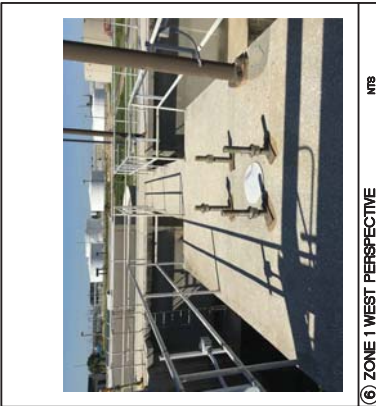
① ZONE 3 NORTH PERSPECTIVE NTS



② ZONE 2 WEST PERSPECTIVE NTS



③ ZONE 3 WEST PERSPECTIVE NTS



④ ZONE 1 WEST PERSPECTIVE NTS



⑤ ZONE 2 WEST PERSPECTIVE NTS



⑥ ZONE 1 NORTH PERSPECTIVE NTS



⑦ ZONE 2 NORTH PERSPECTIVE NTS



⑧ ZONE 1 EAST PERSPECTIVE NTS

1 2 3 4 5 6 7