



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

June 5, 2014

SUBJECT: FAU 7975 (Carpenter Street)
Project TIG-5146(087)
Section 13-00475-00-BR (Springfield)
Sangamon County
Contract No. 93617
Item 210
June 13, 2014 Letting
Addendum (A)

NOTICE TO PROSPECTIVE BIDDERS:

Due to clarify information necessary to revise the following:

- 1. Pages 45 and 46 of the Special Provisions.**
- 2. Adding pages 45a – 45w to the Special Provisions.**

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

John Baranzelli, P.E.
Acting Engineer of Design and Environment

A handwritten signature in black ink, appearing to read 'Ted B. Walschleger, P.E.' with a stylized flourish at the end.

By: Ted B. Walschleger, P.E.
Engineer of Project Management

- to the customer's purchase order.
2. A motor and cable insulation test for moisture content or insulation defects.
 3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
 4. The pump shall be run for 30 minutes submerged, a minimum of 6 ft under water.
 5. After operational test No. 4, the insulation test (No. 2) is to be performed again.
 6. Each pump shall be tested for flow versus head at the design conditions in accordance with the latest edition of the Hydraulic Institute Standards.

A written report with certified flow versus head curves stating the foregoing items have been done shall be supplied with the pump at the time of shipment. The curves indicated shall include head, capacity, horsepower, efficiency and input KW.

Manufacturer shall be certified ISO 9001

Prior to system operation, all equipment shall be inspected for proper alignment, quiet operation, proper connection and satisfactory performance by means of a functional test.

Field Testing

Functional Test - required. Performance Test - required.

Before final acceptance of the pumps specified herein, the Contractor shall submit five (5) copies of certified and properly identified performance curves which shall reflect the operating characteristics of each pump model and impeller combination being supplied. The curves shall indicate head, capacity, horsepower, efficiency and input KW.

Finishes

Shop - All pump assemblies supplied under this section shall receive finishes that are in accordance with the pump manufacturer's standard finish.

Field - All pump assemblies shall be touch-up painted with matching paint supplied by the pump manufacturer.

Drive Motors - All pump drive motors furnished under this section shall only receive finishes that are in accordance with the motor manufacturer's standard finish. DO NOT apply shop or field coatings to the drive motors.

Manufacturer's Services

The Contractor shall include with his bid the services of the equipment manufacturer's field service technician for a period of one (1) trip for a period of two (2) 8-hour days at the site. This service shall be for the purpose of check-out, initial start-up, certification, and instruction of plant personnel. A written report covering the technician's findings and installation certification shall be submitted to the Engineer covering all inspections and outlining in detail any deficiencies noted.

Duplex Pump Control Panel

The pump control manufacturer shall coordinate with the pump supplier to ensure compatibility between the two.

1. General

- a. The duplex pump control panel enclosure shall be strut support-mounted UL-listed, NEMA 4X stainless steel rated for outdoor use, and pad lockable. Enclosure shall have 3-point latching mechanism and handle for easy release. Enclosure shall not have clasps around the door to maintain a NEMA 4 rating. Enclosure shall be manufactured by Hammond, Hoffman, Rittal, or approved equal and shall be sized to accommodate equipment furnished. The enclosure shall also provide for "dead-front" construction using hinged inner doors (swing out panel) to mount all operator devices. Bond all panels and panel doors to ground system. Hinges shall not be considered as an adequate grounding path. All hardware shall be corrosion resistant.
- b. The panel manufacturer shall be a current Underwriters Laboratories listed UL 508 industrial control panel builder and shall show its follow-up service procedure file number on submittals. The control panel manufacturers shall be regularly engaged in the manufacture of controls for the water/wastewater industry. All devices within the panel shall be UL-listed and/or recognized where applicable and shall be mounted and wired in accordance with the most current edition of UL 508 and the NEC. All conduit runs entering or leaving the pump station wet well shall have explosion-proof conduit seals suitable for Class 1, Division 1, Group D environment. All conduits for intrinsically safe wiring shall enter the pump control panel enclosure at the intrinsically safe section of the panel. Non-intrinsically safe wiring including, but not limited to, power feeder conductors, branch circuit conductors, alarm circuits, and pump motor cables shall not enter the control panel at the intrinsically safe wiring section and shall maintain a minimum separation distance inside the control panel from the intrinsically safe conductors as required by NEC 504 and ANSI/ISA RP12.6.
- c. All conduit entries into the Pump Control Panel shall have water-tight threaded hubs, UL-listed for the respective NEMA 4X enclosure.
- d. Include a label placed on the inside of the panel door with the name, address, phone number and emergency phone number of the service representative for the pumps and control panel.
- e. Contractor shall furnish all equipment, labor, services, submittals, tools and work required to provide a complete and operational Duplex Pump Control Panel as shown on the Plans and specified herein.
- f. The pump control panel enclosure shall be located adjacent to proposed pump station as detailed on the Plans. Furnish and install stainless steel strut support Unistrut

P1000SS or approved equal, and all mounting hardware. Include warning label on inner and outer door labeled "WARNING POTENTIAL ELECTRIC ARC FLASH HAZARD, DISCONNECT FEEDER BREAKER BEFORE SERVICING", or similar note conforming to the requirements of NEC 110.16 "Arc Flash Hazard Warning." Warning label shall also conform to ANSI Z535.4-2002 "Product Safety Signs and Labels."

- g. The power feeding the pump control panel will be 480 VAC, 3 phase, 3-wire, 60 HZ.

2. Control Description

- a. A microprocessor based pump controller shall be provided to monitor wet well level via remote sensor as specified hereinafter and provide Duplex pump down mode pump control. The pumps shall start and stop as required to maintain an acceptable level.
- b. If the capacity of the lead pump is less than the influent flow, the lag 1 pump shall be called to start. If the capacity of both pumps running in parallel is greater than the influent flow, the lag shall stop when the wet well level falls to the lag pump stop setpoint. The lead pump will continue to run.
- c. If the capacity of the lead pump is greater than the influent flow, it shall stop when the level falls to the lead pump stop setpoint. The pumps shall alternate after each complete operating cycle if alternation is enabled.
- d. The pump control panel shall include the following described equipment in Paragraph 3 of this document (installed complete and operational), as well as that shown on the Plans and specified herein.

3. Components

- a. Power Distribution Blocks: Each power distribution terminal block shall be provided with a clear plexiglass cover. Terminal block shall be Square D Class 9080, or approved equal sized as required for the respective conductors. All terminal blocks shall be rated 600 volt with amperage ratings in conformance with NEC Table 310-16 using 75°C wire for the respective lug wire range.
- b. Secondary Surge Protector: AC surge protector shall be UL listed per UL 1449, third edition, suitable for 480 VAC, 3 phase, 3-wire plus ground system, with surge current rating of 40 kA per mode 8/20 μ s (20kV) wave, and status indication lights, Joslyn 1451-49 or approved equal.
- c. Control Power Transformer (2 kvA minimum): Control transformer and power supply shall be provided to provide the 120 VAC for control circuits when required. Transformers shall have circuit breaker over current protection on the primary and secondary circuits. The secondary windings shall be grounded. Control Power

Transformer larger than 2 kVA shall be externally mounted on the control side of the enclosure and shall be supplied in a NEMA 4X stainless steel nonventilated weatherproof housing. Primary and Secondary Protection shall be provided for transformer. The overcurrent protection shall be achieved with fuses. The control power transformer shall Square D Type T, TF or approved equal.

- d. Circuit breakers: Circuit breakers for motor circuits, control circuits, and other branch circuits shall be thermal magnetic, molded case, 100-Amp frame minimum, 10,000 Amps symmetrical, interrupting current rating at 120/240 VAC for one-pole and two-pole breakers and 22,000 Amps symmetrical, interrupting current rating at 480 VAC for three-pole breakers as manufactured by Square D, or approved equal. Breakers shall have “on”, “off” and “tripped” positions and shall be UL-listed. Breakers shall be sized as required for the respective equipment in accordance with NEC and the respective equipment manufacturer’s recommendation. Include breakers for the following equipment as a minimum.
- i. Pump motor #1 branch breaker.
 - ii. Pump motor #2 branch breaker.
 - iii. Pump control panel control circuit.
 - iv. Accessories (GFCI receptacle, and heater)
 - v. Alarm System
- e. Reduced Voltage Solid State Starter (RVSS):
- i. This specification describes the required performance, functional characteristics, fabrication details and installation of a microprocessor controlled low voltage Softstarter, used for stepless start and stop as well as protecting of standard AC squirrel cage induction motors.
 - ii. The softstarter shall be ABB Type PSE Series, Eaton Cutler-Hammer S 811 or pre-approved equal. The softstarter shall contain at least the features, functions and adjustments described below, in order to provide the motor and application with sufficient protection, and start and stop the motor in a precise and controlled manner.
 - iii. Operator Interface (Human Machine Interface –HMI). The starter shall be operated with a LCD display presenting all data and information using a language neutral icons and figures. All numbers shall be presented using four positions, seven segments. The use of binary, hexadecimal code, or any other code is not acceptable and currents and measurements shall be presented as either exact values or as a percentage of the maximum value. Adjustments shall be made by a digital four push button keypad. No binary coded dipswitches shall be used for programming or function selection. The HMI shall be possible to lock to prevent unauthorized changes to the programming. Data should always be presented with the actual value, and the unit of the data

(i.e. V, A or %, etc.). Data entered and selections made to the Softstarter using the display and keypad should be stored in case of a power loss. LED Indicators using long life LEDs shall provide additional quick annunciation.

- f. Mode Select: Method of operation shall be by a three position maintained "Hand-Off-Auto" selector switch provided for each pump. Selector switch shall be water-tight/oil tight (NEMA 4/13) Allen Bradley 800T Series, Square D Class 9001, Type K, or Eaton Cutler-Hammer E22 or Cat. No. 10250 Series. Position commands are as follows:
- i. Hand – In this position, the applicable pump shall run without regard for the level sensing commands and will relay on operator discipline to run and stop.
 - ii. Off – In this position, the applicable pump will not run under any circumstances.
 - iii. Auto – In this position, the pressure transducer, float switches and respective control relays shall control the applicable pump. The pressure transducer will sense the appropriate levels in the wet well and initiate start and stop commands to the pump through the associated control relays. Floats will act as a backup to the pressure transducer in the event the transducer fails.
- g. Legend Plates: Legend plates shall be required for all starters, circuit breakers, pilot lights, control panels, and disconnects. Legend plates shall be provided to identify the equipment controlled and the function of each pushbutton, indicating light, pilot light, selector switch and device. Legend plates shall be weatherproof and abrasion resistant phenolic materials. Lettering shall be black on white background, unless otherwise noted.
- h. Condensation Heater: Provide a condensation strip type heater sized as required for the pump control panel enclosure to minimize moisture that may accumulate inside the enclosure. Heater shall be sized to maintain a minimum internal enclosure temperature of approximately 50°F for an outside design temperature of -15°F. Include integral thermostat and circulating fan for condensation heater. Circulating fan shall be 4 in. to 6 in. nominal diameter axial type fan with wire guards, 115 VAC, 60 Hz. Thermostat shall be line voltage thermostat, 120 VAC, 5-Amp minimum current rating, SPST, with adjustable control knob as manufactured by Honeywell, White-Rogers, Hammond, Hoffman, Rittal, or Chromalox.
- i. Convenience Duplex Receptacle: Provide a duplex receptacle with ground fault circuit interrupter. Receptacle shall be rated 120 VAC, 60 Hz, and 15 Amps with a trip threshold of 5 ± 1 milliamp. Receptacle shall be a UL Class A GFCI unit complying with and tested in accordance with UL Standard No. 943. GFCI shall be

as manufactured by Leviton, Hubbell, Eagle, Arrow-Hart, Bryant, or Pass & Seymour.

- j. Pump Motor Thermal Trip: A thermal trip on the motor will cause immediate shutdown and activate the respective thermal trip condition alarm. Pump motor thermal trip shall be wired to provide manual reset and restarting of the pump motor in conformance with the recommendations of the respective submersible pump manufacturer's representative. Provide interposing relays as required. Verify thermal trip requirements with the respective submersible pump manufacturer.
- k. Pump Motor Seal Leak Detection: The seal leak detection on the motor shall shut down the pump and activate the respective seal leak alarm as required/recommended by the respective submersible pump manufacturer's representative.
 - i. Provide interposing relays as required. Verify seal leak requirements with the respective submersible pump manufacturer.
- l. Motor Monitor Relays: Motor monitor relay shall be provided by the pump vendor or be a model approved by the pump vendor to ensure the pump warranty is maintained.
- m. Enclosure Light: Provide a 60-watt incandescent light fixture for the pump control panel enclosure with door activated switch. Light fixture shall be Hoffman Catalog Number A-LTDB1, or approved equal. Include lamps for respective fixture.
- n. Construction Standards
 - i. Wire Numbers – Each wire in the control panel shall be marked with a wire number that corresponds to the page and ladder rung of the schematic diagrams. A unique wire number shall be provided between component contacts and coils. Wire markers shall be Brady Thermal Transfer Self-Laminating Vinyl or equal by Grafoplast or Thomas & Betts.
 - ii. Color Coding – Wires shall also be color-coded as follows: 120 VAC Line = black; Neutral = white; Ground = green; Switched 120 VAC = red; DC current carrying conductor = blue, DC non-current carrying conductor = white with blue stripe, Foreign voltage = yellow, Intrinsically safe = light blue.
 - iii. Component Identification – Each component in the system shall be identified by a unique number that corresponds to its coil's page and ladder rung location on the schematic drawings.
 - iv. Wire – AC control conductors shall be 600 volt and a minimum of 18 gauge. DC control conductors shall be a 300-volt and a minimum of 18 gauge. Control conductors shall be UL Type MTW rated for 105° C. Analog conductors shall be 22 gauge shielded twisted three conductor rated for 300

volts. Wire shall be Beldon 8771 or equal. Shields shall be grounded at the PLC or panel location. Power conductors shall be sized per UL and NEC standards and rated for 600 volts. Conductors shall be UL Type MTW, THHN or THWN rated for 90° C.

- v. Control Terminals – All field control conductors shall be connected to terminal blocks. Terminals shall have machine marked wire numbers. Connection of field control conductors directly to control panel components will not be allowed. Terminal blocks shall be rated for 30 amps at 600 volts. They shall be screw terminal type capable of terminating No. 10 to 26 gauge wire. Terminal bridge bars shall be provided when it is necessary to bridge multiple like terminals together. Terminals and accessories shall be Phoenix Contact “Clipline” or equal by Allen Bradley or Weidemueller 21.
- vi. Provide one (1) box (5 minimum quantity) of each type and size of fuse, upon completion of the job, for use as spares.
- vii. A schematic diagram (showing wire color) shall be permanently fastened to the inside of the enclosure. An Installation and Service Manual shall also be included with each control panel. The control panel shall be U.L. listed as an assembly.
- viii. Ground Bar. Provide ground bar mounted and bonded inside the panel enclosure.
- ix. Wiring Duct. Provide wiring duct to route conduits as necessary for a neat and workable installation.
- o. Level Controller
 - i. General
 1. The Lift Station Controller shall be an off-the-shelf, preprogrammed, dedicated to the application, microprocessor based controller capable of monitoring process variable inputs and automatically control up to two constant speed pumps. Systems using a one of a kind, non-standardized, custom programming generic controller represent additional complexity and unproven operation and thus are not in conformance to the intent of the these specifications and will not be acceptable.
 2. Controller shall be configured for the number of pumps to be controlled at this lift station as per these specifications.
 3. The operator interface shall display the current level in feet and represent the level in bar graph form, which dynamically updates based on the level in the wet well.

4. An active/dynamic graphical representation of each pump and its status shall be displayed on the same screen along with flow in gallons per minute. Pump graphic shall change state to indicate – “Off”, “Called”, “Running”, and “Failed/Out of Service”.
 5. Touching an active pump on the home screen takes you to the respective pump status screen.
 6. A trend screen showing, a minimum of, the last 2 hours of wet well level fluctuations shall also be available.
 7. The operator interface shall have a display area not less than 3.5” with 160 x 128 pixel resolution, Transflex touch screen graphic display viewable in direct sunlight.
 8. The operator interface shall be suitable for Type 12, 4 & 4X environment. Additionally, the display shall be manufactured from a UV resistant polyester substrate.
 9. To prevent the loss of data during an extended power outage, longer than 4 hours, the controller shall have a built in replaceable battery system to keep volatile memory active for approximately 10 years.
- ii. Inputs & Outputs: The controller shall come standard with herein specified inputs and outputs. The controller shall also have the ability to accommodate additional expansion I/O without the need to replace hardware or upgrade the controller.
- iii. The controller shall be configured to monitor the following discrete input status signals:
1. Pump 1, 2 Running
 2. Pump 1, 2 HOA In Auto
 3. Pump 1, 2 Seal Failure
 4. Pump 1, 2 Overtemp
 5. Pump 1, 2 Overload
 6. Backup Active
 7. High Level Float
 8. Low Level Float
 9. Control Power Failure
 10. Phase Failure
 11. Station Intrusion
 12. Flow Pulse
 13. Temp Alarm High/Low

- iv. The controller shall provide the following discrete output signals:
 - 1. Pump 1, 2 Call
 - 2. Pump 1, 2 Failure
 - 3. Common Alarm
 - 4. Alarm Horn
 - 5. Alarm Horn Silence
 - 6. Backup Reset

- v. The controller shall monitor the following (4-20 mA) process signals:
 - 1. Wet Well Level

- vi. A two level security system shall be provided for operators (OPER) and supervisors (SUPER). Without being logged in, screens are view only.

- vii. OPER – Operator Access
 - 1. Rights to edit set points and acknowledge alarms

- viii. SUPER – Supervisor Access
 - 1. All privileges as the OPER
 - 2. Right to change the passwords of both SUPER and OPER users
 - 3. Right to set lifetime pump runtime and start totals
 - 4. Right to toggle communication ports between telemetry communications or local programming modes
 - 5. Right to set the controller time and date
 - 6. Right to access removable media system screen
 - 7. Shall be provided with factory default passwords
 - 8. To prevent unauthorized controller adjustments, an adjustable 0-999 second delay shall be provided to automatically logoff the current user after the adjustable time period, and no operator screen navigation has been detected.
 - 9. The controller shall be capable of operating pumps in an automatic or fixed mode. In automatic mode, a built in alternator shall be available to equalize motor starts, stops and run time. The alternator shall have the capability of being put into fixed sequence mode at any time. Alternation shall also have the capability to alternate cyclically or following an adjustable period of time.

- p. Alternation
 - i. Alternator shall have pump fail replace logic allowing a failed pump to be detected and the lag pump to be called into service without level increasing to lag start setpoint.

 - ii. Auto Alternation Mode

1. If the running signal input is not received within 60 seconds (adjustable) of the respective pump being called to start, a pump failure alarm shall be displayed in the alarm banner and the next pump in sequence shall be called to start.
- iii. Fixed Alternation Mode
1. If the running signal input is not received within 60 seconds (adjustable) of the respective pump being called the respective pump shall continue to be called until the level in the wet well reaches the next level setpoint at which point the next pump in the sequence shall be called to start.
- q. Setpoints
- i. The following system setpoints shall be provided: (* indicates an associated, user adjustable (0-999) seconds time delay shall also be provided to prevent momentary process fluctuations from impacting alarm or control.)
 1. Wet Well Level High and Low Level Alarm * 26 ft. High
 2. Start Lead*, Lag 1* 9.7 ft. Lead 25 ft. Lag
 3. Stop Lead*, Lag 1*, 5.7 ft both
 4. Pump 1, 2 Failure To Start Delay 20 sec
 5. Pump 1, 2 Seal Failure Delay 20 sec
 6. Pump 1, 2 Over Temp Delay 20 sec
- r. Alarms
- i. The controller shall monitor, display and log the following alarms:
 1. High or Low Wet Well Level Alarm (Transducer)
 2. Pump 1, 2 Seal Failure
 3. Pump 1, 2 Over Temp
 4. Pump 1, 2 Overload
 5. Pump 1, 2 Failure (internal to controller, Call No Run)
 6. Float Backup Active
 7. Low Level Cutout (from floats)
 8. High Level Alarm (from floats)
 9. Control Power Failure
 10. Phase Failure
- s. Pump Status
- i. The controller shall have Pump Status screens that provide the following information and control options:
 1. Pump 1, 2 Status (Off, Called, Running, & Failed)
 2. Pump 1, 2 Hard and Soft H-O-A Status
 3. Pump 1, 2 Seal Failure Status
 4. Pump 1, 2 Over Temp Status

5. Pump 1, 2 Overload Status
6. Today: Pump 1, 2 Runtime xx.x Hours
7. Today: Pump 1, 2 Starts xxx
8. Yesterday: Pump 1, 2 Runtime xx.x Hours
9. Yesterday: Pump 1, 2 Starts xxx
10. Current (CRNT) Month (MNTH): Pump 1, 2 Runtime xxx.x Hours
11. Current (CRNT) Month (MNTH): Pump 1, 2 Starts xxx
12. Last Month (MNTH): Pump 1, 2 Runtime xxx.x Hours
13. Last Month (MNTH): Pump 1, 2 Starts xxx
14. Total: Pump 1, 2 Runtime 999999.9 Hours
15. Total: Pump 1, 2 Starts 999999

t. Navigation

- i. A menu system shall be provided for the user with proper access to change setpoints, setup pump starts, stops, alarms, alarm delays and setup pump alternation. The following parameters shall be provided:
- ii. Level and Level Delay Setpoints
- iii. Alternation – Auto or Fixed mode; Timed or Cyclical
- iv. The operator shall have a choice of selecting automatic or a fixed sequence.
 1. Pump Failure – call, no run
 2. The user shall be able to enter pump failure time for each pump that is enabled. A failed pump will be replaced with the next available pump.
- v. Seal Failure and Over Temp
 1. The user shall be able to enter seal failure and over temp time delays for each respective pump that is enabled.
- vi. Miscellaneous Alarms
 1. The user shall be able to enter delays for communications failure, intrusion and high or low temperature.
 2. Transducer Range (wet well level)
- vii. A field shall be provided to scale the transducer in feet to setup the vertical scale on the Home screen and an adjustable offset in feet, shall be provided to compensate for the transducer to be raised off the bottom.

u. Volumetric Flow Calculation

- i. The controller shall provide station flow information based on external flow transmitter or based on high accuracy volumetric process calculations using wet well level excursions as sensed by wet well level transmitter in conjunction with verified pump operations. Systems that do not monitor/use actual pump run feedback in the calculation are deemed unreliable and will not be acceptable.
- ii. The controller shall provide the following flow related information as a minimum:
 1. Station incoming flow rate (Average).
 2. Station Effluent Today's flow total.
 3. Station Effluent Yesterday's flow total

4. Station Effluent Previous Month Flow Total
 5. Station Effluent Current Month Flow Total
- v. Historical Data Storage
- i. Controller shall log the pump run time data, alarms and analog data to the removable memory card.
- w. Submersible Level Sensor
- i. General
 1. A loop powered submersible level transmitter shall be provided to sense the wet well level. The wet well level transducer shall sense wet well level by measuring the hydrostatic head pressure associated with water levels above the base of the diaphragm. A linear and proportional, to hydrostatic head pressure, 4-20 mA signal shall be produced and input to the pump controller. The transducer shall be installed in accordance with manufacturer's instructions.
 2. The pressure transducer shall be certified by FM, UL, and CSA for installation in a Class I, Division 1, Groups A, B, C, and D, Class II, Division 1, Groups E, F, and G, Class III, Division 1 hazardous location when connected to associated apparatus manufactured by PR Electronics, R.G. Stahl and others. The transducer shall be installed in accordance with manufacturer's instructions.
 3. The pressure transducer wetted materials shall be 316 SS, Viton®, Polyurethane or Tefzel®.
 4. Sensing diaphragm shall be 2.75" in diameter and include diaphragm protector allowing the unit to be placed on or near the bottom of the wet well without affecting pressure readings.
 5. The transducer shall include circuitry that provides protection from overvoltage, reverse polarity and shorted output.
 6. Transducer overall accuracy shall be 0.25% full scale or better with a resolution of .0001% over the entire range of the wet well.
 7. The sensing element shall exhibit non measurable hysteresis, withstand overpressures to 200% of rated range without damage.
 - ii. Warranty
 1. Transducer unit shall have a manufacturer's life time warranty that includes damage from electrical surges.

iii. Construction

1. The pressure transducer shall be mounted in the wet well and furnished with a minimum of 75 feet of cable.
2. The cable shall be 0.3" outside diameter Polyurethane or Tefzel® material.
3. Cable shall have non stretch Kevlar reinforcement strands bundled within the wiring cable to provide additional cable strength. Cable strength shall allow up to 200 lbs of pulling strength.
4. A sealed breather tube system shall extend from the top of the cable to the transducer assembly to provide barometric compensation to the transducer.
5. Breather system will be sealed and maintenance free. Systems that use gaps in wire cable and or desiccant filters that require periodic replacement will not be considered.

iv. Installation & Mounting

1. The transducer shall be suspension mounted in the wet well in an area of the wet well allowing full measurement of the wet well and in such a manner as to not be adversely affected by motor operation or incoming flow streams.
- v. The transducer shall be mounted so that it is approximately 6" above the floor of the wet well.
- vi. The transducer shall be furnished with a suspension mounting kit made out of stainless steel. It shall include a stabilization weight to maintain its position in the wet well.

x. Cellular Based Communication System: Mission M800 RTU

- i. Furnish and install a factory wireless data cellular based communication system for the purpose of monitoring and controlling various equipment operations. The supplier of the communication system shall be responsible for coordination required to insure equipment compatibility. The communication system shall be provided complete, in place, as specified herein and needed for a complete, proper installation.
- ii. The Contractor shall be responsible for coordinating the instrumentation equipment, communication equipment and other related equipment so that all elements are compatible and form a complete working system. Shop drawing submittals shall include sufficient information regarding component compatibility to demonstrate compliance with this requirement.

- iii. Qualifications of Manufacturers Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- iv. The submitting Company shall provide evidence of, and warrant compliance with, substantially all below listed requirements.
 1. The submitting Company shall have been in business providing remote facility monitoring and control services through the data side of the cellular system to the water distribution / wastewater collection industry or a substantially similar industry for at least six (6) years.
 2. The submitting Company shall be the actual manufacturer and operator, or a duly authorized and trained agent of the manufacturing company or a combination of both, who will actually provide, maintain, and warranty the proposed system.
 3. The Manufacturing Company of the field equipment shall also be the provider of all monitoring related services associated with the field equipment and all ongoing service agreements will be with the actual company providing the monitoring service, not a subcontractor or agent.
 4. The submitting company shall have a primary central monitoring and control center and a fully redundant, physically separate, backup-computer monitoring center. Either center shall have the capability of operating all the remote monitoring and control field RTU's.
 5. The submitting Company shall offer and provide 24x7, 365 technical support.
- v. System Components
 1. Microprocessor Based Field RTU
 - a. Data Cellular Radio
 - i. The Remote Terminal Unit (RTU) shall incorporate a radio that utilizes the data side of any cellular system to transmit the data and alarms monitored, as well as receive manual or automated control commands.
 - ii. Cellular radios from all cellular carriers shall be able to mount in the same mounting port on the motherboard and consequently be interchangeable in no more than 10 minutes.
 - b. NEMA4X enclosure with the battery inside and which has front door and top "sun shades" to reduce internal temperatures when placed in the sun.
 - c. Microprocessor Feature Updates
 - i. Microprocessor features like data transmission rates shall be able to be adjusted through the cellular system without any site visits necessary.
 - d. RTU Inputs and Outputs

- i. RTU shall have eight (8) digital inputs. These eight (8) inputs shall have end of line resistor supervision, or similar supervision, that can detect normal alarm trip inputs and detect input wiring disconnection/shorting as a distinctly different signal and report.
 - ii. RTU shall have an optional expansion board of an additional eight (8) digital inputs
 - iii. The digital inputs shall be user selectable as normally open (NO) or normally closed (NC).
 - iv. In M800 Models eight of the RTU digital inputs on main board shall be capable of being programmed to record and report pump run times in one minute increments or less as indicated by a relay opening and closing. If only two pumps are monitored then the unit shall also be capable of recording and reporting simultaneous pump run times.
 - v. RTU shall have built-in alarms for input wiring fault, AC failure, communication failure and low battery detection.
 - vi. RTU shall have two (2) analog inputs measuring 4-20mA or 1-5 VDC at 10 bit resolution with four (4) alarm thresholds per input.
 - vii. RTU shall have an optional expansion board of an additional four (4) analog inputs
 - viii. RTU shall have an optional expansion board of an additional eight (8) digital inputs
 - ix. RTU shall have an optional expansion board of an additional two (2) analog outputs.
 - x. RTU shall have an optional expansion board of two (2) pulse counter inputs
 - xi. RTU shall have an electronic key reader input to monitor on-site personnel. The RTU shall utilize an audible tone to verify key reading. Each key in the system shall provide unique identification of the key holder when they are on site vs. "someone" is on site.
 - xii. RTU shall have three (3) digital normally open or closed output relays rated ½ ampere@ 120VAC
- e. Status LED's on Motherboard
- i. LED's above each digital input shall visually display the status of the digital input
 - ii. Radio signal strength shall be displayed by at least 8 LED's in 5db increments between -75db and -110db to facilitate accurate antenna placement

- iii. Operational and diagnostic status of at least 8 criteria shall be displayed by individual LED's.
- f. Power Requirements
 - i. The RTU shall be powered by 12 volts AC and have a built in battery backup capable of keeping the RTU powered for 30 hours in case of primary AC failure.
 - ii. Terminations inside the RTU enclosure shall be low voltage AC or DC (28 volts or less).
- 2. Communication Links
 - a. Communication System
 - i. Wireless communication links shall be through the data side of the cellular system. The voice side of the cellular system and satellite based links are not acceptable.
 - b. Cellular Carriers
 - i. The submitting company shall have direct relationships with the cellular companies and shall not use third parties to affect data transport through the cellular companies.
 - ii. The RTU shall have an interchangeable data cellular radio that will communicate through third generation GPRS (ATT), CDMA (Verizon) or iDEN (Nextel) to maximize the likelihood of reliable communication.
 - iii. If a GPRS (ATT) radio is used, the submitting company shall have PTCRB approval from ATT to use the radio, contract and product acceptance with ATT. If an iDEN radio is used the submitting company shall be have certified partner status, contract and product acceptance with Sprint/ Nextel.
 - iv. The Owner shall not have or have to purchase cellular data contracts direct with the carrier(s).
 - c. Security Protocols
 - i. All the cellular radios shall all make continuous, secure socket connections (SSL) from the radio, through the cellular system, to the submitting company's servers and web pages.
 - ii. The RTU shall utilize a transmission scheme that encrypts the transmitted data utilizing a 128 bit encryption method that meets or exceeds the advanced encryption standard (AES). The 128 bit AES encryption shall be at all stages of data transfer and storage
 - iii. The cellular radios shall all have private IP addresses

- iv. The submitting company shall have established multiple, private gateways through the cellular system, completely behind firewalls, with at least one of the cellular providers.
- d. Data Transmission Rates
 - i. All alarms regardless of unit type shall be transmitted immediately upon occurrence; delays can be added by the Owner at the RTU or the supplier's website.
 - ii. The RTU shall continuously transmit all digital state changes on an as occurs basis; analog and pulse inputs will be transmitted at least once every two minutes on M800 models.
 - iii. The RTU shall have an effective, continuous, transfer rate of at least 19,200 baud.
- e. Communication Link Structure and Performance Criteria
 - i. The communication link structure shall be a secure socket connection from the RTU through the cellular system to the supplier's servers, and it shall be a continuous connection, 24 x 7, 365.
 - ii. Receipt of all data sent from the RTU to the server center shall be acknowledged by the server center back to the RTU in real time for every data packet sent. Such structure is called end-to-end data acknowledgement.
 - iii. The secure socket connection shall be from the RTU through the cellular system direct to the system supplier; no third parties shall receive the data from the cellular carrier and then pass it to the system supplier.
 - iv. The above mentioned secure socket connection shall be monitored for end-to-end uptime with interruptions as small as 15 seconds being captured.
 - v. Both end-to-end uptime and the number of times the link was disconnected/reconnected shall be reported for each RTU continuously with daily summary statistics posted on the Owner's website. All the end-to-end uptime history of each RTU shall be available on the Owner's web site from when it first powered up to the present. Weekly management summaries of each RTUs end-to-end uptime shall be automatically emailed to the Owner.

3. Centralized Server Centers: Hardware and Software Requirements
a. Server Center Physical Structure

- a. The server center housing shall have at least six (6) separate and redundant, on-site power generating facilities to backup the local utility power such that there can be stand-alone operation of the center for at least 24 hours.
- b. **Server Center Redundancy Structure**
 - a. The server center shall house the manufacturers completely redundant and hot linked:
 - i. Servers
 - ii. Interconnects
 - iii. Databases
 - iv. Power supplies
 - v. Inbound cellular connections
 - vi. Outbound internet hubs and providers
- c. **Database Structure**
 - a. All data from the RTU's shall be held for access forever.
 - b. All databases shall be backed up and archived daily
 - c. The databases shall be capable of interfacing and transferring, on a continuous basis, all RTU data to an OPC compliant database for access by other OPC compliant HMI software packages.
 - i. Client side OPC software shall run as an executable or NT service.
 - ii. Client side OPC software shall, on a user definable interval, establish a socket connection to static IP address(s) at providers' server center.
 - iii. OPC software shall retrieve all changed OPC tag values and close the socket. OPC software shall be set up so as customers OPC computers firewalls may be programmed to only allow Internet traffic to/from the designated service providers IP addresses and port numbers.
 - iv. OPC software shall allow for multiple customer OPC software packages to establish, concurrently, OPC connections so as to provide for redundant HMI database operation at customers locations.
 - v. Owner's firewalls will not be programmed to accept socket connections.
- d. **System Security**
 - a. All data links shall be behind firewalls, 128 bit encrypted and never accessible, addressable or

viewable via the general public Internet. Private IP's are required, pooled public IP's will not be accepted.

e. System Software

- a. The system software shall collect and display:
 - i. Alarms including individuals accepting alarms.
 - ii. RTU electronic key reads with user names, time of read, and site name.
 - iii. Pump running status.
 - iv. Pump run times with historical graphs.
 - v. Individual pump flow estimates.
 - vi. Automatic daily analysis of pump runtimes for abnormalities with automatic customer notification of such abnormalities.
 - vii. Pump starts with hourly analysis of excess pump starts with automatic notifications of excess pump starts.
 - viii. Minute-by-minute radio health checks with automatic notification of non-reporting or poorly reporting RTU's.
 - ix. Scaled and labeled pulse totalizations and if rainfall gauges are used, inter-day rainfall graphs and run time verses rain fall based on either rain gauges installed as part of the system or as run time verses a reporting airport rain gauge.
 - x. Performing and displaying volumetric inflow/outflow calculations from RTU supplied data for each pump cycle as they occur. Such volumetric calculations will utilize real-time pump start/stop data with simultaneously gathered level transducer data to perform the inflow/outflow and pump GPM calculations.
 - xi. Utilizing real-time data collection have the ability to based on digital input closure, open or close digital output relay on the same or another real-time unit (Intertie).

4. Alarm System Structure and Software

a. Alarm Delivery Formats

- i. Alarms shall be delivered in the following formats:
- ii. Phone (voice call), fax, pager (numeric or alphanumeric (short alpha or long alpha format), text message, email, or any combination of the above simultaneously.

- iii. Alarms shall be able to be acknowledged by phone, text message, 2-way pager, email or on the Owner web site.
- iv. Voice alarm acknowledgement shall be adjustable to be able to mimic the format of dialers.
- v. Alarms shall be called out on alarm and upon return to normal conditions.
- vi. Return to normal alarms can be adjusted to call the alarm callout group or a different callout group.
- b. Alarm Callout Formats
 - i. Alarm callout groups shall be able to be setup to automatically switch between callout groups at different hours of the day and/or different days of the week.
 - ii. Alarm callout groups shall be able to have multiple teams within each group to easily facilitate rotation of teams of on-call personnel.
- c. Alarm Message Formats
 - i. All alarms shall have the alarm condition, time, alarm location and pump status at the time of the alarm in each message.
 - ii. Alarm message format shall be adjustable to include just the above information when calling a phone where it is known who will answer the phone, or be adjustable to add an introductory message asking for a specific person when calling a phone where it is not known who will answer the phone (like a home phone).
 - iii. Alarms shall be able to be delivered individually or be able to be grouped into one message so that multiple, simultaneous alarms (like AC Fail at multiple sites) can be delivered and acknowledged in one phone call.
- d. Alarm Dispatch Logs
 - i. Each alarm shall have a full log of each notification attempt of that alarm documenting the following:
 - ii. Date, time, and alarm condition
 - iii. If each notification attempt was a success or failure and the reason for each failure if an attempt was a failure (like line busy, call dropped, etc)
 - iv. A recording of each voice notification attempt so the specific reason for a notification failure can be known.
 - v. Date, time, and name of person who acknowledged the alarm.
- e. Voice Alarm Delivery Capacity
 - i. Manufacturer shall provide at least 20 outbound lines to deliver voice alarms so as not delay delivery of current alarms.

5. Remote Data Access

a. Remote Data Access Format

- i. Data collected by the system shall be able to be remotely accessed by simple web browser. The system shall provide individual web pages for the User to access via any web browser.
- ii. To access the web pages, the User shall have to enter a User Name and Password.
- iii. The User can set up any of three levels of access to the web pages:
 1. Read only... can see but cannot make any changes
 2. Read/Write... can see and can make changes
 3. Read/Write/Control... can see, make changes and effect control functions, also add or remove logins/ passwords.
- ii. The vendor shall provide at least two separate web sites for the Owner. One shall be designed to be viewed on a traditional laptop or desktop computer. The other shall be designed to be viewed on a web enabled cell phone or PDA. This web site shall still have graphs showing trending of data, and shall be designed to minimize the data sent so as to minimize the page loading times and size of the data plans necessary to view the site on a web enabled cell phone or PDA.
- iii. The system supplier shall provide secure access through a specified phone without the need for web access (Voice SCADA). This shall require login to system via numeric 5 digit code and must be set up in the system to an associated login for that site to a specific phone number to maintain site security.
- iv. In addition to the above web sites, the User will be provided at no additional charge with a customizable software interface that shall display real-time status and graphic trending of data collected by the M800 RTU.
- v. The software shall be downloadable from the Mission customer website.
- vi. The software shall automatically update itself every time the User accesses the software.
- vii. The software shall require NO programming to customize.
- viii. The software shall be the Mission Real Time Viewer.

- b. Remote Access Security
 - i. In addition to the Username and Password structure described above, all access of the User web site shall be logged. Such logging data to include date, time and duration of access, User Name and Password of user to access the site and IP address of the accessing computer. The log shall be accessible through the User web site
 - c. Automated Administrative Reports and Alerts
 - i. The User web site shall produce and automatically deliver weekly reports which summarize alarms and responses, pump runtimes and flow estimates, weekly end-to-end uptime percentages of each RTU, and all electronic key uses at the RTU sites.
 - ii. The web site shall be capable of sending two (2) different categories of notifications, Alarms and Alerts. Alarms are for conditions that the User decides they want to be notified immediately about. Alerts are conditions that need attention, but are not so time sensitive that they cannot wait till the next morning.
 - 1. The Alarms callout list and the Alert callout list shall be able to be separate and distinctly different.
 - iii. The User web site shall analyze daily pump run times at compared to a moving 30 day average of the pumps most recent runtimes and automatically Alert the User that the pump runs are outside the normal runtime variation pattern.
 - iv. The User web site shall analyze hourly pump runtimes and automatically compare it to two (2) User set thresholds. If the Alert threshold is exceeded, an Alert shall be sent the following morning. If the Alarm threshold is exceeded, an alarm shall be sent immediately.
 - v. The User web site shall send an Alert the first morning that the units are in Communications fail even though Alarms have been sent at the time the RTUs went off-line. Such Alerts are a reminder to Management that they still have units that are off line.
6. RTU Locations
- a. The RTU shall be located at the Carpenter Street Pump Station and shall be furnished with an omnidirectional antenna at grade plus 8 ft. Provide a support pole and foundation for the

antenna. The antenna shall be grounded to a driven ground rod.

7. Monitoring Points per RTU

a. The inputs to be monitored are as follows:

i. Digital inputs

- DI-1 Pump 1 Run
- DI-2 Pump 2 Run
- DI-3 Pump 1 Alarm
- DI-4 Pump 2 Alarm
- DI-5 Pump 1 Runtime
- DI-6 Pump 2 Runtime
- DI-7 Power Failure
- DI-8 Wet Well High Level Alarm Backup

ii. Analog inputs with four (4) hi/low threshold alarms

- AI-1 Pressure Transducer
- AI-2 Spare

iii. Relay Outputs

- R-1 Spare
- R-2 Spare
- R-3 Spare

8. Other Materials

a. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

9. Coordination

- a. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- b. Additional coordination with the supplier's information here.

10. Installation

- a. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- b. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their

proper location, adequately anchored, and adjusted to achieve optimum operation. If required, the Contractor shall adjust the antenna placement or elevation to obtain consistent, stable operation of the system.

- c. Delineate timing of RTU installation and commissioning.

11. Service

- a. Demonstrate to the Owner's operation and maintenance personnel the proper methods for operating and maintaining the equipment, and the contents of the operation and maintenance manual required to be submitted under Article 1.03 in this Section.
 - b. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared by the instrumentation equipment manufacturer's field service technician certifying that:
 - i. The equipment has been properly installed in accordance with manufacturer's recommendations.
 - ii. The equipment check out and initial start-up activities have been completed in accordance with manufacturer's recommendations and under the technician's supervision.
 - iii. Antenna placement has been optimized.
 - iv. The equipment is free from any undue stress imposed by connecting conduit or anchor bolts.
 - v. The equipment operates satisfactorily and in compliance with the requirements of this Section.
4. The pump station control panel and accessories, and wireless monitoring and control system shall be included in the cost of the Pumping Station. Connections to conduits and wiring external to the control panel shall be included in the cost of Pump Station Electrical Work.

General: This work includes all excavation, backfill, temporary shoring, labor, materials and equipment required to manufacture, furnish, and install the valve vault, lid, access frame and hatch, butyl rubber sealant, pumps, pump bases, rails, lift chain, cable and chain brackets, pump rail brackets, testing, and other incidental items as shown on the plans.

Basis of Payment: This work will be paid for at the contract lump sum price for PUMPING STATION.

OC/OA OF CONCRETE MIXTURES - APPLICABLE ITEMS

The Special Provision for "Quality Control/Quality Assurance of Concrete Mixtures" (Recurring Special Provision Check Sheet Item #31 and BDE 80281) shall only apply to the following:

Pay Item:	All Items Utilizing Self-Consolidating Concrete
Location:	All Applicable
Pay Item:	Superstructure Concrete
Location:	Bridge Decks

All other Portland Cement Concrete utilized in the construction of this project shall be produced in accordance with Check Sheet item #30 for "Quality Control of Concrete Mixtures at the Plant."

SAWING PAVEMENT (FULL DEPTH)

Description: This work shall be used in the removal of driveway pavement, sidewalk, pavement, curb, gutter and combination curb and gutter to ensure a satisfactory transition between replacements and the portion remaining in place. The contractor shall saw cut a joint between the portion of the driveway pavement, sidewalk, pavement and curb and gutter to be removed and that to be left in place in order to prevent the surface from spalling when the concrete is broken out. This work shall be done in such a manner that a straight joint will be secured.

Basis of Payment: This work will not be measured separately but shall be included in the contract unit price for the item to be removed.

SIGN REMOVAL

Description: This work consists of the removal and disposal of the two existing specialty signs along Carpenter Street. Specifically, the St. John's Hospital Parking Lot sign on the south side of Carpenter Street mid-block between 9th Street and the railroad tracks, and the Benmar Sign on the north side of Carpenter Street mid-block between 9th Street and the railroad tracks.

General: This work shall include the removal of the sign panels, footings, foundations,