



City Of Carmel
West Ground Storage Tank Booster Pump Station

ADDENDUM 7

November 27, 2024

Planholders on the City of Carmel Ground Storage Tank Booster Pump Station project are hereby notified of the following amendments to the Contract Documents. This Addendum is hereby made a part of the Contract Documents.

SPECIFICATIONS

The attached Specification 16902 shall be included in the Contract Documents.

SECTION 16902
METERING AND CONTROL EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

- A. Work under this Section includes furnishing and installing all metering and control equipment which is part of the Plant Control System except the programmable controller system and the graphic user interface system.
- B. All Work performed shall comply and be in accordance with all approved trade practices and manufacturer's recommendations.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:
 - 1. Shop Drawings for Review:
 - a. Manufacturer's literature including model number, type, size, materials, quantity, connections, equipment number, mounting hardware, and installation information.
 - 2. Information for the Record:
 - a. Equipment suppliers report that equipment is properly installed and satisfactory operation is obtained.
 - b. Software, cables, etc. for configuration, programming or operation of meters or equipment, minimum of two each is required.
 - c. Operation and maintenance manuals.
 - d. Schedule of Owner's training for all new equipment.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. All metering and control equipment shall be as indicated on the Drawings and as specified, and shall include, but not be limited to those devices hereinafter defined. Should additional devices be required, but not specifically indicated elsewhere, in order to affect the intent of the Contract Documents, such devices shall be furnished.
- B. All metering and control equipment used for similar applications shall be the product of a single manufacturer.
- C. All features and requirements listed in the individual instrument specifications are required.

- D. All field instrument enclosures shall be NEMA 4X construction except in hazardous locations where the enclosures shall be NEMA 7 for Class I, Division 1, Group D service, unless otherwise noted. Equipment in hazardous locations shall indicate temperature rating as specified in the NEC.
- E. All faces of panel mounted instruments shall be NEMA 4X construction except where the panel is located in a protected Control Room environment.
- F. Whenever an "or equal" equipment item is proposed in lieu of that specified it will not be considered equal if it is of non-potted construction and the specified item is potted construction.

2.02 PERFORMANCE REQUIREMENTS

- A. Intrinsically safe equipment shall be Factory Mutual approved for Class I, Division 1, Group D service.
- B. Analog signals for input to a programmable controller system shall be isolated 4-20 mA DC and where required, current to current transducers or other device shall be furnished to produce an isolated signal to the programmable controller analog input modules.
- C. Digital input signal sources shall provide an isolated contact rated at 5-amp minimum, 115 VAC, to the programmable controller system.
- D. Power supplies shall be furnished for two-wire transmitters and other devices requiring DC power. No more than four loops shall be powered from one power supply. Separate power supplies shall be provided for duplicate instruments to ensure failure of one power supply will not inhibit operation of secondary equipment.
- E. The Site is in an area subject to radio frequency activity. Any equipment sensitive to radio frequency interference (RFI) shall be provided with the proper RFI filters, be properly shielded and grounded, or otherwise protected to allow proper operation of the equipment.

2.03 POWER AND POWER CONDITIONING

2.04 RESERVED

2.05 RESERVED

2.06 SIGNAL CONTROL

2.07 RESERVED

2.08 LEVEL

- A. RESERVED
- B. RESERVED
- C. RESERVED
- D. Level Element/Transmitter ((LE/LIT))

Function:	Determine level and transmit signal reflecting level to devices indicated.
Type:	Non-contacting, radar
Input Signal:	Analog process level
Range:	1 to 48 feet
Outputs Signals:	4-20 mA HART, scalable
Output Accuracy:	+/- 0.02 mA
Measurement Accuracy:	+/-2mm or 0.08 Inches. Provide NIST calibration Certificate
Repeatability:	+/-0.04 Inches
Ambient Temperature Effect:	0.006%/K
Frequency:	78 GHz
Fail Safe:	mA programmable high, low, or hold
Display:	Local Alphanumeric and multi-graphic liquid crystal with pushbuttons if available. If Local display is not visible or accessible please provide remote display that is 110VAC or 24 Volt powered.
Process Temperature:	-40 to 176 degrees F
Power Supply:	24 VDC Two Wire with built in surge protection
Ambient Temperature:	-40 to 176 degrees F
Enclosure:	Dual Compartment Housing NEMA 4X, or NEMA 6, IP67, as required. Sensor shall be FM approved Class I. Div. I explosion-proof
Antenna:	316 Stainless Steel Horn Antenna
Accessories:	Software with Hart modem or Bluetooth as required. Provide 316 Stainless Steel Flange or process seal on chemical tanks. Provide ANSI Flange as required on drawings. Provide mounting bracket installation on open

	tank applications. Provide echo mapping and data logging software if available
Manufacturer:	Rosemount, Endress Hauser, Vega, Siemens, or equal
Model:	S5408, FMR60, PULS64, Sitrans LR100 Series

- E. RESERVED
- F. RESERVED
- G. RESERVED

2.09 FLOW

A. Flow Element and Transmitter ((FE))/(FIT))

Function:	Measure, indicate and transmit the process flow in a full pipe. Meter must be a full bore meter with the magnetic field traversing the entire cross section of the flow tube. Insert magmeters or multiple single point probes inserted into a spool piece are not acceptable. Magnetic flow meter, operating based with high impedance electrodes. Flow tube with two coils mounted outside a 304 stainless steel tube, transmitter, interconnection cables and mounting hardware.
Type:	Pulsed DC magnetic induction with absolute zero stability
Size:	As specified on Drawings and in Schedule
Input Signal:	Analog Process Flow
Conductivity:	Minimum 5 Micromho/cm
Process Temperature:	-10 to +130 degrees F
Outputs:	Isolated 4-20 mA DC into 1,000 ohms. Scaled pulse outputs as standard.
	Flow direction, empty pipe detection, configurable status two contact outputs and one contact input for zero contact return.
Display:	Backlight LCD capable of simultaneously displaying flow rate and totalization
Calibration:	Provide with each flow meter a printout of two points of calibration starting at 1 FPS with measurement devices traceable to NIST standards. Three minute 1.5 x PN- All meters shall have internal meter verification diagnostic.
Accuracy:	+/- 0.25 percent rate or less (3 to 33 ft/sec)
	or +/- 0.005 percent FPS below 1 FPS
Repeatability:	+/- 0.1 percent of reading
Range ability:	100:1 turndown
Selectable Damping:	0.01 to 99.99 seconds, configurable
Low Flow cutoff:	0 to 10 percent, configurable
Electrodes:	Hastelloy C, bullet nosed electrodes on wastewater and flush electrodes on clean fluid. Titanium or others for chemical feed applications. It is the manufacturer's responsibility to provide materials comparable with the process medium.

Liner:	Polyurethane, hard rubber, neoprene for sewage meters. Ebonite, Teflon or Tefzel for all sludge meters (RAS, WAS, thickened). Meters 14 inches and larger shall have a polyurethane or hard rubber liner. All meters specified in potable water lines shall have an NSF 61 or FDA approved liner.
Flow Tube:	
0-12 inches:	304 or 316 stainless steel, meters 0-12 inches shall be capable of accidental submergence with 30 feet of cable to remote converter. Meters located below grade or in a meter vault shall be NEMA 6P rated with 100 foot cable. Cable shall be factory installed and potted. Compound mixtures installed in the field are not acceptable. All meter housings shall be of a welded design.
12-72 inches:	304 or 316 stainless steel shall be capable of continuous submergence in 30 feet of water with cable to remote converter.
End Connections:	
0-4 inches	150 lb. ANSI carbon steel or wafer design
6-24 inches	150 lb. ANSI carbon steel flanges
30-78 inches	Class D AWWA flanges
Lay length	All meters should comply with ISO 13359 lay lengths
Grounding:	All meters must be supplied with orifice type 316 stainless steel grounding rings. Grounding electrodes are not acceptable. Meters shall have 316 grounding straps.
Converter:	Microprocessor based remote converter. Refer to drawings for cable length. Only one conduit between flow tube and converter. Three totalizers for forward, reverse and net.
Power Requirements:	110/120 VAC 50/60 Hz.
Transmitter Enclosure:	NEMA 4X die cast aluminum rectangular housing immune to RFI inference, with flow rate and totalization indication.
Electrical Rating	All meters installed in a wastewater treatment plant shall be FM approved Class 1 Division 2 Grounds A, B, C and D. Meter shown on drawings in Class 1 Div 1 area shall be rated for that area.
Ambient Temperature:	-40 to 150 degrees F
Manufacturer:	Endress & Hauser 53W Promag, Rosemount 8700 Series or Johnson Yokagawa ADmag, Siemens 3100, or equal.
Model:	Manufacturer shall be ISO 9001 compliant and meters shall have a two year standard warranty. All meters shall have a stainless steel tag. All meters shall have internal meter verification along with coating, ground loop and process noise diagnostics. All meters shall have empty pipe direction with contact inputs for zero return.

B. RESERVED

C. RESERVED

- D. RESERVED
- E. RESERVED
- F. RESERVED
- G. RESERVED

2.10 PRESSURE ELEMENTS AND TRANSMITTERS:

A. Pressure Transmitter ((PE))/(PIT))

Function:	Measure process pressure and transmit signal proportional to pressure
Type:	Capacitor sensing element and electronic solid state transmitter with integrated LCD display
Input Signal:	Analog Process Pressure
Output Signal:	4-20 mA DC, user selectable for linear or square root output
Accuracy:	+/- 0.055% of span, including combined effects of hysteresis and repeatability
Stability:	+/- 0.125% of upper range limit for five years
Rangeability:	100:1 turndown
Response Time:	100 msec
Temperature Effect:	+/- 0.025% of upper range limit per 50 degrees F for ranges < 100:1
Static and Over Pressure Limits:	0 psig to 2000 psig on either side without damage to the transmitter
Line Pressure Effect:	+/- 0.025% of upper range limit per 1000 psi
Span and Zero:	Continuously adjustable externally non-interacting
Damping:	User selectable from 0 to 60 sec, in addition to sensor module response time
Temperature Limits:	-40 to +185 degrees F sensing element operating -4 to +185 degrees F amplifier operating
Humidity Limits:	0 to 100% relative humidity
Fill Fluid:	Silicone
Wetted Parts:	Hastelloy C diaphragm, drain and vent valve, TFE O-ring
Diaphragm Seals:	To be provided where required to achieve instrument functionality or process isolation. Fill fluid and stiffness to be selected to minimize temperature effect. Direct flange mount where transmitter accessibility is not impeded. Capillaries and process connection taps shall be sized and located to minimized head and temperature effects.
Process Connection:	Coplanar 316 SS, integral 3-valve manifold with test pressure connections to be included
Power Requirements:	24 VDC 2-wire loop
Housing:	Low-copper aluminum, NEMA 4X
Accessories:	One handheld HART communicator required for every four units, factory calibration certificate
Manufacturer:	Rosemount, Siemens, Foxboro, or equal
Model:	3051S Series

- B. RESERVED
C. RESERVED
D. RESERVED
E. Pressure Switch ((PS))

Function:	Indicate at setpoint pressure in process line
Type:	Diaphragm/piston transducer, automatic reset switch
Operating Range:	As required by instrument schedule
Switch:	DPDT, 5 amp resistive, 125 VAC
Repeatability:	+/- 1% of range
Deadband:	Set and reset points independently adjustable over the full range
Temperature Limits:	-4 to +250 degrees F, sensing element operating
Wetted Parts:	316 SS
Enclosure:	NEMA 4X
Manufacturer:	Emerson Industrial Automation ASCO Tri-Point, or equal
Model:	Series SA

- F. RESERVED
G. RESERVED
H. RESERVED
I. Diaphragm Seal

Function:	Provide isolation from process fluids
Duty:	Continuous
Diaphragm:	316 SS, to suit pressure range and minimize temperature effect
Fill Fluid:	Incompressible, non-corrosive, and suitable for materials of construction and temperature encountered. Fill fluid to be selected to minimize temperature effect.
Housing Material:	316 SS
Construction:	To allow the connected instrument and the diaphragm seal top housing to be removable from the process piping without disconnecting the diaphragm seal bottom housing. Teflon coated gasket to provide seal between removable diaphragm and bottom housing.
Connections:	Sludge piping process connections shall be 1-1/2 inch 150 lb flanged. Gas and water piping process connections shall be 3/4 inch NPT. All instrument piping connections shall be 1/2 inch or 1/4 inch NPT, as required. All process connections shall have a 1/4 inch NPT flushing connection with a 316 SS plug.
Special Service:	Diaphragm and bottom housing shall be Hastelloy C for all chlorine liquid, gas and solution service. Entire seal shall be

	rated for 1,000 psig for all chlorine liquid and gas - under-pressure service.
Manufacturer:	Ashcroft, or equal
Model:	Type 101 or 103 as required

J. RESERVED

2.11 POSITION

2.12 RESERVED

2.13 RESERVED

2.14 RESERVED

2.15 ANALYTICAL

A. RESERVED

B. RESERVED

C. RESERVED

D. RESERVED

E. Chlorine Residual Analyzer ((AE))/(AIT))

Function:	Continuous free residual chlorine monitoring, transmit signal proportional to chlorine residual
Type:	Free and total residual analysis, microprocessor based control unit using DPD colorimetric method, integrated LCD display
Performance Criteria:	Standard Methods 408.E
Range:	0 to 5 mg/l free or total chlorine residual
Outputs:	4-20 mA programmable over span, 130V isolation from earth ground,
	Two SPDT, 5A @ 230 VAC, relay contacts configurable for sample concentration alarm, system warning, and system shutdown alarms
Display:	Integral LCD indicator and alarm status LED
Resolution:	0.035 mg/l
Accuracy:	+/- 5% or 0.035 mg/l, whichever is greater
Repeatability:	Within 0.05 mg/l
Cycle Time:	One sample analysis every 2-1/2 minutes
Sample Flowrate:	Minimum 200 ml/min
Sample Inlet Pressure:	1.5 to 75 psig
Ambient Temperature:	41 to 104 degrees F
Power Requirements:	120 VAC, 90 VA max
Enclosure:	NEMA 12

Installation:	Sample supply line shall be provided with hot tap in process piping. Tap location and drain line routing shall be approved by Owner/Engineer.
Accessories:	Sample supply line including ball valve and pressure regulators (adjustable and preset), drain line, maintenance kit, Y-strainer, and (3) reagent kits for each analyzer
Manufacturer:	Hach Company, or equal
Model:	CL17

- F. RESERVED
- G. RESERVED
- H. RESERVED
- I. RESERVED
- J. RESERVED

2.16 ACCESSORIES

- A. All piping and tubing for connections to instruments shall be stainless steel. Threaded pipe shall be ASTM A312, Grade TP304, Schedule 40S, and fittings shall be AISI Type 304. Tubing shall be ASTM Grade TP304, 0.028-inch minimum wall thickness for flareless "bite" type with threaded nut and ferrule fittings.
- B. Valves shall be stainless steel eccentric plug valves with a bolted-on non-removable lever actuator. Valves shall be equal to DeZuric Figure 130 with synthetic rubber faced plugs. Valves shall have screwed or flanged ends as required. Valves for gas service shall be designed for gas service and shall provide leak-proof shutoff.
- C. Diaphragm seals shall provide continuous isolation between pressure gauges, switches, and transmitters from process fluid. Upon instrument removal or failure, there shall be no leakage. Seals shall be of the type to allow instrument and diaphragm top housing to be removed from the process piping with no leakage of process fluid. Seal fill fluid shall be incompressible, non-corrosive, and suitable for materials of construction and temperature encountered, and shall be selected to minimize temperature effect. Sludge piping process connections shall be 1-1/2-inch, 150 pound flanged. Gas and water piping process connections shall be 3/4-inch NPT. All instrument piping connections shall be 1/2-inch or 1/4-inch NPT, as required. All process connections shall have a 1/4-inch NPT flushing connection with a 316 SS plug.
- D. All mechanical fasteners such as bolts, nuts, screws, cinch anchors, clamps, etc., shall be stainless steel.
- E. All special mounting brackets shall be stainless steel, galvanized, or nonferrous non-corrosive metal.
- F. All equipment mounted outdoors that includes any type of visual indicator, LCD, etc., shall be furnished with a sun visor.
- G. All equipment located outdoors shall include a thermostatically controlled space heater.

- H. All field instruments and devices shall be equipped with a 1-inch x 3-inch stainless steel identification tag firmly affixed to the instrument or device with stainless steel fasteners. Each tag shall show the manufacturer's name, serial number, part number, tag number (to be approved by the Engineer), calibrated ranges, or calibration constants.
- I. For each type of device installed, the Contractor shall supply two complete sets of software, hardware, calibration devices, and cabling, used to configure, calibrate, or make adjustments.

PART 3 EXECUTION

3.01 GENERAL

- A. The features and installation of the instrumentation shall be coordinated for optimal performance with the characteristics of the process material to be metered.
- B. Care must be exercised to identify locations that meet the requirements of the manufacturer including upstream and downstream distances, pressures, temperatures, and accessibility for maintenance.
- C. Verify equipment requirements and dimensions with provisions specified under this Section. Check actual field conditions, report necessary changes, and submit equipment reflecting changes.
- D. Coordinate Work with other trades to avoid conflict and to provide correct rough-in and electrical connection requirements. Inform Contractors of other trades of the required access to and clearances around equipment to maintain serviceability and code compliance.
- E. Where the installation of any device is dependent on, or affected by, Work performed under other sections of these specifications, the Contractor shall coordinate the Work. Installation coordination includes the correct location and placement of devices, piping to the equipment, pipe taps, control power circuits, connections to the control system, etc.
- F. Installation of instrumentation in an existing system being modified, replaced, or abandoned, shall be coordinated with the Owner and shall be performed to minimize operational disruptions and minimize time that equipment may be out of service.

3.02 INSTALLATION

- A. Installation shall include the provision of materials, and the coordination of all details, necessary to properly install the instruments including location, arrangement in piping, power source, signal wiring and conduit, special brackets, and all mounting hardware.
- B. All instrumentation devices shall be installed in accordance with the manufacturer's installation requirements.
- C. Wiring practices for intrinsically safe systems shall be in accordance with ISA RP12.06.01.

- D. Instruments shall be installed so that the various components are accessible for maintenance. Care shall be taken in the installation to ensure sufficient space is provided between instruments and other equipment, including piping, for ease of removal and servicing. All instruments shall be readily accessible from grade, permanent platforms, or fixed ladders.

3.03 STARTUP AND TRAINING

- A. The Contractor shall provide the services of component manufacturer's factory trained personnel for the supervision of installation, initialization, and calibration of equipment.
1. These services shall also include a minimum of one eight-hour day to instruct the Owner's personnel in the operation and maintenance of the equipment. Specifically, these services shall be provided for but not limited to the following equipment items: All new equipment that is provided by Contractor.

Specification Subsection	Description
2.08, 2.09, 2.10, 2.15	All

PART 4 SPECIAL PROVISIONS

4.01 GENERAL

- A. Schedules included herein are intended to supplement the Drawings and are not guaranteed to be complete. All instrumentation devices shown in the Contract Documents or otherwise required to complete the Work shall be furnished and installed.

4.02 LEVEL INSTRUMENT SCHEDULE

- A. The following schedule is a listing of level instruments to be installed including: radar and sonic transducers, capacitance probes, and floats.
- B. The following letter designations are used in the schedule:

Item Designation:

LT-1	First Letter	L	=	Indicates Level Device
	Second Letter	T	=	Function, Indicator and Transmitter
	Number	1	=	Item Number

Function:

S	Switch
I	Indicator
T	Transmitter

Range: As noted

- C. Level instruments are numbered on the Drawings and scheduled as follows:

Item Designation.	Process Function	Range	Process Conditions	Power Supply	NEMA Rating	Dwg No.	Spec No.
LIT-1	Reservoir Level	0-49 ft	Potable Water	Via Transmitter	4X	I-2	16902
LIT-2	Reservoir Level	0-49 ft	Potable Water	Via Transmitter	4X	I-2	16902

4.03 FLOW INSTRUMENT SCHEDULE

A. The following schedule is a listing of new flow devices to be installed.

B. The following letter designations are used in the schedule:

Item Designation:

FT-1	First Letter	F	=	Indicates Flow Device
	Second Letter	T	=	Function, Transmitter
	Number	1	=	Item Number

Function:

S	Switch
I	Indicator
T	Transmitter

C. Flow devices are numbered on the Drawings and scheduled as follows:

Item Designation	Function	Pipe Size	Range scfm/gpm	Process psig/in. H2O	Process Conditions	Power Supply	NEMA Rating	Dwg No.	Spec No.
FIT-1	Reservoir Fill Flow	14 in	0-6000 gpm	0-100 psig	Potable water	120 VAC	4X	I-2	16902
FIT-2	Discharge Flow	16 in	0-8000 gpm	0-100 psig	Potable Water	120 VAC	4X	I-4	16902

4.04 PRESSURE INSTRUMENT SCHEDULE

A. The following schedule is a listing of pressure assemblies including: gauges, diaphragm and in-line chemical seals, pressure transmitters, and pressure switches. Each line item requires a snubber (Ashcroft Type 1106S) and shut-off valve (Ashcroft Type 7004). Each line item so indicated shall include accessories shown.

B. The following letter designations are used in the schedule:

Item Designation:

PT-1	First Letter	P = Indicates Pressure Device
	Second Letter	T = Function, Transmitter
	Number	1 = Item Number

Function:

E	Element or Sensing Device
S	Switch Only
I	Indicator Only
T	Transmitter

Tap Size:

1-1/2-inch	Sludge
3/4-inch	Water and Gas
1/2-inch	Air

Service Pipe Size - As shown on the Drawings

Type:

P	Pressure
C	Compound

Note: Unless noted, all compound pressure gauges shall have 0-30-inch Hg vacuum range.

C. Pressure instruments are numbered on the Drawings and scheduled as follows:

Item No.	Function	Range/Setpoint	Seal	Tap Size	Power Supply	NEMA Rating	Dwg No.	Spec No.
PIT-1	Influent Pressure	0-100 PSIG	Diaphragm (NSF Cert)	½ in	Loop	4X	I-2	16902
PIT-2	Discharge Pressure	0-100 PSIG	Diaphragm (NSF Cert)	½ in	Loop	4X	I-4	16902
PS-5	Air Comp Pressure	0-150 psig	None	1/2in	24 VDC	1	I-6	16902

4.05 RESERVED

4.06 ANALYTICAL INSTRUMENT SCHEDULE

A. The following schedule is a listing of analytical devices including: gas detection, chlorine residual monitors, turbidity, etc.

B. The following letter designations are used in the schedule:

Item Designation:

AIT-1	First Letter	A	=	Indicates Analytical Device
	Second Letter	I	=	Function, Indicator
	Third Letter	T	=	Function, Transmitter
	Number	1	=	Item Number

Function:

C	Controller
S	Switch
I	Indicator
T	Transmitter

C. Analytical instruments are numbered on the Drawings and scheduled as follows:

Item No.	Function	Range	Power Supply	NEMA Rating	Dwg No	Spec No.
AIT-1	Tank Fill Cl Level	0-3 mg/L (free)	120 VAC	4X	I-2	16902
AIT-2	Pre-Reservoir Cl Level	0-3 mg/L (free)	120 VAC	4X	I-4	16902

4.07 SPARE PARTS

- A. The Contractor shall furnish spare parts as shown in the Spare Parts Schedule. The spare parts shall be individually packaged for protection against dirt and moisture. Each package shall be labeled as to its contents with a description and part number.
- B. All spare parts shall become the property of the Owner. The Contractor shall maintain the spare parts inventory level as shown in the Spare Parts Schedule, and replace at no cost to the Owner all spare parts consumed during the one-year warranty period.

4.08 SPARE PARTS SCHEDULE

- A. Specification

Subsection Number	Description	Quantity	Remarks

- B. Where a unit is indicated it shall be a complete unit as specified herein and installed including enclosure.

END OF SECTION