SECTION 13423 - LEVEL MEASUREMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. Bubbler.
   2. Ultrasonic level transmitter.
   3. Flange mounted level sensor.
   4. Cord type float switch.
   5. Rod type float switch.
   6. Capacitive level sensor.
   7. Capacitance/RF level sensor.
   8. Conductance probe.
   9. Pressure switch.
   10. Pressure switch/gauge.
   11. Torque switch.
   12. Submersible level sensor.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Sections 01300 and 13410, Shop Drawings covering the items included under this Section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Bubbler Assembly:
      a. Brooks.
   2. Capacitive Level Sensor:
      a. Endress-Hauser.
      b. Siemens.
      c. ABB.
   3. Conductance Probe:
      a. B/W Controls.
      b. Delta Controls Corp.
      c. Warrick Controls, Inc.
   4. Cord Type Float Switch:
      a. Conery.
      b. Anchor Scientific, Inc.
      c. Consolidated Electric Co.
      d. Pulsar, Inc.
   5. Flange-Mounted Level Sensor:

a. Endress-Hauser.
b. Siemens.
c. ABB.

6. Laser Level Sensor:
   a. Vega.
   b. ABB.
7. Instrumentation Rated Pneumatic Fittings (not cast):
   a. Parker-Hannifin.
   b. Swagelok.
8. Pressure Switch:
   a. Allen-Bradley, Bulletin 836T.
   b. Square D Co., Class 9012.
9. Pressure Switch/Gauge:
   a. Dwyer Instruments, Inc.
   b. Frank W. Murphy, Mfr.
10. Rod Type Float Switch:
    a. Delta Controls Corp.
    b. Magnetrol.
    c. Sensilevel.
    d. Square D Co.
11. Ultrasonic Level Transmitter:
    a. Siemens.
    b. Endress-Hauser.
    c. ABB.
12. Submersible Level Sensor:
    a. Endress-Hauser.
    b. Siemens.
    c. ABB.
13. Torque Switch:
    a. Bindicator Co.
    b. Conveyor Component Co.

2.02 BUBBLER ASSEMBLY

A. Bubbler assembly shall consist of an air set, 3-position duplex selector valve, air purge regulator with rotameter, water purge rotameter, and water bypass valve. All bubblers are to be factory assembled and pre-piped in a 10-gauge steel subplate with turned edges. Bulkhead fittings shall be used for all supply and outlet connections to subplate bubbler assembly.

B. Air set assembly shall include a pressure regulating valve with indicating gauge, filter assembly, and a ball valve.

C. Pressure regulating valve shall have 0.375-inch ports, self-venting mechanism, and a screw handle for adjusting output range from 0-30 psi.

D. Indicating gauge shall be a 2- or 2.5-inch dial with a 0-30 psi range and 1 psi graduations. Accuracy shall be 2 percent at mid-scale. Indicating gauge shall be glycol filled.

E. Filter assembly shall be a self-drain type with 0.375-inch ports, cast aluminum bowl and a 40 micron filter type element.

F. A 2-way ball valve shall be provided on outlet side of pressure regulating air set.

G. Duplex valve shall be a Conant 2-stack, 5-way, 180 degrees with mechanical stops and mid-position detented, 3-position, with escutcheon plate reading PURGE-OFF-NORMAL in a clockwise rotation, or duplex valve shall be a Versa Products VHA-8403-33F, 2 inlet and 1 outlet 3-way valve coupled with a VUA-2403-33F, 2-way, 3-position detented on a mounting base MB-33-33. Versa valve assembly is a 3-position assembly with all 0.375-inch ports blocked in center position. Provide an escutcheon plate marked PURGE-OFF-NORMAL.

H. Air tubing shall be 0.375-inch polyethylene type HP plastic tubing for subplate assembly.

I. Air purge shall consist of a purge meter with a differential pressure regulator integrally piped. Purge meter shall be of rotameter type with a metering tube housed in a fiberglass body. Meter shall be equipped with brass end fittings, Buna-N O-rings, stainless steel needle valve in inlet fitting, and nylon ball check valve in outlet fitting. Metering tube shall be of snap-in type for easy removal for range change or cleaning. Tube shall have etched graduations for direct reading of flow rate. A constant differential pressure regulator shall be provided to maintain a constant flow rate with varying downstream pressure. Regulator shall have a brass body with Buna-N diaphragm and it shall be piped to purge meter with copper tubing. Regulator shall be designed for a maximum differential pressure of 100 psi.

J. Rotameter air capacity shall be 0-3 scfh, and pressure regulating valve shall regulate 0-30 psi with an input air rating of 150 psi.

K. A water purge assembly shall be provided when shown on Drawings. Water purge assembly shall consist of a rotameter, flow control valve, and 2-way bypass ball valve. Rotameter shall operate with pressures up to 100 psi. Rotameter shall be 2 to 20 gph capacity.

L. Ferric Chloride Bubbler: Fittings, components, and tubing shall be of corrosive-resistant materials such as rubber, fiberglass, tantalum, or PVC. Tank liquid level indicating system for mounting inside building shall be furnished.
   1. Air filter, pressure regulating valve, and rotameter shall be furnished with bubbler tube, tank fittings, and manometer for continuous monitoring of $FeCL_3$ tank level. Rotameter air capacity shall be 0-3 scfh, and pressure regulating valve shall regulate 0-30 psi with an input air rating of 150 psi.
   2. Bubbler shall be capable of operating in applications in which $FeCL_3$ tank is open, sealed, or operates under pressure.

2.03 ULTRASONIC LEVEL TRANSMITTER

A. Sonic level device shall be microprocessor-based and include sensing head, control cabinet, and cable between head and control cabinet.

B. Length of cable shall be sufficient for application shown.

C. Sensor shall automatically compensate for ambient temperature changes.

D. CONTRACTOR, equipment supplier, and manufacturer shall examine Drawings for each installation to determine equipment supplied will work in each application.

E. Drawings shall contain a typical installation detail and show location of sensors.

F. Equipment supplier must ensure beam angle of sensor shall not have interference from walls, pipes, or other objects at each location. Shop Drawings shall be specific about model numbers at each location, and detail sketches showing mounting height, zero dimensions, span dimensions, and beam angle data for each location.

G. Any device that will not function reliably to specifications in its application shall be replaced at CONTRACTOR's expense.

H. Sonic sensor head shall be intrinsically safe for NEMA 7 areas (explosion-proof). Sensor head shall be epoxy-coated metal, encapsulated or mylar for corrosion resistance.

I. Control cabinet shall be supplied rated NEMA 4 or as shown on Drawings. Control cabinet shall contain a receiver processor, a full-hinged front door, for outdoor applications a control cabinet thermostat controlled heater for -20 degrees F operation, and local digital indicator configured in engineering units.

J. Connections to controller and ultrasonic sensor shall be with well-marked terminal blocks.

K. Operational Data:
   1. Temperature: Sensor to operate within specifications over -20 degrees F to 150 degrees F. Controller shall operate from 32 degrees F to 120 degrees F without heater, and -20 degrees F with a heater.
   2. Pulse Rate: 1.5 pps minimum sensing rate.
   3. Reflection Blocking: Adjustable receiver blanking to operate on every pulse received and have have the ability to blank reflections. Shall be electronically adjustable with manufactures supplied program.
   4. Cable Length: shall be per the application.
   5. AGC: Automatic gain control to maximize signal to noise ratio.
   6. System Accuracy: Plus or minus 1.0 percent of full scale over the complete temperature range.
   7. Power Supply: 24 volt DC.
   8. Output: 4-20 mA output linear with level into a minimum of 700 ohms. Output shall be isolated, floating to prevent system ground loops when used with other control loops that have an established common at a remote location. Output time constant shall be adjustable through keypad from 1 to 10 seconds

2.04 FLANGE-MOUNTED LEVEL SENSOR

A. Flange-mounted level sensors shall be pressure to current signal converters and shall be 2-wire, solid-state electronic, temperature-compensated strain gauge or capacitive type, designed for mounting directly on ANSI 150-pound 3-inch flange without diaphragm extension. Process pressure shall be applied to sealing diaphragm in measuring section. This pressure shall be transmitted to a measuring element connected to the electronics of the transmitter. Converter shall include a repairable circuit board mounted in a cast aluminum explosion-proof housing. Transmitter shall output an isolated 4-20 mA signal proportional to pressure measurement. Adjustable electronic damping shall be provided from 0-16 seconds in electronically adjustable increments of 0.1 second.

B. Positive overage protection shall be provided. Diaphragms and wetted parts shall be 316 stainless steel, except where other special alloys are required to prevent corrosion.

C. Accuracy shall be within plus or minus 0.1 percent of calibrated span for spans from 1:1 to 15:1 of URL. Stability shall be plus or minus 0.1 percent of URL for six months. Zero suppression and elevation shall be at least 500 percent of range.

A. Units shall be supplied with integral or local digital flow display and shall display the programmed scale of the device, except for submersible units. Units shall be HART protocol capable and supplied with HART hand-held configurator (per project). See specification section 16050 2.01.

2.05 FLOAT SWITCH (CORD TYPE)

A. Direct acting float switch shall be furnished to automatically detect liquid level change. Liquid rise from rest position shall operate float switch and reset will occur when liquid level drops, per manufuacturer's recommendation

B. Float switch shall consist of 316 type stainless steel or corrosion resistant material housing, mounting clamp according to drawings, flexible cable with a synthetic jacket, and mercury switch. A mercury free float switch may be used only when specified on drawings. Inside float housing will be a (normally open/closed) mercury switch potted in epoxy. Electrical load for switch contacts shall be rated 115 volt AC at 0.5 horsepower inductive load.

C. Float bodies made of conductive materials shall have green grounding wire connected internally to float housing.

2.06 FLOAT SWITCH (ROD TYPE)

A. Vertical flange-mounted types shall be caged andin accordance with ANSI. All materials shall be those required per work application. Contact output shall be SPDT rated at 10 amps.

2.07 CAPACITIVE LEVEL SENSOR

A. Capacitive level sensors shall measure changes in capacitance to measure level of fluid. Device shall have a wide range of adjustments of zero and span. Output signal of device shall be 4-20 mA DC.

B. Controller shall be housed in a NEMA 12, 4, or 7 enclosure as required for application.

C. Repeatability shall be 0.1 percent or better. It shall be suitable for mounting outdoors with a temperature range of -20 to 160 degrees F. Power supplied will be 24 volt DC.

2.08 CONDUCTANCE PROBE

A. Level switch shall consist of intrinsically safe conducting electrodes and a controller. Controller shall be housed in a NEMA 12, 4, or 7 enclosure as required for application. Electrodes shall be rod type or wire suspension type. Wire type electrode shall be used with condulet holder or cast flange holder as shown.

B. Controller shall be high-sensitivity relay for operation with liquid as specified on drawings.

C. Sensitivity shall be field adjustable by resistance change. Unit must be field convertible from normal to inverted output.

D. Electrode wire length between sensor and controller shall not effect operation.

E. Controller shall operate on 24 volt DC. Output contact shall be rated 3 amp resistive.

2.10 PRESSURE SWITCH

A. Pressure switches shall be rated minimum 3 amp at 120 volt AC with SPDT or DPDT contacts shown on Drawings.

B. Pressure switches shall have an adjustable differential.

C. Proper ranges and NEMA 12, 4, or 7 housing requirements shall be as shown on Drawings. CONTRACTOR shall obtain proper device for each application.

D. If there is insufficient data on Drawings to determine range, overpressure, differential, and number of poles on switch, CONTRACTOR shall obtain this information from ENGINEER.

E. Shop Drawing shall show switch model number, range, differential, overpressure, contact data, and set and reset points for each device.

F. Two single-pole switches individually set will not be accepted as a substitute for 2-pole switches.

G. Pressure switch parameters vary greatly with manufacturers. If, in the judgment of ENGINEER, pressure switch submitted is operating at limits of range, overpressure or differential, it will not be accepted if another manufacturer has a more appropriate device for application.

2.11 PRESSURE SWITCH/GAUGE

A. Pressure switch/gauge shall be a pressure gauge combined with a pressure switch. Unit shall have pressure range indicated on Drawings. Pressure gauge shall have a minimum diameter of 4 inches and shall have a plus or minus 2 percent full-scale accuracy. Pressure switch shall utilize a 24 volt DC output relay with DPDT contacts rated 5A at 120 volt AC. Switch trip and reset points shall be adjustable on front of gauge via knob controls.

2.12 SUBMERSIBLE LEVEL SENSOR

A. Submersible level sensor shall measure liquid depths using a fully submerged differential pressure transducer suspended in measured medium by electrical cable. Transducer shall be supplied with cable required to reach control unit from sensor location.

B. Transducer shall be a 4-20ma loop powered device capable of HART programming.

2.13 TORQUE SWITCH

A. Torque switches for bulk material level detection shall operate on 120 volt AC power and have a general-purpose enclosure. Upon level detection two 3 amp rated Form C contacts shall be operated. Units shall mount on a 1.25-inch pipe tap. Paddles shall be stainless steel. Units shall be top or side mounted as shown on Drawings and provided with all required accessory parts.

PART 3 - EXECUTION

3.01 GENERAL

A. Examination, Installation, Field Quality Control, Demonstration: In accordance with Section 13410.

END OF SECTION